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July 1 to Dec. 31, 1917

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INDEX TO VOLUME CIV

July 1 to December 31, 1917

EXPLANATORY NOTE

Illustrated articles are denoted by an asterisk (*); book notices by a dagger (†).

This index is made comprehensive but concise. Pains are taken to bring together matter belonging to the same subject, so that when a reader looks up an article he will be cited to related data. Under these conditions some further explanation of the method will be useful in finding leading articles quickly. Series of simple page numbers following names of mines or companies usually refer to news notes and other lesser matters. Descriptive articles are appended under titles (often abbreviated) beginning with dashes. When the minor references are numerous, as in the case of "Anaconda," they are sometimes separately designated as various "notes." The unspecified entries may, however, be important; for instance, an editorial or other article may be entitled simply by a proper name. With a major entry or series of entries may be placed several minor ones relating to the same subject in order that its history may be followed. The asterisks denoting illustrated articles assist in finding them and if the author's name be known, it is the simplest means of reference. Productions are indexed under names of metals and countries or states, in important cases under both. The mere juxtaposition of a mineral and geographical name usually signifies an output but may cover other statistical or news matter. Not all news notes are indexed, but a liberal selection of them is made.

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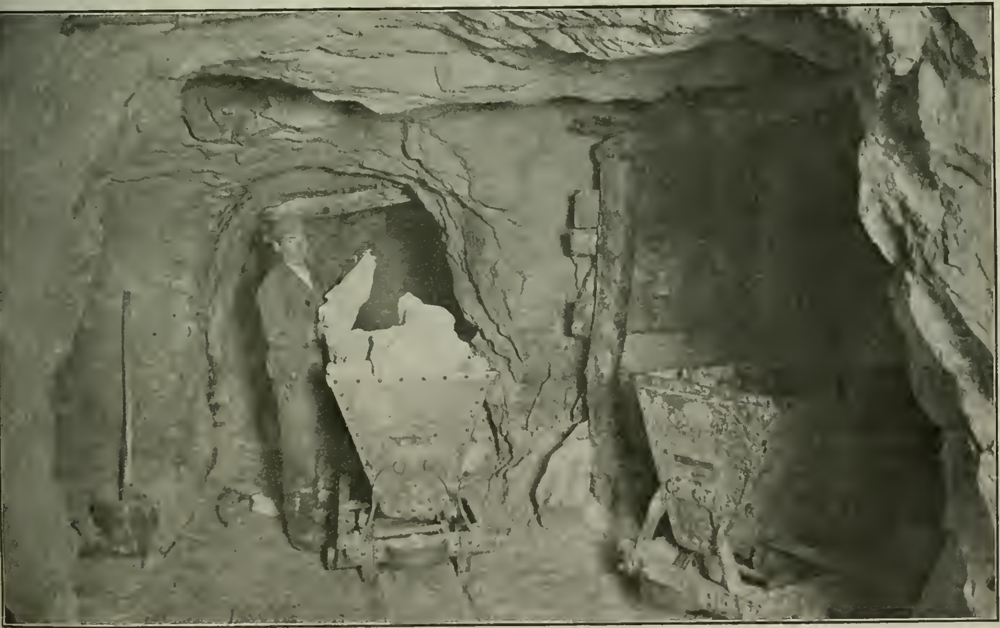
Growth of the Talc Industry

By FREELAND JEWETT
President, Eastern Talc Co., Boston, Mass.

Production of talc in Vermont has, during the last ten years, increased from 10,000 tons per annum to 70,000 tons, which is equal to the combined production of France and Italy. A brief history of the talc mining and grinding industry in general is given.

THE history of the talc industry of Vermont for the period covered by the last 11 years has been to such an extent influenced by the operations of the Eastern Talc Co. and the mining and manufacturing so extensively developed by this corporation, that in treating of the subject some activities are mentioned in detail. These details are considered interesting since they represent the most comprehensive development in talc properties ever accomplished either abroad or in this country.



UNDERGROUND IN THE TALC MINES, PEROSA, ARGENTINA, ITALY

The increase in the talc production of Vermont during the last ten years has been marked. While in 1906 the talc, in 1915 the amount had risen to 62,000 tons, and intotal output of the state was 10,413 tons of pulverized complete figures for 1916 show an approximate production of 70,000 tons.

Prior to 1907 there had been three or four small producers, some of which had no mills and shipped to various grinding plants, while others produced in an irregular fashion, often being forced to cease operations in extreme weather. The majority of the companies operating were poorly financed, and the mining end was crude, being usually in the hands of men of little or no experience. Prices were often dictated by necessity for funds or enforced by shortage of storage space for finished product; transportation was undeveloped in many cases, and in general the industry was unprofitable and ill-managed.

In 1905-06 new interests started exploration work in Roxbury, developing a mine on the White River below that town and the next year taking property in East Granville, where the first mill was completed in 1907.

The capacity was 1000 tons monthly, since increased to 1200 tons. These same interests by 1911 had holdings in Braintree, Bethel, Stockbridge and Rochester, and by 1913 had three mills at work with a capacity of 4800 tons per month—a larger tonnage than produced in all France and more than double the entire production of Italy.

The greatest increase in consumption has come from the paper-manufacturing trade and the manufacturers of prepared roofings, while rubber and the textiles have also developed their requirements in enormous proportion.

The Eastern Talc Co. produces a large proportion of the total output of Vermont and Massachusetts, having in operation at Rochester, Vt., the largest talc mill in the world. The construction is up to date, and the buildings are sprinkled by approved underwriters' system. The company operates also one other mill of 1200 tons' monthly capacity, which has already been noted. The mines at Rochester are connected with the mills by about five miles of railroad built by the company in 1913. The power at the mills is wholly steam. The mines are operated by installations of steam and compressed air. Diamond drilling has been extensively done on most of the reserve properties, and a tonnage of over 2,800,000 has been proven. At East Granville the ore is transported to the mill by an overhead cableway.

TALC MILL AT PEROSA, ARGENTINA, ITALY

C. B. Hollis has had charge of the work for the last 10 years. The property is the most complete and extensive talc mine in the history of the industry as viewed by comparison with the French mines in the Pyrenees and the Italian mines in the Alps above Turin.

Other properties operating in Vermont are at Chester, Johnson and Waterbury, with from about 9000 to 12,000 tons average production per year each. Two of these mines are subject to a long haul to mill—in one case nine miles—so that an increase in production would seem to depend on better transportation.

It would appear that the greater proportion of the well-located talc deposits in Vermont are now being actively worked or held in reserve by operating companies and that increase of production will probably come from producers already in the field. Some deposits are known to exist that would justify development could transportation be secured, these mainly in the southern central portion of the state, but the possibility of railroad building in this section is remote if indeed it is considered at all.

Foreign Production of Talc

The foreign production of talc has shown great increase from 1905 to 1913 inclusive. In that period the output of the French properties has practically doubled, in the latter date being in the neighborhood of 60,000 tons per annum, although a small proportion of this production was soapstone and asbestos. The Italian production has been wholly talc, and, from 7000 tons per annum in 1905, has increased to approximately 18,000 tons.

The main producing factors in France are two properties, one at Montferrier, in the Pyrenees, about 12 miles from the Spanish line. This represents a large investment, in all estimated at upward of four million francs. The ore is transported by a tramway for about three miles to a mill with a capacity of over 100 tons per day. An excellent water power has been developed—in fact there is a large surplus of power at all seasons of the year. The water comes from above the snow line and in one place shows a continuous drop, within a distance of approximately a mile and a quarter, of 1000 ft. On account of the high altitude at which this property lies, it has been found practical to conduct mining operations in general only from June until November, the great trouble being caused by crude talc freezing in the tramway buckets, making it impossible to discharge them.

The process of manufacture is practically the same as in the United States with the exception that the grinding units are smaller and the pulverized material is forced through the bolting cloths by the action of a fan running at high speed. The transportation problem is not wholly satisfactory, and even at the low rate of wages prevailing before the war, it has been impossible for this company to make satisfactory earnings.

The other large French property is at Luzenac, nearer the port of Cette, and is worked with greater success from a financial standpoint. During 1913 the operations were extensive and were reported to be reasonably profitable. The transportation and shipping facilities are considered the best in France. At present, on account of war conditions, the French production is practically negligible.

The Italian production comes mainly from the section above Turin in the neighborhood of Perosa, Argentina, in the Valle di Chisone. There are several small properties worked largely by interests from Turin and Livorno and one considerable series of properties worked by a local proprietor who resides in Perosa. The production comes from several mines or caves, as they are locally called, the output from no single property being extensive. The transportation from some of the mines is by tramway for a portion of the distance, and from some other small properties is by wagon. The mill supplied from these various properties is of modern construction, electrically driven by a well-developed water power.

The process is analogous to that employed in the United States except that prior to crushing, much of the material is hand-picked, some of the ore being reduced to the size of a goose egg by hand hammering or chipping. This work is done by women, who operate with a modified form of geological hammer. Even at the low wages prevailing prior to the war (about two lira a day for women, equivalent to approximately 40c.) the production costs have been high, approximating double those of the French production; in fact, the French producers possess the advantage in cost over the Italian producers in three main divisions—mining, transportation and milling. The greater comparative value of the Italian product, however, has made competition possible and, as a matter of fact, in general the production of talc in Italy has been more profitable than in France. The uses of talc in industry are so well known that it seems hardly necessary to outline them in an article of this kind.

EASTERN TALC CO.S MILL, EAST GRANVILLE, VERMONT

LOOKING DOWN TRAMWAY EAST GRANVILLE TALC CO.

Graphite in Madagascar*

Ceylon is the world's greatest producer of graphite, used in the manufacture of crucibles. Madagascar, since the outbreak of the war, has been producing an amount almost equal to that of Ceylon. Before the war the Singalese output was ample for the world's needs, averaging approximately 31,000 metric tons per annum. The production has been governed entirely by the market price, the mines having been operated or closed down as the demand rose or fell.

Madagascar has now become a competitor, the product in the last nine years having been as follows: 1907, 8 tons; 1908, 82; 1909, 197; 1910, 545; 1911, 1246; 1912, 2731; 1913, 6313; 1914, 7939; 1915, 12,188 tons. In less than eight years the production has increased from eight to over 12,000 tons per annum and at present (October, 1916) is about 2000 tons per month, and it is estimated that during 1917 it will reach 16,000 to 20,000 tons, or two-thirds of the output of Ceylon, without reaching its limit.

After the war is over and the demand for graphite returns to normal, there will be an abundance of material provided the prices are such that both fields can afford to operate. Operators are already becoming uneasy, fearing an oversupply and a corresponding cut in prices.

At the present time (October, 1916), there is a great variation in prices, the quotations being: Madagascar, 1000 to 1200 fr. ($200 to $240) per metric ton at Marseilles; Ceylon, 2080 fr. ($416) per 1016 kg. f.o.b. Colombo.

The lowest price quoted is 924 fr. ($185), the highest 3235 fr. ($647) per ton.

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*Abstract of an article in "Le Grande Livre," Paris, Oct. 15, 1916.

Copper Smelting at Santa Lucia

BY FRANCIS CHURCH LINCOLN

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Description of a small smeltery in an out-of-the-way place, with interesting costs of operation and general data, especially on fuels. Comparisons are made on transportation conditions and metal markets prevailing before and since the beginning of the war.

THE Southern Railway of Peru, running from Mollendo on the Pacific Ocean over the Western Range of the Andes to Puno on Lake Titicaca, crosses the divide at Crucero Alto, which is 224 miles from Mollendo and 14,688 ft. high. Thirty-one miles beyond this summit and 13,250 ft. above sea level is Santa Lucia, where the copper smeltery of the Lampa Mining Co., Ltd., is situated. This little smeltery—operating under the handicaps of high altitude, expensive fuel and distant market—presents many points of interest, some of which will be described in these notes.

EQUIPMENT OF THE LAMPA PROPERTY

The Lampa property is managed by E. C. P. Barber, who has direct charge of the smeltery. Practically all the ores treated come from neighboring mines belonging to the company and under the superintendence of J. V. Turner. The furnace is an Allis-Chalmers 36-in., round, copper blast furnace. Air is supplied by a 16-cu.ft. Baker rotary blower driven by steam produced by llama dung, locally known as *taquia*. It costs $2.50 per ton, and four tons is consumed in 24 hours. It may be stored outdoors without protection as only the outer layer becomes wet when it rains. A dust chamber has been constructed in the rock behind the smeltery, where flue dust to the extent of 10% of the charge is collected. This dust contains 1.5% copper and 7 oz. silver. It is wet down and returned to the blast furnace without briquetting. The plant is also equipped with a Robey square lead blast furnace, which is rarely used.

The Lampa smeltery began operations on Jan. 4, 1914, and up to June 27, 1916, had been in blast 58% of the time. Sixteen campaigns, ranging in length from 8 to 72 days and averaging 33 days, had been run and 19,377 tons of ore, flux and furnace returns smelted with the aid of 2021 tons of fuel. The following table shows the proportions of the different materials charged:

	Average of All Campaigns	Sixteenth Campaign
Ores	58.9%	55.1%
Fluxes	16.9	16.4
Furnace returns	14.7	17.8
Fuel	9.5	10.7
	100.0%	100.0%

Throughout the time of its operation the furnace has averaged 41 tons of charge per day, of which 24 tons has been ore.

The ores smelted have averaged 3.24% copper and 30.8 oz. silver per ton. When smelting first began, limestone flux was employed, but a calcareous ore is now used in its place. There is not, however, sufficient sulphur in the ores to produce the desired 40% matte, so barren pyrite is purchased and fed to the smelter. The percentage of furnace returns has been high, owing in part to experiments to determine the effect of altitude and to attempt to reduce the consumption of expensive fuel. It was found at an early date that the use of a 14-oz. blast through tuyeres an inch greater in diameter than at sea level gave satisfactory results, but the experiments with fuels are still in progress.

SANTA LUCIA SMELTERY, PERU

BRIQUETTES WITH SALT AND BLOOD BINDER

The cost of imported fuels has increased greatly as a result of the European War. The fuels available at Santa Lucia are imported coke, imported coal, local coal and local wood. The cost of coke delivered at the port of Mollendo has risen from $17.50 to $27.50 per ton, to which must be added $11 for railroad freight to Santa Lucia and 50c. for packing to the smeltery. American coal delivered on the west coast of South America rose from $8 to $23 in the five months prior to June 15, 1916, and is therefore nearly as expensive as coke. Anthracite from Sumbay, on the railway just west of the divide from Santa Lucia, costs $10 per ton delivered at the smeltery. The approximate analysis of

Sumbay coal shows about 60% fixed carbon, 10% volatile matter and 30% ash. This is by no means as bad as it looks, however. The ash—and incidentally the volatile matter—are mainly due to pyrite; and as pyrite is required in the charge, its presence in the coal is helpful rather than detrimental. Half the coke may be replaced by the cheaper Sumbay coal with excellent results. The combustible employed in campaign 16 consisted of 52% coke, 46% pyritiferous anthracite and 2% wood.

Wood costs $20 per ton delivered. One-third of the coke may be replaced by twice its weight in wood with satisfactory results, but at the present price of wood nothing is saved by this procedure. In making tests with wood as a fuel, it was found that its use improved the running of the furnace. At one time the quantity of wood was gradually increased until the furnace was actually run entirely on wood for ten charges. By that time the zone of fusion had risen from the tuyere level to the top of the furnace and the use of wood had to be discontinued.

STACKING BRIQUETTES, SANTA LUCIA, PERU

A considerable quantity of fines is present in both coke and coal when delivered at the smeltery. In order to prevent this form of waste, the fines are briquetted in a hand press. The suggestion that the fines in household coal be coagulated with salt as a war-economy measure, which was made in the German and English press and also found its way into ours, was seized upon by Mr. Barber, who is now employing salt as a binder for briquetting coal. Salt costs $28 per ton delivered, and as 8 lb. of salt dissolved in 20 gal. of water is sufficient to briquette a ton of coal, the cost for binder is 11.2c. per ton. Unfortunately, coke breeze will not briquette with salt, but slaughter-house blood has been found a good and cheap binder, 20 gal. of blood with 25 gal. of water being required to briquette a ton of coke. After briquetting in the hand press, the briquettes are stacked in the sun to dry and harden.

COST OF MINING AND SMELTING

The furnacemen work on 12-hour shifts. The foreman receives $60 per month, the weighmen each $20 per month, the tapmen $0.90 per day, and the chargers $0.70 per day. These wages seem very low, but experiment has shown that raising wages produces bad results. Increasing the comforts of the workmen, however, produces good results, and it seems to be along this line rather than that of increased wages that improvements can be made. The cost of mining and smelting may be seen from the following table, for which campaigns 12, 14 and 16 were selected on account of their being longer than 13 and 15:

COST OF MINING AND SMELTING

	Campaign 12		Campaign 14		Campaign 16	
	Per Ton Ore	Per Ton Charge	Ore	Charge	Ore	Charge
Date	Aug. 11-Oct. 31, 1915		Jan. 5-Mar. 4, 1916		Apr. 24-June 27	
Cost of ore	$6 00	$3 33	$5 01	$2.95	$4 40	$2 43
Cost of pyrite	2 33	1 29	2 36	1 40	2 68	1 48
Cost of fuel	4 76	2 64	4 90	2 90	5 52	3.04
Wages and materials	1 65	.92	1 58	.93	2 52	1 36
General expenses	1 28	1 72	1.52	.90	2 77	1 54
Total	$16 02	$8.90	$15 37	$9 08	$17 89	$9 85

The profits made in the company store reduce these costs by about 5%.

The recoveries and losses from the smeltery reports of campaign 13, 14, 15 and 16 are as follows:

RECORD OF RECOVERIES AND LOSSES

	Copper	Silver
Matte recovery	82%	93%
Block copper recovery	1	1
Smeltery returns (bad slag, etc.)	1	1
Slag loss	10	5
Flue dust loss (by difference)	6	0
	100%	100%

The apparent absence of silver in the flue dust lost may be due to cumulative errors in the other items or to the presence of small amounts of silver in some of the ores that are not credited with any. The silver in the slag throughout these campaigns ran 1 oz., and the copper from 0.25% to 0.30%. The block copper contained 80% copper and 600 to 800 oz. silver per ton. The matte produced ran from 33% to 40.8% copper and contained from 330 to 410 oz. silver per ton.

PAYMENTS AND CHARGES ON COPPER MATTE BEFORE THE WAR AND RECENTLY, PER LONG TON

Payments	1913–1914	Mar. 31, 1916
Price of silver per ounce	£0 099	£0.1125
Ounces of silver	400	400
Value of silver	39 6	45 00
Price of copper per long ton	63	130
3½% discount		4 55
	63	125.45
Refining charge	10	10.75
	53	114 70
Copper paid for—45%—1 3%	437	437
Payment on copper	23 161	50 124
Payment on silver	39 6	45.0
Payments on matte	62 751	95 124
Charges		
Ocean freight (42/6 and 97/6)	2 125	4 875
Broker's commission (2½% gross value)	1 569	2 378
Marine insurance (7/6 per £100)	235	357
War insurance (23/9 per £100)		1 130
Receiving, weighing, sampling and assaying	210	210
Entry, dock dues and porterage		.126
Charges on matte	£4 139	£9 076
Net value of matte on board ship	£58 622	£86 048

The effect of the war upon the transportation and sale of matte is well illustrated by the accompanying table, which compares the actual returns on a recent shipment with the returns that would have been made on a similar shipment the year before the war. To make the comparison more exact, the figures in each case have been given on the basis of a shipment of 20 long tons of matte containing 45% copper and 400 oz. of silver per long ton. These shipments were to England, and all figures were in English money, which for the purposes of this article are given in decimals of a pound sterling rather than in shillings and pence.

It will be observed that while the payments on copper have been reduced and the charges have more than doubled, yet owing to the higher prices of silver and copper, the net value of the matte on board ship at Mollendo is about 50% higher now than it was just before the war. The charges on matte shipped to New York are now much less than on matte shipped to Liverpool, and the last shipment made by the Lampa Mining Co. was to New York.

So successful have been the operations of the company that it is planning to increase the capacity of the Santa Lucia smeltery to 200 tons per day in the near future.

Coeur d'Alene Items, June, 1917

By Robert N. Bell

State Inspector of Mines for Idaho

The four deepest mines and principal producers of lead-silver ore in the Cœur d'Alene district are being worked at capacity with gratifying manifestations of permanency and expanding ore resources in their deepest levels, ranging down to a maximum depth of 3200 ft. vertically and including the Bunker Hill & Sullivan mine at Kellogg, the Morning mine of the Federal company at Mullan and the Hecla and Hercules at Burke, Idaho.

The high price and scarcity of labor, machinery and material are retarding the operation of new development enterprises in the Cœur d'Alene district at this time among the lead-silver prospects, but a few very interesting developments are being made that seem to hold out definite promise of new tonnage resources.

Among the zinc-ore deposits the Consolidated Interstate-Callahan mine in the Nine Mile district continues to maintain its splendid production of clean zinc ore. A new body of rich zinc mineral has recently been opened in the 1500-ft. level of the Success mine. Its dimensions and importance are not yet fully demonstrated, but with this and other development at the 1400-ft. level of this property, a materially increased production has recently been made.

Zinc deposits at Pine Creek, a few miles south of Kellogg, have developed in a remarkably interesting manner within the past few months and show tonnage resources at this time that promise equal if not superior capacity to the Nine Mile deposits. They are equally rich in associated lead and silver values as well as in zinc, but of a more complex nature, due to a blending of iron sulphide with the more desirable minerals, a condition that is likely to involve the modern hydroelectric method of treatment for a full realization of their values.

The principal ore developments in the Pine Creek district are at the Denver, Highland-Surprise, Constitution and Douglas mines, each of which has been actively operated and gives evidence of an important tonnag capacity of relatively high-grade zinc ore. They will receive further careful investigation.

What promises to be an epoch-marking occurrence in the history of this remarkable smelting-ore district i the completion of the million dollar lead-silver smelte and refinery plant of the Bunker Hill & Sullivan Mining and Concentrating Co. adjacent to the company's big ore resources at Kellogg. The management hopes to celebrate the 4th of July this year by blowing in thi big plant for the treatment of its great resource of lead-silver ore and custom ores of the Cœur d'Alene district A most desirable site has been selected for this enterprise, elaborately planned for transportation and convenience, gravity handling, and supplied with every modern mechanical device obtainable, with a specia eye to economizing in man-power cost of operation as well as all other possible cost-reducing means.

The refinery is directly connected with the blast furnace, and the molten metal produced will be kept in continuous motion until separated into a refined product of lead-silver and gold. This company should cut an interesting figure in the lead metal market of the future Its special advantages in this connection include a broad previous experience of its directing head in the smelting business and a resource of the cleanest lead-silver mineral in nature, including a vast tonnage development below the Kellogg level of the Bunker Hill mine to a maximum depth of 4300 ft., at an average dip of 40° and the fact that at that deep level the mine now exhibits the premier orebody of its history, which includes among others one shoot of mineral 500 ft. long with a maximum horizontal cross-section of 100 ft. that is nearly 50% clean galena whose only other associated gangue is crushed quartzite and iron carbonate without any visible mixture of objectionable associated minerals like zinc or iron sulphide.

In addition to this great resource of clean ore, this new smelting plant has obtained a long-time contract on the next cleanest lead-silver ore resource of the district, which comprises the entire output of the Hecla mine at Burke, whose expanding profits and ore-producing capacity in its deep levels has been one of the notable features of the Cœur d'Alenes during the last two years, and will combine to put this new smelting enterprise in an exceptionally strong position from the viewpoint of a large tonnage resource that will warrant continuous operation of the smelter for a term of years

The recent announcement by Fred W. Bradley, president of the Bunker Hill & Sullivan, of the early construction of an electrolytic zinc plant at Kellogg, has been received with keen interest by the owners of the important zinc-ore deposits of the near-by Pine Creek district.

The Bunker Hill company has carried on extensive experiments in the treatment of complex ores at its Kellogg mill for several years past and is doubtless in a position to take full advantage of this feature of the business, which will supply, in addition to a local market for the zinc-ore producers, the necessary spelter requirements of the silver-refinery end of their big lead-smelting plant.

Work of the Engineers in the Field[*]

The work of the Royal Engineers with the original British Expeditionary Force is outlined and contrasted with changes required by experience. Their work performed between the retreat from Mons and the advance to the Aisne is briefly described. Duties of demolition require time and dispatch, as well as trench work. Mining plays an important part, some galleries being 400 ft. or more in length. Waste material sacked at the breast and moved by hand to the surface and used for parapets, revetments, or for dummy trenches which attract the hostile artillery fire as directed by aëroplanes.

THE Royal Engineers with the original British Expeditionary Force were divided into two classes: (1) Divisional engineers, under which were allotted for each division two field companies and one signal company; (2) engineer units on lines of communication, comprising fortress companies, works company, railway company, signal companies and printing company.

The "works" company was intended for work at the base, but owing to our numerous bases, it was split up into sections, one being at each base. Assisted by French civilian-labor contractors and working parties from any infantry available, they were responsible for the complete erection of the base camps, and all work in connection with them, such as water-supply, drainage, lighting, sanitary arrangements and road making.

They had at the same time to provide store accommodation for the large quantity of supplies and ordnance stores that were arriving, the work for the most part being adapting existing buildings and sheds to meet the requirements of those concerned—sometimes very difficult work. Their function at present is mainly the upkeep of the base camps, which are now run more or less on the lines of any town at home having its own organized engineer staff.

Use of Fortress Companies

The fortress companies did not come into active use until the Aisne, and from that time their work was essentially connected with that of the field companies. When the new armies were formed, army troop companies took the place of the fortress companies, and the latter name is no longer used. These army troop companies can be placed at the disposal of the chief engineers of the different corps, and their role is to assist the field companies in the construction of the defensive lines. They have been employed for the greater part on the second-line trenches and strong points.

The signal service may be roughly divided into two parts—communications in rear of division headquarters, and those in advance of division headquarters. In rear of the various division headquarters the majority of lines are of a semipermanent nature and the system is not unlike that employed in post offices. All the instruments used are similar to those in use in post offices at home. At the headquarters of armies and at the bases, high-power instruments are being employed, such as the Wheatstone automatic, which can send telegrams at speeds of 200 to 600 words per minute.

In advance of division headquarters a very highly trained personnel is required, as great mobility is essential. Cable can be laid from a cable wagon with horses going at a hard canter and can be picked up at the same pace. During the retreat from Mons, communication during the day was almost entirely by motor cyclist, but as soon as units went into billets, cables were laid from division headquarters to brigades each night, and again from brigade headquarters to battalions. This cable was picked up again before moving off each morning (usually about 3 o'clock), and I know of one division that lost only five miles of cable in the whole of the retreat.

About six years ago the whole signal service was reorganized, and when the war broke out it was hardly out of the experimental stage. The enormous importance of good communication has been recognized by all commands, and the personnel of the companies has been considerably augmented since the beginning of the war. The use of telephones for conversation between actual commanders was found almost indispensable, although early in the war practically all work was done by telegraph only. At the present time within a division there is a duplicate set of lines so that telegraphy and telephony are kept quite distinct. Each division has its own telephonic exchanges, and at a division headquarters there may be as many as 20 different lines to one exchange. The greatest task to which the communications within a division are put is in the attack, and several alternate lines are always laid to insure perfect communication.

Work of the Field Companies

The brunt of the engineering work in this war has fallen on the field companies, and the work accomplished by them includes almost every branch of engineering. To run briefly through the work performed by the field companies in the early part of the war, up to the end of October, 1914, when trench warfare began, the easiest way is to follow the movements of our troops and see what engineering work was carried out during the retreat from Mons and the advance to the Aisne.

At Mons on Saturday, Aug. 22, and the next morning, the Royal Engineers had their first experience of assisting the infantry in the preparation of a position for defense. The work consisted of giving advice as to the siting of trenches and then putting any special points such as a farm or small village into a state of defense. The shortage of tools was very noticeable at this period, and much time was spent in collecting all available types of shovels and spades from the neighboring district.

Late in the morning, on Sunday, an order came that the bridges over the Mons Canal had to be demolished. Eight sections, consisting of a subaltern, 20 men and one tool cart, set out for the bridges as fast as possible. Unfortunately, the distances to the bridges varied. Those close at hand were successfully destroyed; those at a distance were in the hands of the Germans when the Royal Engineers arrived; but at the intermediate bridges the Germans arrived while the sappers were at work—two sections were missing, one being entirely wiped out.

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[*] Excerpt from a lecture by Lieut. C. G. Martin, Royal Engineers, delivered at the Royal Artillery Institution, Woolwich, Apr. 6, 1916. Reprinted from "Journal" of the Royal Artillery by Professional Memoirs, January-February, 1917.

This brings up a most important point that everyone must grasp—the fact that Royal Engineer work takes time. To demolish a bridge is not the work of a minute, but may take three or four hours, the time depending on the construction of the bridge. Until this fact is realized, orders will still come in at the last moment, which, if successful result is to be attained, should have arrived two or three hours earlier.

On one occasion most of the sappers were put into the firing line alongside the infantry, and many instances of the same kind occur from time to time. This brings up another important point. Is it worth while using sappers as infantry? The answer is unquestionably "No," for it is absolutely essential to have the sappers available after the fight to assist in consolidating the new positions taken up. Of course, there are occasions where, in the last resort, the Royal Engineers had to be called upon to act as infantry, but it should be done only as a last extremity.

When the advance began, the nature of the Royal Engineers' work changed. From "destruction" we now turned to "construction"—engineer reconnaissance of roads—river crossings—demolished bridges—and fortified positions formed the bulk of the engineer work, and when the Aisne was reached, the sappers had their first opportunity of bridging on a large scale.

Replacing Bridges

The River Aisne has a mean width of about 170 ft. and a depth of about 15 ft. Five permanent bridges that had been demolished were at once made passable for infantry in single file, and later repaired to take mechanical transport. When one reads of bridge building, one's thoughts go to pontons, girders and other types of bridging; but from the sapper's point of view the actual construction of the bridge is the simplest portion of the task, the real hard work beginning when the approaches are begun.

To make a satisfactory approach to one of the bridges over the Aisne, a road about 200 yd. in length had to be made. This necessitated collecting brushwood for the construction of over 2000 fascines, their transport to the site of the bridge and the collection of all available road metal in the neighborhood.

Coming to the time when trench warfare was beginning, consider the composition and strength of a field company, which from a working-party viewpoint, consists of four sections, each under a subaltern and each being able, at full strength, to supply a working party of 30 men, but which under average conditions rarely exceeded 20.

The different calls that may be made on the Royal Engineers during trench warfare are: Site and mark out fire trench; distribute tools and place the men at the tasks; supervise construction; make traverses; lay out wire along front of trench, say 300 yd.; dig communication trenches back; make machine-gun emplacements in front trenches; construct dugouts for officers and men; revet trenches; make loopholes; arrange drainage; repair all damage and daily wear and tear; collect material for all above. The engineers got the same calls for the support line and also for the reserve line.

The brigade had, at the same time, calls on the field company, consisting of the four sections working as above, to make strong points near reserve line. The division also had calls on its three companies to construct the second line the same as for first line. The corps had its call on the Divisional Royal Engineers to put *points d'appui* behind second line into a state of defense.

Besides all this there were the following, by no means simple, undertakings: Cut, collect, and cart all material for trench work; manufacture hand grenades from stores available and train the infantry in their use; construct huts behind the lines for the rest camps. Later, when the two lines were drawing close together, the following additional calls were made on the section: Run out as many saps as possible toward the enemy; begin mining operations against the enemy.

Of course, under the conditions that existed at that time, the work could never have been done in some years. The only troops to assist the field companies at that time were one fortress company to each corps. The first and obvious method was to teach the infantry to do all the simple work on the spot and to continue training them until they could do all the ordinary field engineers' work, thus releasing the Royal Engineers for the more difficult tasks.

Infantry Working for Engineers

The following items illustrate some of the work which can be, and is now, undertaken by the infantry, under Royal Engineer supervision—after a thorough course of instruction by the Engineers—and which before the war was left by them entirely to the sappers: Erecting wire entanglements; complete digging, riveting, loopholing, traversing and flooring of the front, support, reserve and communication trenches of the first and second lines; repair of above-mentioned, necessitated by daily wear and tear; making any necessary saps. All these need no technical ability when the men have been once shown, and with a few weeks of supervision the infantry can carry them out with perfect success.

This leaves the Royal Engineers free for training the infantry in the simpler branches of engineering work, reserving for themselves the more technical duties, such as: In the front line—bombproof machine-gun emplacements, which consists of concrete and reinforced steel and where the ground admits, constructing deep shellproof dugouts. In the first line—strong points. These small works require very careful siting and concealing, and it is on them that, in the event of a portion of the front lines falling, time is gained for the counter-attacks. These strong points should be weather-proof and as comfortable as possible. The same duties apply equally for the second line. The construction of *point d'appui*, or strong areas, in the rear. Here much technical work can be done with concrete and steel joists for machine-gun emplacements. Infantry parties are essential to assist with digging, carrying and filling sandbags, etc.

The work still remaining, which the engineer field companies were originally expected to do, is: Bomb manufacture; drainage; collection of material; and mining.

When the call was made to the field companies to undertake mining operations, it was seen that this work could be undertaken by them only at the expense of the work on the trenches, so special mining companies were formed at home and sent out at once. The mining companies are allotted to different parts of the front, as required.

The mining schemes are drawn out by the army, who inform the corps concerned, and are carried out by the companies. When mining operations have once started, work has to be kept up at as fast a rate as possible, and to insure success, reports of rate of progress, etc., have to be sent in regularly and as soon as possible. In the case of a mine being fired, reports are wired to the controller, giving all details, and these reports are passed on by him to general headquarters.

Coöperation again plays a very important part in the success of mining operations. Though in no way part of his command, the brigadier in command of an infantry brigade holding a length of trench is naturally much interested in the mining operations going on in this front, and the mining companies work in close conjunction with him, obtaining the necessary working parties to deal with sandbags, etc., and keeping him informed of progress of work, etc.

The usual gallery now used is about 4 ft. high, 2 ft. 6 in. wide at the top and 3 ft. at the bottom, measured inside the timbering; this means a section of some 12 sq.ft. Galleries have been run out 400 ft., which gives about 5000 cu.ft. of earth to dispose of. This will mean 4000 sandbags from each gallery.

Silence the Great Desideratum

The great secret of successful mining is "silence," and it has been found that the most satisfactory method of disposing of this earth is to put it in sandbags and drag them to the head of the shaft by hand or by a winch. Here the infantry should take the bags over for use in their fire trenches. In the event of their having a surplus, an excellent plan is to build a dummy parapet on any available ground high enough to cast a good shadow for aëroplane observation purposes. The Germans have been known to spend the best part of the day shelling such a dummy trench, which can only be distinguished with difficulty from a real one.

Work on the face of a gallery is carried out by three men—one working, one filling bags and one resting, the number of the remainder depending on the length of the gallery. The average rate of progress is about 12 ft. a day, but galleries in favorable soil have been run at the rate of 32 ft. in 24 hours. The depth of the galleries varies according to the tactical requirements, and may vary from 12 to 120 ft.

With regard to the charges used, there are two distinct types: A common mine, used with the idea of making a crater on the surface and destroying the enemy's work; or a *camouflet*, used to destroy the enemy's mining works underground and so charged as to leave the surface undisturbed. Mines to produce craters have been charged up to 13,000 lb., producing a crater 60 yd. long by 40 yd. across.

The charges of *camouflets* vary with the depth of the charge and the soil, and in some cases charges of two or three tons have been fired without disturbing the surface. The explosives used are those obtainable at the time. Ammonal, an explosive composed of ammonium nitrate and powdered metallic aluminum, has been used in large quantities with great success.

Drainage and ventilation are effected by pumps; continuous experiments have to be made to find the most silent and at the same time effective types. Lighting the galleries is carried out usually by candles, but electric torches have to be used when the mines are being charged.

Collecting material is perhaps, the most important and at the same time the most tedious of all Royal Engineer work. Originally, the companies cut what timber they could and collected from houses and villages all suitable material, but the local supply soon became exhausted and the matter had to be taken up on a large scale. There is one point that even many Royal Engineer officers are ignorant of, and that is the quantity of material necessary for putting the trenches in a fit state for occupation in winter. One sees type drawings of various trenches and shelters which are put forward as models to be copied, but when one comes to work out the material necessary, one finds that it cannot be obtained. There is never enough, and the supply, cost what it may, must be increased.

A detailed estimate was made out for one mile of front, including first and second lines and all communications. It was made where the breastworks are essential, owing to the low ground being water-logged. It gives some idea of the material required, and is as follows: Wire entanglement, 1,800,000 yd. of wire, or 900 miles, weight, 110 tons; standards or posts, 6 ft. long, 12,000; small pickets, 12,000; trench construction, 6¼ million sandbags, weight, unfilled, 1000 tons; corrugated iron, about 36,000 ft. run; timber, average dimension, 3 x 3 in., 1,125,000 ft. run. In addition, large quantities of revetting material are required, including timber, planks, wire netting and expanded metal.

Time Required for Trench Construction

As to the time taken to complete the construction of one mile of such trenches to make them fit for winter occupation, an average man will fill and place in position on the parapet, parados, or dugout, at the most, 25 sandbags in one night. So, to fill and place the 6,000,000-odd bags will take a working party of a battalion about 240 nights' work, or about 8 months. If the sappers were to complete the job without assistance from the infantry, it would take a field company, with its usual working party of 80 men, about 6 years to finish.

This brings out the most important ideas: It is essential for the infantry to assist the sappers with every man they can spare; do not put off the preparation of the trenches for the winter campaign until too late. With every man working, it cannot be done under two or three months, and the time to start is, at the latest, the end of July. Of course the times mentioned—the 240 days and the 6 years—are based upon dealing with the material required in the perfect trench. In actual practice these amounts of material never reach the trenches. But it is not until everyone grasps the idea of the enormous quantities needed that the supply will be increased.

With regard to the state of training already reached by the infantry in field works, I should like to give the following example: In one division the divisional cyclists were handed over as a permanent working party to assist the Royal Engineers. They were allotted to a field company to be trained as a party for the construction of wire entanglements. This party, after a few weeks' training, assisted by sappers, total strength being 120 men, in 2½ hours ran an entanglement 1200 yd. long and 20 yd. wide in front of a newly captured position. They used 117 miles of wire, 1600 six-foot iron standards and 1600 pickets. Five days were occupied, before the attack, in carrying up the stores for the work and placing them in a handy position to begin work at the required moment.

I have been able to give only a very small idea of the work performed by the Royal Engineers. I have tried to show how, with the small establishment of engineers and the immense amount of work which the new type of warfare has necessitated, most of the old ideas on the legitimate duties of the Royal Engineers have changed.

The respective spheres of action of the Royal Engineers and infantry are now separated by a stream, the size of which is a measure of the difference in technical knowledge. The continual personal instruction of the infantry in all matters, formerly supposed to be the exclusive province of the Royal Engineers, is gradually draining the stream, and bringing nearer the time when the infantry will be as skilled in pioneer work as the regularly constituted pioneer battalions, while only the most advanced technical matters remain within the completely separated area of Royal Engineer activities.

Sulphuric Acid in Great Britain

The British Minister of Munitions has issued the following order:

No person shall as on and from June 11, 1917, until further notice manufacture sulphuric acid except under a license issued by or under the authority of the Minister of Munitions and in accordance with the terms and conditions of such license as to the quantities to be manufactured or otherwise.

No person manufacturing sulphuric acid shall as on and from June 11, 1917, until further notice use during any one calendar month more than 10 tons in all of 95% sulphuric acid (or its equivalent in acid of other strengths) for the purpose of all other manufactures, trades and businesses carried on by him except under and in accordance with the terms and conditions of a license issued by or under the authority of the Minister of Munitions.

No person shall as on and from the day following the date of this order until further notice supply sulphuric acid (including waste sulphuric acid) to any person except under and in accordance with the terms and conditions of a license issued by or under the authority of the Minister of Munitions. Provided that no license shall be required to supply not more than 56 lb. of 95% sulphuric acid (or its equivalent in acid of other strengths) to any person during any one calendar month. And provided also that any sulphuric acid supplied subsequently to the date of this order in pursuance of written directions or requests given or made by or on behalf of the Minister of Munitions previously to the date of this order shall unless and until such written directions or requests are canceled or withdrawn be deemed to have been supplied under a license issued under the authority of the Minister of Munitions within the meaning of this order.

As on and from the date of this order until further notice no manufacturer of sulphuric acid or agent of such a manufacturer shall charge or receive in payment for any sulphuric acid supplied by or through him a price exceeding the maximum price specified for sulphuric acid. Provided that the maximum prices shall not apply to—(a) Sulphuric acid supplied to persons outside the United Kingdom under export licenses. (b) Sulphuric acid manufactured outside the United Kingdom. (c) Sulphuric acid made wholly from brimstone. (d) Sulphuric acid specially purified for laboratory purposes.

All persons engaged in producing, manufacturing, selling, distributing or storing sulphuric acid (including waste acid), or in any manufacture, trade or business in which the same is used, shall make such returns with regard to their businesses as may from time to time be required by or under the authority of the Minister of Munitions.

For the purpose of this order the expression sulphuric acid shall include sulphuric acid of all strengths up to 100% H_2SO_4, but shall not include acid containing free SO_3 (commonly called oleum or fuming sulphuric acid).

Amalgamated Contract Nearly Completed

The contract entered into between Amalgamated Zinc (De Bavay's) Ltd., and American smelters has, according to the *Sydney Morning Herald*, about been completed, 5000 tons only remaining to be shipped. While the outlook was decidedly unfavorable to producers, it was hoped that something might be done to enable the company to ship concentrates. It will not curtail production. With the 100,000 tons of concentrates per annum sold to the Imperial Government, a contract for 45,000 tons of spelter per annum for ten years after the war was also entered into—half to be ordinary brands and half electrolytic. Under the contract the buyers guarantee a minimum price of £23 on ordinary brands and £28 on electrolytic. A corollary of this contract was the establishment of a plant to produce spelter to the amount of tonnage sold, and the Zinc Corporation has joined with other companies to determine whether a zinc-distillation works could be successfully established. This investigation is proceeding, but it will take some time before it will be possible to say whether the distillation process will be entered into in Australia.

Among the Newer Uses for Graphite, perhaps the most important is for preventing the formation of scale in boilers. This is a use which was originated and developed by the United States Graphite Co., according to W. L. Whitney, chemist for the company. It is now employed for this purpose all over the country. Its action is mechanical. Being soft and slippery, it prevents the particles of scale from adhering to one another or to the boiler. The scale is thus kept in a soft condition and is easily removed.

The Tayeh Iron-Ore Deposits*

During the time I was in charge of this mine, from 1914 to 1915, I had occasion to read the interesting papers by T. T. Read and C. M. Weld about these deposits, to find how far their observations corroborated mine. To quote from the paper on "The Mineral Production and Resources of China," by T. T. Read:[1] "The iron ores at Tayeh . . . lie along the contact between a marble and an intrusive body of a dark gray syenitic rock. . . . At one place it is slightly magnetic, apparently having been partly reduced to the magnetic oxide by the action of reducing solutions, which have deposited small amounts of copper and iron sulphides along the foot wall." To quote from the paper on "The Tayeh Iron Ore Deposits"[2] by C. M. Weld: "I find the orebodies described as occurring along an approximately E-W contact between hornblende-granite and limestone. . . . The granite is a granitoid rock consisting essentially of quartz, potash-feldspar and hornblende." These quotations show the differences of opinion entertained by two observers. My own study of these interesting deposits has been made intermittent amid the manifold duties devolving upon a superintendent. They may be of interest in view of the previous conflicting ideas.

General Description of the Deposits

The deposits are situated to the west of the Yangtse River, being connected with the river by a standard-gage railroad of 56 li (16.16 miles, 26 km.) in length. The general topography of the region is of mature age, showing broad valleys with sluggishly meandering streams. These deposits are worked as two mines, named the Tieh Shan Mining Department and the Teh Tao Wan Mining Department, the former consisting of three orebodies more or less connected, named Tieh Man Kan, Sha Mau Tze and Lung Tung, and the latter consisting of Chang Pei Shan, Sze Tze Shan, Ta Shih Men, Yeh Chih Ping and Tsin Shan, also more or less connected,

The deposits lie along the contact between an igneous intrusion, belonging to the hornblende-syenite group—the syenite of Read, diorite of Seltzer and hornblende-granite of Weld—and limestone. The hornblende-syenite, invariably in a decomposed condition along the whole length of the contact, presents the appearance of a decomposed alkaline aluminum silicate rock of a light brownish color, sometimes, though rarely, with a greenish tint to it, which is due to the greenish color of the partially decomposed hornblende. The essential minerals forming this rock, being medium-grained and of inequigranular fabric, are orthoclase and hornblende. The various stages of decomposition of the orthoclase mineral—from the fresh colorless crystals to a dull whitish kaolin product—can be clearly discerned with a field lens. It must be remarked here that there are two varieties of hornblende-syenite—the one, dark gray, near the partially decomposed rock next to the orebodies; the other, mottled white, which is farther off from the deposits and can be found as boulders and pebbles along the streams. The limestone occurs in various stages of crystallization, in which hardly any trace of contact minerals can be found. I am indebted to my assistant, W. A. Wong, for having found a layer of limestone thickly studded with crystals of garnet, not far from the orebody—the only layer of limestone with such contact mineral that I saw during my stay in Tayeh.

The deposits are more or less lens-shaped, having an approximate NW-SE strike and a NE dip of 60° to 70°, with the exception of the orebodies at Sha Mau Tze and Tsin Shan, which dip away from the igneous rock (SW dip); that is to say, the hornblende syenite forms the hanging wall, which is generally sharply distinct from the orebodies themselves, and the limestone the foot wall, which in many places is very irregular in outline, inclosing bunchy pieces of limestone, ranging from two to ten feet in diameter. The orebody at Tieh Man Kan has been faulted from the main trend of the other orebodies in a southwesterly direction. The iron ore is essentially composed of a mixture of magnetite and hematite, with occasional occurences of malachite, chalcocite and pyrite and rarely epidote and mica. Table I shows average analyses of the ore and of the limestone.

TABLE I. AVERAGE ANALYSES OF ORE AND LIMESTONE

Ore:

No.	Localities	For	Fe, %	Mn, %	S, %	P, %	Al_2O_3, %	Cu, %	SiO_2, %	Sp. Gr
1	Teh Tao Wan	Wakamatsu and Hanyang	62.93		0.029	0.049		0.238	5.42	4.64
2	Tieh Shan	Hanyang	59.45	0.63	0.319	0.109	1.05	0.292	9.16	4.13

Limestone:

SiO_2, %	$Al_2O_3Fe_2O_3$, %	CaO, %	MgO, %	Sp. Gr.
3.14	1.14	52.63	0.92	2.71

By analysis the discarded ore, dumped into the waste heap, has been found to contain as much as from 1 to 2% S and from 0.5 to 3% Cu. All the orebodies are more or less jointed, and the jointing planes are in a general way parallel to the hanging wall, along which is frequently found copper carbonate which must have been deposited and concentrated there from the leaching of the chalcocite found disseminated in certain portions of the orebodies.

Origin of the Deposits

I consider that these orebodies belong to the contact-deposit type and are the products of contact metamorphism; that the magnetite is primary—it has been in places partially or wholly altered to hematite, due to hydrothermal and pneumatolytic reactions, concomitant with the intrusion of the hornblende-syenite—and that the hematite thus originated has been carried forward by ascending telluric water, probably together with the aid of descending meteoric water, to replace metasomatically the intrusive and the limestone, especially along the contacts at certain particular spots. I have arrived at this conclusion from a consideration of the following facts:

1. As already noticed, the hornblende syenite along nearly the whole length of the contact is in a decomposed and altered condition, due undoubtedly to hydrothermal and hydro-metamorphism, that involves the development of kaolin and chlorite with traces of epidote, pyrite, quartz and calcite. This may be the result of the process of propylitization.

2. At Ta Shih Men, the hornblende-syenite changes to a light-brownish and yellowish color and is rather

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*A paper by Chang Yu Wang, Hankow, China; to be presented at the St. Louis meeting of the American Institute of Mining Engineers, September, 1917.

[1] Trans. A. I. M. E. (1912), 43, 29-30.

[2] Trans. A. I. M. E. (1912), 44, 27-37.

soft, with scales of sericite, distinguishable megascopically. This is probably the result of sericitization, developing prominently in this particular locality.

3. The crystallization of the limestone to marble is undoubtedly due to its contact with the hornblende-syenite magma, with the development of a banded structure in the limestone, particularly discernible at Sha Mau Tze. This banded structure may probably be due to differing degrees of silification.

4. Near the main orebodies at Tieh Man Kan, irregular smaller bodies of ore rich in manganese are found in the limestone, which must owe their origin to the same magmatic emanation.

5. I regard the magnetite as primary and derived from magmatic emanation rich in iron, and the hematite as a secondary product from the oxidation of the magnetite. We can picture to ourselves how this process of hematization can be brought about. Chemically, magnetite is composed of the sesquioxide Fe_2O_3 which is hematite, and the protoxide FeO, which, being unstable, would readily be oxidized to Fe_2O_3 in the presence of active free oxygen under suitable pressure and temperature. Undoubtedly the gaseous vapor, during the intrusion of the syenite, furnished such oxygen. O. Silvestri has found as much as 18.97% of oxygen in the gas issuing from Mt. Etna. It is generally known that chemical reaction may or may not be favored by an increase of pressure, and this is why magnetite cannot be hematized either at or near the surface, or at great depth. Probably the gaseous emanation rich in magnetite and oxygen, on coming up from below, reaches a particular zone where the pressure and temperature are suitable to the combination of the oxygen and magnetite to form hematite.

6. Some of the hematite thus produced may be carried forward by telluric water, probably aided by descending meteoric water to replace metasomatically some portion of the rocks of both the hanging wall and the foot wall; this process of replacement is clearly shown where decomposed hornblende syenite is totally inclosed by hematite; from the occurrence of big bunchy pieces of limestone, as described, inclosed entirely by hematite, and from some hand specimens in which altered syenite is being replaced by hematite.

The output of iron ore from 1896 to 1914 inclusive, in round numbers, was about 3½ million tons. The ore in sight of these deposits, including Chang Pei Shan, which, being government property, has not yet been opened, has been estimated by three engineers to be 20, 30, and 100 million tons respectively. But according to my judgment, it would not be unreasonable to regard the ore in sight as 30 million tons and the probable ore in depth as 30 million tons.

Zinc Corporation Wins Suit

The Zinc Corporation claim of £84,000 against Aaron Hirsch & Sohn, for balance due on certain concentrates shipped prior to the war, was allowed in full by Justice Hood, in the Banco Court, Melbourne, Australia, on May 8, according to the Sydney *Morning Herald*. This is one of the suits that were made necessary by the "trading with the enemy" act, which prohibited the sale of the concentrates to the Germans, who in turn refused to make setlement for concentrates.

Braying at Mr. Hoover

Senator Reed, of Missouri, is a good man, but a born polemic, says the *Evening Post*. He would rather dispute than eat. A three hours' speech is a delight to him, if he is able to fill it with challenges to all and sundry. For him, propositions exist only to be controverted. Upon the most innocent-sounding statement he will pounce in order to show that it is dripping with fallacies, is unreasonable, unconstitutional and in derogation of God-given rights. He seems to have taken for his model that cantankerous Englishman of whom it was said that his mouth was always full of "cabbage and contradictions." He is full of objections and denunciations.

The waspish and litigious Senator from Missouri almost outdid himself yesterday in his attacks upon the food-regulation bill, and especially upon the plan to place its administration in the hands of Herbert Hoover. That gentleman became "some Hoover," somebody who had "left this country" to seek his fortune, and who had lived abroad so many years in touch with autocratic government that he was totally unfitted to understand the ways of free-born Americans or to have anything to do with "regulating their affairs." The proposal to make such a man "a King, a Czar, a potentate, a Cæsar, or a Kaiser" over us all was an offense to the pure soul of Senator Reed. In fact, we gather that he is rather opposed to the bill and does not love Mr. Hoover.

Senator Reed may not know it, but the place where he really belongs is Kronstadt. In the rules and regulations put forth by the mushroom republic of that island, it was stated that the government was to have no ministers, for everybody was to be on a perfect equality. It was added that no "outstanding personalities" would be tolerated, inasmuch as they would be "dangerous to liberty." It is almost a pity that this governmental theory did not live long enough to be tried out. We venture to affirm that if the Kronstadt republic had been permitted to do any business, some dominant man or group of men would have done it. Someone would have had to manage things. He might have done it under the guise of abject humility and complete deferring to the wishes of others, but he would have done it somehow. Human affairs cannot be directed except by some human being. And dread of unusual ability in public business belongs to the childish stage of democracy. Full-grown democracy is demanding greater efficiency in government; and when it gets hold of a remarkably efficient man, it delights to honor him and make use of him. And if all the mules in Missouri took to braying at Mr. Hoover, they could not obscure the fact of his singular fitness for the work which it is proposed to entrust to him. His years of skilled executive work, and especially the fruitful experience which he had as the head of the Commission for Belgian Relief, mark him out as a man who has come to the kingdom for such an hour as this. We ought to be thanking our lucky stars that we can command the services of an American whose peculiar genius for the kind of work he is to undertake in his own country has had admiring recognition in England and in France, in Belgium, yes, and in Germany, as well as the rest of the world.

The Scope and Value of State Mining Bureaus*

By E. K. SOPER
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The United States with the greatest and most varied list of mineral resources of any country, expends less money upon the industry than it should in view of its great importance. The extent and value of metals and nonmetals are pointed out.

OF ALL the nations of the world, the United States possesses the greatest and most varied mineral resources. According to advance figures of the United States Geological Survey, the gross value of all raw mineral products for 1915 amounted to $2,373,000,000. With the development of the arts, mining has assumed larger and larger proportions in this country, until today it occupies a place second only to agriculture in importance, and in a number of our Western States mining is the principal industry.

In spite of the phenomenal growth of the mining industry in this country and its intimate relation to our national welfare, which will become still more important with the close of the war, mining is not receiving anything like its just share of Federal and state aid. This fact is well shown by statistics prepared by the United States Bureau of Mines and presented in an address by Director Van H. Manning before the American Mining Congress in Chicago. The statistics show that if mining were to receive the same consideration as agriculture, considering the relative value of the outputs of the two industries, its proportion would be nearly four times as much as it is now, or $8,018,560, instead of $2,333,075. This does not take into account the money appropriated for agriculture by the various states nor under the Morrill Act, which runs into many millions more.

APPROPRIATIONS FOR AGRICULTURE AND MINING

Another interesting comparison shows that the Federal Government in 1916 donated to the farmers one dollar for every $295 worth of products of the farms. It has donated to mining one dollar for every $1017 worth of products from the mines. The per capita contribution of the people for the betterment of agriculture is 34.8c., while the per capita contribution of the people for the betterment of mining is 2.3c. The total amount appropriated by the Federal Government in behalf of agriculture for 1915 was $35,553,852, while the total amount appropriated for mining was $2,333,075. This includes the total appropriations of the Bureau of Mines and the United States Geological Survey. The per capita production of agriculture is $102.94, while the per capita production of mining is $23.26. Thus while the value of the agricultural production of the country is about five times that of the mineral production, the per capita appropriation for agriculture is 15 times the per capita appropriation for mineral investigations.

In citing these statistics I would not intimate for a moment that agriculture is receiving more state and Federal aid than is justified. I believe mining men would be among the first to support any worthy effort to increase the yield of our soils, improve the breed of our stock and better the conditions on our farms, but it will be apparent to anyone who will examine the facts that mining is not receiving the share of Federal and state aid that it deserves. This is partly due to a lack of organization in the mining industry, developed to a very high degree among the agricultural interests, and partly to a failure on the part of the public to understand the real nature of mining as a business and its importance to the economic and industrial welfare of the state and nation.

Until a few years ago there was no Federal Bureau of Mines and only two or three of the states maintained mining bureaus. Under the able leadership of the late Dr. Joseph A. Holmes the Bureau of Mines was organized to take over the work in mineral technology and fuel testing previously done by the Geological Survey and to carry on investigations toward furthering mining and metallurgical activities and improving the welfare of those engaged in mining.

The great benefits derived from the work of the Bureau of Mines, even in the short time that it has been in existence, first under the late Dr. Holmes, and now under Director Manning, are to be seen on every hand—in efforts to minimize the danger of mine explosions; in its safety investigations; in its mine rescue work; in its educational campaign among the workmen; and in the prevention of waste in mining. In addition, the Bureau of Mines has accomplished much through its investigations of more efficient mining, milling and metallurgical methods; in its experiments to determine workable methods for the treatment of low-grade and complex ores; in its petroleum and natural-gas investigations; and in many other activities.

WORK OF THE BUREAU OF MINES

Notwithstanding the value of the work already accomplished, little more than a start has been made. The Federal Bureau of Mines, because of the limited appropriations, cannot begin to do the work that the mining industry demands. Even with increased appropriations there are many problems peculiar to individual states which can be solved only by the active coöperation of the states concerned. Moreover, work in the various so-called mining states can be done in much greater detail and investigations and surveys can be conducted with far more thoroughness under the active support and direction of the various states. This can best be accomplished through state mining experiment stations or state mining bureaus, coöperating with the United States Bureau of Mines, just as nearly all the states maintain geological surveys, coöperating with the United States Geological Survey.

Recognizing this fact, most of the Western States have established mining experiment stations or mining bureaus, and under recent agreements with the United States Bureau of Mines the state organizations coöperate with the Federal bureau.

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*Abstract of address before the Idaho Mining Association, Boise, Idaho, Jan. 16, 1917.

Among the states that maintain mining experiment stations or state mining bureaus, most of which are in connection with the schools of mines of the respective states, are Arizona, California, Colorado, Minnesota, Missouri, Oregon and Utah.

The scope of these state mining experiment stations is well stated in the Utah act creating a station in that state. The particular purposes for which the Utah station was established are there stated to be the "finding of ways and methods of profitably treating low-grade ores, of securing a higher percentage extraction of metals from these ores, of obtaining other information that shall have for its object the benefit of the mining industry and the utilization and conservation of the mineral resources of the state, and to publish and distribute bulletins and articles relating to the department and its work."

The coöperative plan under which most of these organizations work is essentially as follows: The work is under the direction of the officials of the state experiment stations and of engineers and metallurgists of the United States Bureau of Mines assigned to duty at these state experiment stations by special arrangement with the Federal bureau. The operating expenses are thus shared by the state and the Federal Government, the latter usually paying the greater part and never less than half. Under such a coöperative agreement, for every dollar appropriated by the state for the support of a state mining bureau the Federal Government appropriates an equal amount, the total to be used entirely within that state for research or for other activities relating to the mining industry. The results of the investigations thus carried out are published at the expense of the Federal bureau and distributed free to all persons interested.

State and Federal Coöperation

An agreement has just been reached between the mining department of the University of Idaho and the United States Bureau of Mines for coöperative work in Idaho. Under the terms of this agreement the Federal Bureau of Mines is to appropriate funds equal in amount to those appropriated by the state to carry on the work and, in addition, to bear the expenses of the publication of reports and bulletins. The plan is to make a careful survey to determine just what the problems are in Idaho and to undertake investigations and experiments looking toward their solution. In order to make a start and to secure this coöperation, since the state as yet makes no provision for mining and geological research, the mining operators of the Cœur d'Alene district generously contributed a fund which was increased by an equal sum from the Federal Bureau of Mines. A competent metallurgist and assistant from the staff of the United States Bureau of Mines will be assigned to duty at Moscow in the near future to begin this work.

Idaho, through the fame of the Cœur d'Alene region and the numerous mining districts in the central and southern parts of the state, is one of the great mining states of the West. It contains extensive mineral resources as yet largely undeveloped throughout its entire area. According to State Mine Inspector Robert N. Bell, the production of Idaho's mines for the year 1916 will exceed $48,000,000 gross value, representing a profit of $11,500,000. Moreover, there are numerous mineral deposits in this state which were worked twenty to forty years ago until the rich, oxidized or free-milling ores near the surface were exhausted, when the properties were abandoned or closed down, leaving large bodies of lower-grade and more refractory ores untouched. Many such deposits are known in Idaho, the exploitation of which only awaits the development of improved methods of extraction of the metals contained. Furthermore, there are extensive known deposits of ore in the state, which remain undeveloped because they are too low-grade or complex to be profitable under present treatment methods.

An important part of the work of a state mining experiment station should be to make free determinations of ores for prospectors and, when called upon, to give information to prospectors regarding the nature and value of their ores and to advise them concerning development problems.

State Geological Surveys

The object of state geological surveys is twofold—to call attention in accurate and reliable terms to the state's mineral resources, and to render all possible aid in the proper development of these resources by furnishing the prospector, the miner and the farmer with accurate information concerning them. The investigations conducted by state geological surveys generally include: (1) Mineral resources; (2) geologic and topographic maps; (3) underground water resources; and sometimes (4) soils and (5) water power.

The results of the investigations are published in the form of geologic and topographic maps and as reports or bulletins describing the occurrence, character, and value of the mineral deposits of the state. When the state surveys are conducted in coöperation with the United States Geological Survey, these reports are usually patterned after those of the latter in form, but not necessarily in subject matter. Many reports of the United States Geological Survey, are purely scientific in character and have little direct practical value to the prospector or miner. Often such scientific research ultimately proves to be of great indirect economic value, and this branch of the work of the United States Geological Survey is of great importance. However, state geological surveys, especially those in states which, like Idaho, possess enormous undeveloped resources, should avoid such work and devote their efforts to investigations and surveys of direct practical value which will stimulate the legitimate development of the resources of the state.

The United States Geological Survey has followed a policy of coöperating with the various states. It is the custom of the Federal Survey to spend in any state at least as much money as the state itself appropriates for geological work. Moreover, it spends this money in coöperation with the state survey, which enables the state to direct the investigations so that the work will be done where it is most needed.

In order to make clearer the advantages of state geological surveys, some of these advantages may be outlined under the following heads:

The most experienced prospectors are constantly finding rocks and minerals that they cannot identify. In states where geological surveys are maintained, prospectors and others may send rocks and minerals to the survey for free identification and opinion as to possible value.

Certain rocks and certain areas are far more likely places for the finding of mineral deposits than others. On the other hand, there may be certain areas in the state where it would be a waste of time to prospect for metallic ores. It should be the duty of a state geological survey to point out these favorable and unfavorable localities and assist the prospector in every way possible.

Development Work

In the early, or development, stages of a mine, especially if it is in a new district, a thorough understanding of the geology of the deposit and surrounding locality is of the greatest importance in laying out the work. Nearly all big mining companies employ a geologist, in addition to the regular technical staff. Mines in new districts and in the development stage can seldom afford to do this, and often serious errors are made, due to a failure to interpret correctly the geological conditions. State geological surveys should be prompt to examine and accurately map the geology of all new districts, thus giving the operators the advantage of the geological evidence while the need for it is urgent.

There are undoubtedly many valuable mining properties that are now idle because of a failure to understand the geological conditions. The frequency with which faults cause disappearance of the ore is well known. Detailed geological examinations of mining districts, either new or old, will in many cases bring to light new orebodies and open up new possibilities. The actual value of geological surveys to the mining industry is well shown by the respect in which the reports of the United States Geological Survey are held by mining men everywhere. While it is true that these reports have at times been critcized as to certain statements and conclusions, nobody will deny that they have been of immense value to the mining industry; as for example, in Cripple Creek, Bisbee, Globe, Leadville, the Cœur d'Alenes, Butte and other mining districts.

However, the United States Geological Survey cannot cover all the new discoveries in the various states, and hence delays are inevitable. This is another strong argument for state coöperation with the Federal Survey through state geological surveys, for under such an arrangement new discoveries can be promptly investigated, and if they seem promising, geological maps and reports can be prepared.

Nonmetallic Resources

Idaho contains many valuable mineral deposits of a nonmetallic nature, the value of which has been frequently overlooked, especially during the last few years, when the price of lead, silver, zinc and copper has been the chief topic of discussion. The vast deposits of high-grade rock phosphate which occur in the southeast part of the state constitute a source of great potential wealth. But more detailed surveys of these deposits are needed and reports on treatment methods and markets for phosphate rock. Such investigations might well be undertaken by a state geological survey. In addition to her metallic wealth and her great phosphate fields, Idaho contains commercial deposits of excellent clays of all kinds, including some of the highest-grade fireclay in the United States recently discovered and developed near Moscow; building stones, cement rock, limestone, mica, asbestos, marl, volcanic ash, gypsum, infusorial earth and precious stones. Other minerals that may reasonably be expected to occur in Idaho in commercial quantities include: Monozite sand, salt, barite, ocher, molding sand, glass sand, abrasives, natural gas and petroleum. A state geological survey should issue bulletins describing in clear, nontechnical language the occurrence, characters and uses of these substances, the places in which they are most likely to be found, as well as all places from which they have been reported. This would stimulate the search for them.

Road Materials

In the construction of roads and state highways the distribution and properties of rock, sand and gravel are of great importance to the engineers in charge. State geological surveys should work with the state highway commissions in determining and locating the best materials available. California, the banner state in the construction of fine state highways, employs a large staff of geologists whose entire time is devoted to work for the state highway commission. A bulletin upon the subject of road materials recently published by the Oregon Geological Survey was so well received that the entire edition was soon exhausted.

Those Western states that do not already have geological surveys would find it a profitable investment to establish and maintain a combined bureau of mines and geology. Such a bureau should consist of a mining experiment station and a geological survey, and the work should be done in coöperation with the United States Bureau of Mines and the United States Geological Survey under a plan similar to that adopted in many other states.

Holland's Trade in Tin

The imports of tin into Holland during 1916, from the Dutch East Indian Islands of Banka and Billiton, and Straits settlements, according to *Commerce Reports*, June 2, 1917, fell far behind those of any previous year. This decrease during the last three years is shown by the following figures: 1914, 11,438 tons; 1915, 4899 tons; 1916, 1850 tons. The Netherlands Trading Co., of Amsterdam, distributed practically all the tin imported.

Tin exports from the Netherlands, in 1915, amounted to 5807 tons, Germany receiving all but 10 tons. In 1916 only 37 tons was exported. Much Banka tin is shipped direct from Batavia to the United States, France and Great Britain. The Billiton Company sold during 1916 approximately 6932 tons at the Batavia and Singapore markets.

Pig Iron Production in Italy in 1916 was 454,923 metric tons, an increase of 182,014 tons over 1915.

Imports in 1916 were 302,333 tons as compared with 240,366 tons, in 1915, and 221,689 tons in 1913. Included in the 1916 output was 7000 tons of electric furnace pig iron against 2800 tons in 1915. The charcoal iron production was 5090 tons, and the amount of 80% ferromanganese, 4500 tons.

Cementation as Applied to Mining[*]

The properties of cement have been taken advantage of in many ways in dealing with problems of various kinds in mining, and its practical use is widely known. During the last few years, however, its field of application in special cases has been enlarged and it has been found practical to employ cement for conditions under which it was previously considered unsuitable and useless.

It has been found that cement can be introduced into almost inaccessible places, such as fissures or cracks in strata and concrete foundations, by a mixture with water and under high pressure.

The ordinary grouting methods of running cement into cavities are well known, and earlier attempts at the cementation process were based principally upon the methods of grouting, but slightly high pressures, of several hundred pounds per square inch were applied by means of direct-driven force pumps.

Such pressures were found insufficient to obtain the desired results in mining, where water pressures frequently as high as 500 lb. per sq.in. were encountered, consequently pressures up to 3000 lb. had to be employed in some cases, and with success.

Among the cases in which cementation has been successfully applied may be included. Shaft sinking and level driving; underground fires; defective bore holes and defective shaft lining.

CEMENTATION IN SHAFT SINKING

Cementation as applied to shaft sinking consists of a thorough treatment of the material through which it is desired to sink, by the injection of cement into all the existing cracks and fissures in the ground, thus rendering them practically water-tight, previous to the beginning of actual sinking operations.

The mode of operation may be divided into two distinct methods of application: Bore holes through which the cement is introduced into the ground inside the perimeter of the shaft required to be sunk; bore holes through which the cement is introduced into the ground outside of the perimeter of the shaft, in a similar way to the bore holes used in the freezing process.

The former of these methods has the advantage of indicating clearly the position of all water-bearing fissures and also gives an approximation of the size and extent of such fissures, as both quantity and pressure of water are registered as soon as any fissures are encountered.

The cementation is carried out in successive stages; that is, a predetermined length of ground is first treated, sunk through and then lined. After this work has been finished, an entirely fresh set of bore holes is put down inside the perimeter of the shaft.

On reaching a fissure containing water, this water rises up the bore-hole casing. A stop valve is fitted on this casing, and the water is kept under control until dealt with by cementation.

The second method, in which holes are bored outside of the shaft perimeter, is said to have the advantage in that sinking and cementation can be carried on simultaneously. This, under certain conditions, may be attended with satisfactory results, but when bore holes are put down to intersect a variety of fissures, there is less likelihood of obtaining successful results. There is always a tendency for the cement to follow the lines of least resistance during injection, in such a way that if the bore hole should intersect a large fissure adjacent to several small ones, the most extensive fissure would be filled, whereas the smaller would be filled only in the immediate vicinity of the bore holes, and upon proceeding with sinking, water may be encountered as the result of imperfect injection.

SUITABLE MATERIAL FOR CEMENTATION

The cementation process can be employed satisfactorily in practically all kinds of rock, both porous and non-porous, but is of no value in the case of a surface quicksand. Among the various kinds of strata that have been treated are limestones, sandstones, gritstones, chalk and marls.

The first trial of cementation with the interval method of boring was carried out at the Mine de Marles in 1908, upon an abandoned shaft that had collapsed in 1854, had run in and filled with water.

The crater formed by the collapse of this shaft was 92 ft. in diameter. A strong concrete raft was constructed through which bore holes were put down and cementation was commenced, the object being to solidify the broken material and to fill the fissures at the points where the feeders of water existed. The strata in this case consisted of chalk, and the results were highly satisfactory. The work was carried out under the direction of M. Deffieux, chief engineer of the company.

At Hatfield Main colliery, ordinary cementation was of no service, it being found impossible to introduce cement into the ground to any useful purpose, as it was washed out by the pressure of the water. Instead of discarding the process altogether, silicate of soda and sulphate of alumina were used and, when mixed, formed a gelatinous precipitate which sealed the pores of the sandstone and permitted the sealing with cement.

CEMENTATION IN UNDERGROUND DAMS

High-pressure cementation has proved to possess great advantage in closing off underground feeders of water in connection with underground dams. In the first place, dams that have been constructed to meet unexpected inrushes of water have been put in with all possible speed, and sometimes the work has been improperly matured and set before being subjected to water pressure. Leakage occurring may be through openings of very small area, although in many places, and high-pressure injection of cement solves the problem, closing crevices in brickwork or stonework.

Crevices that have permitted air to enter into a fire zone have also been cut off, defective bore holes successfully remedied, and many old shafts that have been lined with stone or brick and have not been watertight have been made so.

It would be interesting to have a description of the mechanical equipment necessary for applying the principles involved, such as the method of mixing the cement, and of pumping it into the territory to be sealed, as there are many questions which will suggest themselves to those to whom the process is of more than passing interest; it is to be hoped that other papers along this line will also give approximate costs of work of this class.

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[*] Abstract of a paper by Thomas Blandford, prepared for the Midland Institute of Mining, Civil and Mechanical Engineers.

Spelter Statistics for 1916

By W. R. INGALLS

REVISED and complete statistics of the zinc industry of the United States in 1916 are given in this article, full reports having been received from all of the ore smelters. I did not undertake to collect the statistics of production by the dross smelters in 1916, and the total of spelter production available for consumption is short by just so much. Some of this spelter is as good as, some of it is even better than, prime Western, this referring to redistilled spelter. Simple remelted spelter is, of course, inferior. In a statistical investigation of this subject it is difficult to draw the line between spelter recovered *after use* and spelter reworked from waste *in the course of manufacture*. The former is a true addition to the supply available for consumption; the latter is merely an incident to consumption. About all that may be safely said statistically on this subject is that there is a rather large production of reclaimed spelter and that statistics of consumption that do not take it into account are incomplete.

It will be observed that the statistics of spelter production now reported differ materially from what were published in the *Engineering and Mining Journal* of Jan. 6, 1917. This is owing chiefly to some omissions from the preliminary report. The number of smelters was increasing so rapidly in 1916, that it was difficult to keep track of them. The revised total is about 11,000 tons larger than the preliminary report. The error in the latter, however, was only a little more than 1 per cent., which is a sufficiently satisfactory result with respect to statistics of the production of nearly 700,000 tons of metal that are collected within two or three days after the termination of the calendar year.

Production—The total production of spelter by ore smelters in 1916 was 683,004 tons, against 507,142 tons in 1915. In 1916 there were 14 ore smelters who produced spelter from dross to a more or less extent, an increase of two over the previous year. The production from dross, skimmings, etc., was 11,681 tons in 1916, against 12,538 tons in 1915.

The production of spelter by quarters exhibited a fairly steady increase right through the year. In the first quarter there was a gain of about 6000 tons, in the second of about 10,000, in the third of about 2600 and in the fourth of about 20,000, each quarter being compared with the next one previous. These figures indicated no especially noteworthy features such as the entry of some large new plants. On the contrary, the increases were fairly distributed by districts. Some of the works showed decreases while others showed increases, generally outweighing the decreases. There were only two works operating in the early part of the year that were idle throughout the fourth quarter, and both of them were small. On the other hand, several plants that were idle during the first quarter resumed operations later. Several new plants, some of them fairly large ones, began to be productive during the fourth quarter. Among these were Quinton, Picher (Henryetta), Checotah, Western, Arkansas and Fort Smith. This explains the large increase in production in the fourth quarter. It is worthy of remark, moreover, that neither of the great new institutions of the business—Donora and Great Falls—produced up to expected capacity. In both cases there was increasing production quarter by quarter, but even in the fourth quarter their outputs were considerably below what they are designed for.

PRODUCTION OF SPELTER

(In Tons of 2,000 Lb.)

By Ore Smelters Only

States	1912	1913	1914	1915	1916
Arkansas					7,637
Colorado	8,860	8,637	8,152	8,984	8,908
Illinois	94,902	111,551	130,587	161,665	181,495
Missouri-Kansas	111,761	85,157	53,424	111,052	154,396
Oklahoma	76,837	83,230	92,467	111,405	169,064
East and others (a)	56,278	69,687	85,682	114,036	161,504
Totals	348,638	358,262	370,312	507,142	683,004

(a) Includes Anaconda and other electrolytic production in 1915 and 1916.

SPELTER PRODUCTION, 1913-1916, BY QUARTERS

(In Tons of 2,000 Lb.)

Reports of Ore Smelters Only

District	I	II	III	IV
	1913			
Illinois	27,924	28,523	25,118	28,985
Kansas-Missouri	22,006	23,820	19,204	20,127
Oklahoma	21,430	21,840	18,502	21,458
Others (a)	20,722	20,153	19,238	18,211
Totals	92,082	94,336	83,062	88,782
	1914			
Illinois	31,005	32,482	32,512	34,588
Kansas-Missouri	13,939	14,659	13,193	11,633
Oklahoma	22,563	22,960	22,945	23,999
Others (a)	22.717	22,715	24,106	24.296
Totals	90,224	92.816	92.756	94,516
	1915			
Illinois	35,786	39,511	41,791	44,577
Kansas-Missouri	14,090	24,554	32,152	40,256
Oklahoma	24,713	26,984	28,613	31,095
Others (a)	26,255	30,575	31,360	34,830
Totals	100.844	121,624	133,916	150,758
	1916			
Illinois	45,344	45,547	41,953	48,651
Arkansas	..		2,977	4.660
Kansas-Missouri	38,513	42,488	39,447	33,948
Oklahoma	34,994	38,786	42,604	52,683
Others (a)	37,853	40,264	42,662	49,633
Totals	156,704	167,085	169,643	189,572

(a) With the exception of one plant in Colorado these are all Eastern works. In the fourth quarter of 1915 and in 1916 is included Anaconda and other electrolytic production.

Spelter Production According to Fuel—Of the total spelter production of the ore smelters in 1911, concerns using coal as fuel produced 119,989 tons, or about 40% of the total. In 1912 they produced 134,077 tons, which was only about 38% of the total. In 1913 their production was 157,653 tons, or about 44% of the total; in 1914 it was 173,520 tons, or about 48% of the total; in 1915 it was 227,143 tons, or about 45% of the total; and in 1916, it was 289,007 tons, or about 41% of the total. The remainder of the production was made by smelters using natural gas as fuel. Up to 1915 there was a general tendency toward increasing production by the smelters using coal as fuel, their proportion of the total output having risen from 40%, in 1911, to 48% in 1914. In 1915 it fell to 45%, in spite of the revival of smelting at Pittsburg, Kan., which is easily explained. There were a lot of inactive natural-gas smelteries that could be put quickly into operation, which was done, and moreover, it was quicker and easier to build new plants in the natural-gas fields than in the coal fields. The same conditions continued in 1916, and the ratio of the spelter produced by smelting with coal fell to 41%, which takes us about back to the situation of 1912. The extension of the production of natural gas in Oklahoma, the opening of new fields in Arkansas and the ease and relatively small outlay of capital for the erection of natural-gas smelteries are the explanation of this.

Electrolytic Zinc—The production of electrolytic zinc in the United States in 1916 was 13,949 tons. The Consolidated Mining and Smelting Co., of Canada, at Trail, B. C., produced 2986 tons. Since the end of 1916 the production of electrolytic zinc, both in the United States and Canada, has increased largely. Not only have the plants at Trail, B. C., and Great Falls, Mont., been raised to something approximating their contemplated production, but also the Judge Mining and Smelting Co., Park City, Utah, and the United States Smelting Co., at Kennett, Calif., have begun production. The Bunker Hill & Sullivan company has announced that it is going to build an electrolytic zinc plant at Kellogg, Idaho.

There was a considerable production of electrolytic zinc in Japan in 1916, the process having been first introduced at a works of the Kosaka mine, and extended to the Nishitori, Ajikawa, Takata and Inawashiro works of the Kosaka Zinc Co. Besides these, the Mogi works at Uji, the Kano Electric Zinc Co., the Fukushima and Onahama works of the Electro Zinc Co., the Isoshima works of the Zinc Electro-Refining Co., the Japan Electric Zinc Co. and the Zinc Electrolyzing Co. were established in rapid succession, and some of these works are now in operation while others are under construction.

The Electrolytic Zinc Co. of Australia began the erection of a plant at Risdon, near Hobart, Tasmania, for the production of electrolytic zinc from ore produced at Broken Hill, and expects to be producing by September, 1917. Interests identified with the Mount Lyell company of Tasmania are contemplating on electrolytic zinc plant in Tasmania for the treatment of the ore of the Roseberry mine.

It is evident that a great expansion in the production of electrolytic zinc in many parts of the world is assured.

General Conditions of Ore Supply—The reports as to ore receipts give some interesting indications as to practice in smelting and as to market conditions. The smelters who make sulphuric acid continue, as in the past, to draw their ore mainly from Wisconsin and from the Joplin district (including Oklahoma). For the manufacture of sulphuric acid this ore is recognized to be superior, but it is noteworthy that several of the zinc acid makers are using a larger and larger proportion of Western ore. Out of the total number of works —52—there were 16 in 1916 that used nothing but ore from the high grade districts, viz., Missouri, Kansas, Oklahoma, Wisconsin and Arkansas, the total quantity taken by them from those states being 270,950 tons.

There were 11 works that did not use any ore from the high grade districts, their chief supply being ore from the Rocky Mountain region and from foreign countries. Imported ores were smelted by 23 works. In 1916 Australian ore was received at eight smelteries, five of which were east of the Mississippi River, the remainder being in Oklahoma. There were two smelteries at which practically nothing but calamine was used.

Ore Smelted—The smelters reported that in 1916 they treated 1,203,837 tons of blende and 510,075 tons of calamine, a total of 1,713,912 tons. In 1915 they smelted 848,776 tons of blende and 339,299 tons of calamine, a total of 1,188,075 tons. As I remarked last year, it should not be attempted to draw too fine distinctions from these figures respecting either the quantity or the average yield of the ore smelted, some smelters apparently having reported "ore received" as "ore smelted," and there was probably some other confusion respecting this inquiry. However, we may draw some rough deductions.

In 1914 the calamine smelted was about 26½% of the total; in 1915 it was about 28½%, and in 1916 about 29¾%. The same tendency to use a larger proportion of calamine in smelting was therefore exhibited in 1916 as in 1915, but the increase was not so marked as it was between 1915 and 1914.

Deducting from the total production of spelter the quantity that was derived from dross and skimmings, and adding 90% of the production of zinc dust, the zinc yield from 1,713,912 tons of ore smelted in 1916 was 39.4%, corresponding to an average grade of 47.2% for the ore, assuming an average extraction of 83⅓%. Figuring in the same way, the zinc yield of 1,188,075 tons of ore smelted in 1915 was 41.7%, corresponding to an average grade of 50%. Figuring in the same way for 1914, but assuming an average extraction of 86%, the zinc yield from 855,435 tons of ore was 43%, corresponding to an average grade of 50% zinc for the ore. The assumption of average yields of 83⅓% and 86%, respectively, is based on nothing but conjecture. We know, beyond any doubt, that the actual yield in 1915 and 1916 was lower than in 1914, owing to production being pushed at the expense of good smelting.

Receipts of Ore—The receipts of ore by smelters in 1916 showed another enormous increase, the grand total having been 1,777,891 tons compared with 1,257,528 tons in 1915. These totals include the receipts of ore by the smelters only, and do not include the ore that was taken by the manufacturers of zinc oxide or what was used by the producers of electrolytic zinc.

The statistics for the United States do not require any extended comment. In the case of almost every state there was increased production, which was especially large in the Joplin district. The important Western states—Montana, Colorado and Idaho—made large gains. Wisconsin and Tennessee, which produce high grade ore, did not advance proportionately to any such great extent as they did in 1915, but in Oklahoma, which also produces high grade ore, there was a very important gain.

A feature of unusual interest was the large quantity of ore derived from foreign sources, especially from Mexico and Australia. Large quantities of ore were received from Spain and from Africa, while small quantities were drawn from a considerable variety of sources, even from China.

The aggregate of ore receipts in 1916 was considerably larger than the aggregate of the ore smelted, just as was the case in 1914 and 1915. The explanation of this feature in 1916 must in the main be the same as in the previous years, namely, the stocking up of new plants. A large tonnage of ore must always be carried in the bins for a working reserve, a sort of balance wheel, so to speak. Not until a considerable number of plants go out of operation, and not until there be a general contraction in smelting, shall we see statistics showing a greater quantity of ore smelted than received. However, I desire to point out in this connection that extremely fine deductions should not be drawn from these statistics, for, although they are compiled from returns made by all the smelters, it is possible, nay, even probable, that some smelters misunderstood the inquiry and unintentionally made incorrect returns. This, of course, is a factor that enters into all statistics.

RECEIPTS OF ZINC ORE

(In tons of 2,000 lb. This table includes the receipts of ore by the smelters only and does not include the production of ore exported or what was taken by the manufacturers of zinc oxide.)

State	1911 (a)	1912	1913	1914	1915	1916
Arizona	6,395	11,937	9,347	6,357	14,718	17,243
Arkansas	860	1,567	1,500	1,737	7,017	12,854
California	3,754	6,639	6,796	8,827	27,445	41,291
Colorado	158,528	212,423	220,166	164,739	148,359	194,418
Idaho	9,667	19,482	31,835	57,001	78,767	104,575
Kentucky	575	947	441	434	1,863	2,460
Missouri-Kansas	268,500	289,177	280,000	247,723	278,099	369,397
Montana	56,593	34,034	91,257	125,663	200,528	233,645
Nevada	5,666	20,654	22,313	20,447	24,949	51,670
New Mexico	10,184	25,889	14,593	15,369	37,042	35,734
Oklahoma	8,750	4,325	23,500	26,247	25,231	42,799
Tennessee	3,439	6,635	8,297	18,708	38,527	43,309
Utah	19,933	24,539	27,073	20,322	21,535	43,240
Wisconsin (b)	71,565	90,762	89,662	74,311	90,128	91,561
Others	44,896	56,099	57,241	57,936	122,490	111,273
Totals	669,305	805,109	884,021	845,821	1,116,698	1,395,469
Mexico	28,596	29,436	19,965	16,414	49,171	142,687
Canada	2,356	9,707	6,012	10,532	14,000	31,877
Australia	.	..		.....	68,448	134,464
Other foreign				....	9,211	73,394
Grand totals(c)	700,257	844,252	909,998(c)	872,767	1,257,528	1,777,891

(a) Smelters' receipts: reports missing from three small smelters. (b) Including Illinois and Iowa. (c) In addition to the ore reported from Canada and Mexico, zinc smelters received a few thousand tons from Europe and Eastern Siberia in 1913.

Spelter Stocks—The stock of spelter at works on Dec. 31, 1916, being the aggregate of the reports of all the smelters, was 16,085 tons, compared with 14,300 tons at the beginning of 1916. These figures include both high-grade and common spelter.

Sulphuric Acid—In 1916, there were 10 smelters who produced sulphuric acid from blende, the same number as in 1915. The enumeration is, however, open to some criticism, owing to complications that are developing in the industry. It is often good business to roast the blende at a good center for the distribution for sulphuric acid, and reship the roasted ore to a good point for zinc distillation. The Western Chemical Co. has for a long time roasted ore at Denver, Colo., and sold the product to smelters. The National Zinc Co., has no roasting furnaces at its smeltery at Springfield, Ill., which gets its ore from the roasting plant of the company at Argentine, Kan. Similarly the Grasselli Chemical Co. roasts at Canton, Cincinnati, Newcastle, Cleveland and Grasselli the ore that is needed by its smelteries at Clarksburg and Meadowbrook. The New Jersey Zinc Co. has a roasting plant at Tiltonville, Ohio, which supplies other smelters. With the movement of the zinc-smelting industry to the eastward, the separation of blende roasting and zinc distillation is becoming more marked, as it has been for a long time in Europe. It will appear from this that the definition between zinc smelters' acid and acid derived from other sources is becoming more and more uncertain. The statistics that I offer are to be regarded, therefore, as more valuable for comparative purposes than as indicative of precise results, although in the latter respect they are probably not far out of the way.

STATISTICS OF SPELTER-SULPHURIC ACID WORKS

(In Tons of 2,000 Lb.)

	1912	1913	1914	1915	1916
Ore received	287,205	364,741	434,666	614,565	705,762
Spelter produced	127,655	148,188	196,529	244,252	271,245
Sulphuric acid, basis 60 deg.	262,555	305,167	355,424	475,740	642,311

It is to be remarked that no attempt should be made to determine from the accompanying statistics any ratios between ore received and sulphuric acid produced or between spelter produced and sulphuric acid produced, for the reason that certain concerns received and smelted a good deal of calamine, which of course never went through the blende-roasting department at all.

ZINC-SMELTING CAPACITY OF THE UNITED STATES

(Number of Retorts at End of Years)

Name	Situation	1915	1916
American Spelter Co	Pittsburg, Kan.	896	(b) 896
American Steel & Wire Co.	Donora, Penn.	3,648	9,120
American Zinc and Chem. Co.	Langeloth, Penn.	3,648	7,296
American Zinc Co. of Ill	Hillsboro, Ill.	4,000	4,864
American Zinc, Lead and Smg. Co.	Dearing, Kan.	4,480	4,480
American Zinc, Lead and Smg. Co.	Caney, Kan.	6,080	6,080
Arkansas Zinc and Smelting Corpn.	Van Buren, Ark.		2,400
Athletic Min. and Smelting Co.	Fort Smith, Ark.		(h)
Bartlesville Zinc Co.	Bartlesville, Okla.	5,184	7,488
Bartlesville Zinc Co.	Blackwell, Okla.		8,800
Bartlesville Zinc Co.	Collinsville, Okla.	10,080	13,440
Chanute Spelter Co. (a)	Chanute, Kan.	1,280	1,280
Cherokee Smelting Co.	Cherokee, Kan.	896	(i) 896
Clarksburg Zinc Co.	Clarksburg, W. Va.	3,648	3,648
Collinsville Zinc Co.	Collinsville, Ill.	(b) 1,536	1,984
Eagle-Picher Lead Co.	Henryetta, Okla.		3,000
Edgar Zinc Co.	Carondelet, Mo.	2,000	2,000
Edgar Zinc Co	Cherryvale, Kan.	4,800	4,800
Fort Smith Spelter Co	Fort Smith, Ark.	.	2,560
Granby Mining and Smg. Co. (j)	Neodesha, Kan.	3,760	3,760
Granby Mining and Smg. Co. (j)	E. St. Louis, Ill.	3,220	4,864
Grasselli Chemical Co.	Clarksburg, W. Va.	5,760	5,760
Grasselli Chemical Co.	Meadowbrook, W. Va.	8,592	8,544
Grasselli Chemical Co.	Terre Haute, Ind.		(h)
Hegeler Zinc Co.	Danville, Ill.	3,600	5,400
Henryetta Spelter Co	Henryetta, Okla.	600	3,000
Illinois Zinc Co	Peru, Ill.	4,640	4,640
Iola Zinc Co	Concreto, Kan.	660	(b) 660
Joplin Ore and Spelter Co.	Pittsburg, Kan.	1,440	(k) 1,792
J. B. Kirk Gas and Acid Co. (c)	Iola, Kan.	3,440	3,440
Kusa Spelter Co	Kusa, Okla.	3,710	3,720
La Harpe Spelter Co	Kusa, Okla.	(g)	4,000
Lanyon Smelting Co.	Pittsburg, Kan.	448	448
Robert Lanyon Zinc and Acid Co.	Hillsboro, Ill.	1,840	3,200
Lanyon-Starr Smelting Co.	Bartlesville, Okla.	3,456	3,456
Matthiessen and Hegeler Zinc Co.	La Salle, Ill.	6,168	6,168
Mineral Point Zinc Co	Depue, Ill.	9,068	9,068
Missouri Zinc Smelting Co.	Rich Hill, Mo.		(k) 448
National Zinc Co.	Bartlesville, Okla.	4,260	4,970
National Zinc Co.	Springfield, Ill.	3,200	3,800
Nevada Smelting Co.	Nevada, Mo.	672	672
New Jersey Zinc Co. of Penn.	Palmerton, Penn.	6,720	7,200
Oklahoma Spelter Co	Kusa, Okla.	(g)	(k) 1,600
Owen Spelter Co. (f)	Caney, Kan.	1,280	1,920
Pittsburg Zinc Co. (a)	Pittsburg, Kan.	910	910
Prime Western Spelter Co.	Gas City, Kan.	4,868	4,866
Quinton Spelter Co.	Quinton, Okla.	.	1,340
Sandoval Zinc Co.	Sandoval, Ill.	896	672
Tulsa Fuel and Manufacturing Co.	Collinsville, Okla.	6,232	6,232
United States Smelting Co.	Altoona, Kan.	3,960	4,600
United States Smelting Co.	Checotah, Okla.	.	4,480
United States Smelting Co.	La Harpe, Kan.	1,924	1,926
United States Zinc Co. (l)	Henryetta, Okla.	.	1,200
United States Zinc Co. (e)	Sand Springs, Okla.	5,680	8,000
United States Zinc Co	Pueblo, Colo.	2,208	1,984
United Zinc Smelting Corpn.	Moundsville, W. Va.	.	(h)
Weir Smelting Co.	Weir, Kan.	(g)	448
Totals		155,388	222,326

(a) Operated by American Metal Co. in 1915. (b) No report received; entered the same as previous year. (c) Taken over by U. S. Smelting Co. in July, 1915. (e) Formerly Tulsa Spelter Co. (f) Operated by American Zinc, Lead and Smelting Co. (g) Was under construction in 1915. (h) Under construction. (i) Idle. (j) Subsidiary of American Zinc, Lead and Smelting Co., 1916. (k) Idle latter part of 1916. (l) Formerly Western Spelter Co.

Smelting Capacity—The capacity of the zinc-smelting works of the United States at the end of 1916 is given in the accompanying table, which shows an increase in the total number of retorts of more than 40% as compared with the end of 1915. This statement falls short of measuring the real increase of zinc producing capacity, for it takes no account of the electrolytic plants. The era of mushroom zinc smelting construction drew toward a close. At the end of 1916 there were under construction only the plants of the Athletic Mining and Smelting Co. and those of the Grasselli Chemical Co. at Terre Haute, Ind., and of the United Zinc Smelting Co. at Moundsville, W. Va., the latter two being coal-smelting plants. At Park City, Utah, and at Kennett, Calif., electrolytic plants were being built.

At the end of 1916 the listed smelters of the United States possessed a total of about 222,300 retorts, and the whole number thereof, except about 4730, was reported in use at the end of 1916. Reckoning a production of 4.2 tons of spelter per annum per retort, which was formerly adopted as a factor, the producing capacity at the end of 1916 was 933,600 tons, or 233,400 tons per quarter. The actual production in the fourth quarter of 1916 was 181,076 tons. Assuming that an average of 200,000 retorts was in use during that quarter, the average per retort figures 0.90 ton, or at the rate of 3.60 tons per annum, which is a good deal less than the figure of 4.2 that used to be reckoned. However, it is common knowledge that at the present time the extraction of zinc from a given grade of ore is materially lower than it used to be, and greater inefficiency of labor in other respects reduces the effective work per retort.

At the end of 1916 new furnaces, comprising 14,108 retorts, were reported as being in process of construction, the corresponding figure at the end of 1915 being 23,234.

Imports and Exports—The imports and exports of ore, spelter and sheet zinc are given in an accompanying table, the figures of which require no explanation. It will be observed that the Government figures for the exportation of spelter are different from those representing the production of spelter in bond as reported by the smelters; also that there are discrepancies with respect to the importation of ore. These differences are in part explained by the difference of the periods comprised within the respective reports, the smelters reporting the spelter when it leaves their works and the Government reporting it when it is entered for export in the custom house. In 1916 the smelters reported the production of 94,626 tons of spelter in bond, of which 75,602 tons was exported, while the Government reported the exportation of only 43,229 tons of foreign origin. A portion of this difference is to be attributed to spelter that was piled up on the docks awaiting exportation. However, it must be said that the Government figures for the exports of spelter are under considerable suspicion. In 1915 a terrific mistake with respect to the exportation of sheet zinc was made, a good deal of spelter being apparently included therewith. Upon this being drawn to the attention of the Bureau of Foreign and Domestic Commerce, of the U. S. Department of Commerce, reference to the original returns was made and corrected figures were published in the "Monthly Summary of Foreign Commerce," but I feel confident that even the corrected figures are in error. However, the Division of Statistics of the above bureau traced this thing back as far as it could and its figures must remain as last stated. The errors probably do not appear in the statistics for the latter half of 1916.

IMPORTS AND EXPORTS, BY QUARTERS

		1914	
Imports	Ore, Long Tons	Spelter, Lb.	Dust, Lb.
I	3,355	500,253	1,288,249
II	4,727	512,123	1,256,259
III	6,849	664,012	535,471
IV	13,607	83,191	1,524,128
Year	28,538	1,759,579	4,604,107
Exports	Ore, Long Tons (c)	Spelter, Lb. (a)	Dross, Lb.
I	2,883	842,465	572,477
II	4,297	872,511	0
III	1,319	48,177,681	1,239,570
IV	1,421	90,591,936	3,259,020
Year	9,920	140,484,593	5,071,067
		1915	
Imports	Ore, Long Tons	Spelter, Lb.	Dust, Lb.
I	14,909	480,949	502,008
II	44,449	496,601	316,073
III	33,863	461,957	355,431
IV	48,611	369,457	538,861
Year	141,832	1,808,964	1,712,373
Exports	Ore, Long Tons (c)	Spelter, Lb.	Zinc Sheet, Lb
I	0	83,313,386 (a)	(e)
II	605	56,829,272 (a)	(e)
III	108	39,528,063 (b)	12,929,438
IV	30	58,318,807 (b)	11,836,786
Year	743	237,989,528	24,766,224
		1916	
Imports	Ore, Long Tons	Spelter, Lb.	Dust, Lb.
I	110,293	435,896	779,253
II	98,497	492,823	477,425
III	74,855	243,186	273,899
IV	60,966	196,655	337,125
Year	344,611	1,368,560	1,867,702
Exports	Ore, Long Tons	Spelter, Lb (b)	Zinc Sheet, Lb.
I		66,840,110	7,174,116
II	30	77,305,196	3,748,914
III	40	109,035,195	12,520,350
IV		124,746,751	11,179,026
Year	70	384,230,412 (d)	28,501,869 (d)

(a) Includes zinc in sheets. (b) Does not include zinc in sheets, which was reported separately from July 1, 1915. ( ) In addition to the exports of ore here reported, there were exported ore and calamine of foreign origin, the zinc content of which amounted to 279,000 lb in 1914 and 1,218,500 lb in 1915. (d) The quarterly figures do not foot up to the total given. Both are from the report of the U. S. Dept. of Commerce, and the difference is probably due to corrections made after the monthly figures were published, of which we have no knowledge. (e) Included with spelter.

In addition to the figures given in the tables which accompany this article, the following data are of interest: The zinc content of ore imported in 1915 was 57,668 short tons, whereas, in 1916, it was 148,146 short tons. In 1915 the United States exported 4166 tons of zinc dross, but in 1916 only 48 tons of that byproduct was shipped abroad.

Prices—At the beginning of 1916 the price for common spelter was about 16c., St. Louis. During January and February there was a secondary advance, the price for prompt spelter touching 20½c. This was short-lived, however, and early in March the market became weak with pressure to sell from many quarters, and during May there were signs of something like demoralization. In August large tonnages were sold at 7¾@8c. Thereafter there was a third advance, the price rising to 13c. in November, but at the end of December the market was down again to about 9½c. Around the latter figure it seemed to have come into equilibrium under existing conditions of increased cost of production, etc.

The behavior of the zinc market throughout 1915 and 1916 was absolutely true to economic form. First, there was a fantastic advance, then a decline; next an advance, but not to so high a level as the first one, this being followed by a decline to a lower level. Thus things continued, each advance being a little less and each decline a little more, advances being analogous to the sucessive bounds of a rubber ball until finally the elasticity is spent, and the market rested on the level of the economic conditions of the time, with an accumulated stock of unsold metal as a balance wheel.

The price for high grade spelter, which was as high as 40c. per lb. in 1915, got down to as low as 16c. per lb. in 1916. The prices for intermediate and brass special declined proportionately. These declines represented a great contraction in the premium over the price for common spelter, such contraction being, of course, the perfectly normal thing.

Bonded Spelter—In 1916 there was produced 94,626 tons of spelter in bond. In 1915 the production in this way was 15,781 tons; in 1914, it was 5630 tons; in 1913, 5904 tons; in 1912, 10,879 tons, and in 1911, 9598 tons.

Zinc Dust—The production of commercial zinc dust in 1916 was 2318 tons, as compared with 1443 tons in 1915, 1042 in 1914, 423 in 1913, 492 in 1912 and 254 in 1911. In 1913 only two smelters were engaged in this manufacture, but when the outbreak of the war in 1914 cut off America's foreign supply and the price rose from about 6c. per lb. to 15@16c., several additional smelters engaged in the manufacture of it.

The importation of zinc dust was 934 tons in 1916, compared with 856 tons in 1915, 2302 in 1914, 2200 in 1913, 2400 in 1912 and 1713 in 1911.

Large Producers—A particularly interesting feature of the zinc business in recent years has been the entry of several general metallurgical companies into this field. We mean companies that are engaged in the production of other metals and have begun the production of spelter as a new feature of their business. Inasmuch as several of these companies make public reports, their outputs in tons in 1916 and 1915 may be stated as follows, the figures for 1916 being given first and those for 1915 in brackets immediately following: United States Steel Corporation, 55,898 (32,031); American Smelting and Refining Co., 23,904 (18,077); United States Smelting Co., 32,292 (17,052).

Production of Zinc in Foreign Countries—Statistics of the production of zinc in foreign countries are available only to a slight extent. We know that strenuous efforts to increase the output have been made in several countries, but in only one or two cases do we have exact statistical information. Without any doubt, Japan has made the most rapid strides. Its output in 1916 was about 50,000 tons, compared with 22,314 tons in 1915 and 6481 in 1914. The production of zinc in Great Britain has also increased, and is destined to increase still further, several important plants being under construction there. The large smelter at Ekibastus, Siberia, began to produce spelter in 1916, but did not make very much. There was also delay in completing the new plant of the Societa di Monteponi in Italy. However, both these plants will probably be in operation in 1917. Although the expansion in zinc production in other parts of the world has not been on so huge a scale as in the United States, nor is it likely to be, nevertheless, such as there is plays an important part in reducing the demands of foreign users upon our supplies.

Consumption—An effort was made to report the consumption of zinc in the United States in 1916, for which purpose a list of consumers—317 in number—was asked to state the amount of their *use*, not *purchase*, of the metal according to principal purposes. The responses to this inquiry were very good, 170 consumers making returns. We failed to receive reports from the concerns given in the accompanying list, against whose names are entered their estimated consumption, which figures must be used in order to get any totals.

In addition to the above, there were 109 small consumers on our list whose use of zinc in 1916 we estimated as having aggregated 26,150 tons.

Our totals will be in error according to errors in the above estimates, according to omissions from the list of 317 consumers, which probably does not include all the small consumers of the United States, and according to the mistakes by misunderstanding or otherwise made by the concerns that furnished reports. In a general way, it may be assumed that our list of 317 consumers, which does not include lead desilverizers, comprises nearly all of the zinc consumers of the United States that used as much as 20 tons of zinc per month.

Before entering upon any statement and discussion of these returns, it will be interesting to compare with a rough estimate on this subject that was made in the *Engineering and Mining Journal* of Dec. 2, 1916, as follows:

"Before attempting to account for the disposition of the present production of spelter, let us try to account for what became of the output in the first six months of 1916. The production during that period, officially reported, was 316,255 tons. The exports were 78,204 tons. The domestic deliveries were 228,700 tons. Domestic deliveries averaged 38,000 tons and exports 13,000 tons per month, a total of 51,000 tons per month.

LARGE SPELTER CONSUMERS WHO DID NOT REPORT

Company	Estimated Quantity, Tons	Purpose
Ball Bros	7,000	Galvanizing
Brier Hill Steel Co	6,000	Galvanizing
Buffalo Copper & Brass Roll. Mills	20,000	Brass Making
Cambria Steel Co	1,400	Galvanizing
Chase Rolling Mill Co	15,000	Brass Making
Detroit Copper & Brass Co	9,600	Brass Making
Gilbert & Bennett	600	Unclassified
Kelly & Jones	600	Unclassified
Lalance & Grosjean	900	Unclassified
Landers, Frary & Clark	600	Brass Making
Manhattan Brass Co	1,200	Brass Making
Mark Manufacturing Co	4,500	Brass Making
Michigan Copper & Brass Co	3,600	Brass Making
Michigan Smelting & Refining Co	1,200	Brass Making
Monumental Bronze Co	600	Castings
Moore-Jones Brass Co	600	Brass Making
National Conduit & Cable Co	6,000	Brass Making
New England Enamel Co	600	Unclassified
Parksburg Iron & Steel Co	2,400	Galvanizing
Reading Iron Co	1,500	Galvanizing
Scaife, Wm. B., & Co	1,200	Galvanizing
Standard Oil Co	600	Unclassified
Stark Rolling Mill Co	7,000	Galvanizing
Youngstown Iron and Steel Co	450	Galvanizing
Youngstown Sheet and Tube Co	12,000	Galvanizing

"In accounting for the use of this spelter, there is available certain definite information, but to a considerable extent we must depend upon conjecture. We have definite information respecting the exports of spelter and of brass in bars and plates. Manufactures of brass exported are also reported, but only in terms of value. We may compute approximately the quantity by dividing by the average price for brass plus an advance representing manufacture. Let us add 10c. per lb., which is probably a low figure. We can approximate the consumption for galvanizing and sheet zinc from information communicated by the galvanizers and rollers. As to brass for domestic peaceful purposes, the figure must be chiefly conjecture. Before the war it used to be 20 to 25% of the total consumption of spelter, the latter being about 300,000 tons per annum. Reckoning 25% of 300,000, we get 7500. Our estimated distribution of the monthly delivery of spelter in the first half of 1916 is as follows:

	Tons
Exports	13,000
Galvanizing	13,000
Sheet	4,000
Domestic brass	7,500
Brass exported in bars, etc	3,000
Brass manufactures exported	7,200
Lead desilverization	400
Castings, etc	1,250
Unaccounted for	1,650
Total	51,000

"Since the middle of the year two very striking things have occurred—the exports of spelter in slabs, etc., have increased to about 16,000 tons per month, while the exports of brass manufacturers have increased to a probable 12,200. We state these figures on the basis of the average monthly exportation during the third quarter. The exportation of brass bars declined slightly. Employing these figures, together with those for other uses at the same rate as in the first semester, we get a probable delivery and distribution per month at the present time approximately as follows:

	Tons
Exports	16,000
Galvanizing	13,000
Sheet	4,000
Domestic brass	7,500
Brass exported in bars, etc	3,000
Brass manufactures exported	12,200
Lead desilverization	400
Castings, etc	1,250
Unaccounted for	1,650
Total	58,800

"It is to be remarked that one kind of present consumption cannot be accounted for quantitatively; namely, the brass that goes into cartridges, the exportation of which is reported under the heading of "Explosives," and as the finished article in terms of value only.

"Our estimate of spelter for brass manufacture totals 22,500 tons per month, corresponding with 45,000 tons, or 90,000,000 lb. of copper, which is just about what authorities in the copper trade estimate for the total copper delivery to brass manufacturers at present."

The aggregate of the reports by consumers (including the estimates previously explained) for the use of spelter in 1916 is as follows:

	Tons
Galvanizing	207,849
Sheet	40,053
Brass	175,435
Castings	2,359
Desilverizing lead (a)	5,307
Other purposes	4,351
Unclassified	14,950
Total	450,304

(a) Estimated on basis of lead desilverized

In order to disarm criticism let me say at once that the above figures do not look just right. The total of deliveries by smelters, computed from stocks at beginning of the year, plus production, less exports and stocks at the end of the year, was 489,787 tons in 1916. Now, that is not an absolute figure to which to tie. Spelter that had left the works, destined for export, might have been locked up in railway cars in transit and might have been piled up on the docks to an extent that would make domestic deliveries, or what is statistically classed as such, appear very much less if it could have been taken into account. On the other hand, the larger part of the dross and scrap that is resmelted and resold is not included in the above report of production and the total supply available for consumption would be increased by just so much.

The production of zinc redistilled from dross by junk smelters in 1916 was about 18,000 tons. In addition thereto there was a considerable production of remelted spelter. The statistical treatment of these subjects is so complex that it would be unsafe to say more on the subject than that there is available for consumption a considerable tonnage of spelter in excess of what is indicated by the deliveries by primary smelters.

Turning to the reports by consumers, the figures for galvanizing, sheet-zinc rolling and lead desilverization look about as they ought to. Galvanizing is indeed considerably ahead of the rough estimate of last December. Sheet zinc is a little under, but it was supposed that this had been overestimated. In the present report the consumption of zinc for castings and miscellaneous purposes is probably understated. The consumers in those classes are generally small concerns and it is likely that there were omissions from the list. However, it is hardly to be supposed that such omissions would make any great difference in the grand total.

The place of trouble is manifestly with the reports of the brass-makers. These reports comprised all of the important brass-makers except those whose figures have been estimated as mentioned previously. It is likely that some small brass-makers, using individually, a few hundred tons of zinc per annum, have been overlooked. But they will not account for the difference.

In the estimate of Dec. 2, 1916, it was said that the total for brass manufacture was reckoned at 22,500 tons per month, corresponding with 45,000 tons, or 90,000,000 lb. of copper, "which is just about what authorities in the copper trade estimate for the total copper delivery into brass manufacture at present." It is to be noted, however, that this is for the last half of the year, during which the brass trade experienced a great expansion. In the first half of 1916 the consumption of zinc for brass-making was at a lower rate, but nevertheless was estimated at 17,700 tons per month. My present statistical accounting for the year shows an average of a little less than 15,000 tons per month for brass-making.

There was published toward the end of 1916 a statement of the consumption of copper by all of the principal concerns at that time, the monthly rate being given and the annual rate being computed by multiplying by 12. Estimating that brassmakers use on the average about half as much zinc as copper, we may translate the statement into terms of zinc, but referring to the individual reports to us none of the brass-makers actually used so much zinc in 1916 as he was supposed to be using on the basis of the estimate near the end of the year.

It is well known that at the end of 1916 there was unusual congestion on the railways and that a larger quantity of zinc, as well as of lead and copper, was in transit than at the beginning of the year. That, together with spelter piled up on the docks for export, accounts for statistics of actual consumption being less than appears from smelters' deliveries. When we say "actual consumption" we mean what was reported by the consumers. Whether their returns represent actual consumption, or what was received at their works, or what was purchased, is another matter. Probably there is a mixture of all those conditions. Some large consumers of metals do not keep their books in a way that will show actual consumption year by year. This does not, of course, refer to all, but it indicates one more of the difficulties of a statistical investigation of this kind.

The only conclusions that I feel may be safely drawn from these statistics are the following:

1. The production of zinc in the United States was 683,000 tons in 1916.

2. The exports were 192,000 tons.

3. The domestic consumption was somewhere in the neighborhood of 450,000 tons.

4. The consumption for galvanizing was more and for brass-making was less than was estimated during 1916.

5. Although the stock in smelters' hands increased by only about 2000 tons, there was in reality a large increase of stock, which, however, was unavailable owing to delays in transit and did not become released until 1917. Consumers then obtaining possession of what they had previously bought were able to reduce their buying and stocks began to pile up in smelters' hands. The behavior of the zinc market during the first half of 1917 has been the natural reflection of these conditions.

Industrial Poisoning in the Manufacture of Explosives

"Industrial Poisons Used or Produced in the Manufacture of Explosives," is the title of a bulletin just issued by the United States Bureau of Labor Statistics. Forty-one factories in the East were visited by Dr. Alice Hamilton, in 1916, in which about 90,000 workers were employed, of whom approximately 30,000 were doing work exposing them to poisons. Practically no women, girls or boys were among this number. This is a matter that merits greater attention, in the interest of public welfare, than has been granted it during the past three years. Attention has been focused upon filling contracts and in many cases little heed has been paid to the health risks involved.

The explosives manufactured in these factories were nitrocellulose, or nitrocotton, including pyroxylin and military guncotton; smokeless powder; picric acid and ammonium picrate; nitroglycerin and dynamite; trinitrotoluol, or TNT or triton; fulminate of mercury; tetranitraniline, or TNA; tetranitromethylanilin, or tetryl; nitronaphthalenes; and ammonium nitrate. Their production involves the use of nitric acid, sulphuric acid, benzol and toluol, anilin oil, chlorbenzol and dinitrochlor benzol; phenol or carbolic acid, sulphuric ether, mercuric nitrate, and amyl acetate. In the course of manufacture certain poisons are evolved as the result of chemical reactions, these being oxides of nitrogen, or nitrous fumes, sulphur dioxide, chlorine gas and ethyl nitrite.

In this industry there is a very high labor turnover, instanced by the fact that in one plant it was necessary to employ about 4000 men during 13 months to keep up a force of 200. On the whole, wages are high and living conditions poor. In most of the plants the men work three eight-hour shifts; two shifts is the exception.

It was impossible to obtain accurate figures as to the amount of sickness and death caused by work in this industry since the war broke out. Many cases were never recognized; others were noted by company physicians or insurance physicians who were unwilling to give any information concerning them; in some factories there was either no medical care or it was inadequate; in others records were so incomplete as to render the data somewhat misleading. Based, however, upon physicians' reports only, although information as to other cases was obtained, it was found that in 28 plants, in the space of about one year, there were 2507 cases of industrial poisoning, of which 75 were women. Of the total number of cases 53 were fatal, 2 of these being women. About 55% of the total cases and 53% of the fatal cases were caused by nitrogen oxides and nitric acid, while 28% of all cases and 25% of the fatal cases were due to trinitrotoluol, or TNT, which is manufactured and made into charges for high-explosive shells.

The reason nitrogen oxide poisoning, or "fume sickness," heads the list is that all these explosives are produced through processes of nitration in which a mixed acid is used, one of the ingredients being sulphuric acid and the other 100% nitric acid. The higher the nitration the greater the danger from fumes. The 1300 to 1400 men who suffered from these fumes were employed in making nitrocellulose or nitrocotton, picric acid or trinitrophenol, the nitrotoluols, nitrobenzols, nitronaphthalenes, nitroglycerin, and the nitric acid needed for these processes.

Another extremely dangerous process is the filling of shells with trinitrotoluol (TNT), either by pressing, which is very dust productive, or by molding, which involves fumes.

Aluminum Company of America

The *Boston News Bureau* has obtained data of the Aluminum Company of America, whose operations have heretofore been a closed book to the public, showing that the company did a gross business of $25,940,427 in 1916 from the sale of 86,589,774 lb. of aluminum at an average price of 29.96c. per lb. In addition the company supplied to its subsidiary, the United States Aluminum Co., 24,821,061 lb. of aluminum which was fabricated by the latter concern.

About 300 persons own the $20,000,000 outstanding capital stock of the Aluminum company, a large number being employees. At the time of his death a few years ago, Mr. Hall, owning the patents which formerly controlled the process of manufacture, held about one-quarter, or $5,000,000 of the total. Bids of $700 a share have been unsuccessful in bringing out holdings, although the company pays only 10% dividends. A nominal market now exists in New York at $700 bid, $800 asked.

The following, never before published, shows issued capital and dividends paid since the company was formed in 1890:

Year Ended	Auth. Cap.	Div.	Year Ended	Auth. Cap.	Div.
Aug. 31, 1889–1894	$1,000,000		Aug. 31, 1905	$3,800,000	6%
Aug. 31, 1895	1,000,000	4%	Aug. 31, 1906	3,800,000	11
Aug. 31, 1896	1,000,000	6	*Dec. 31, 1906	3,800,000	3 37
Aug. 31, 1897–1898	1,000,000		Dec. 31, 1907	3,800,000	11
Aug. 31, 1899	1,600,000	4¼	Dec. 31, 1908	3,800,000	1
Aug. 31, 1900	1,600,000	8¼	Dec. 31, 1909	20,000,000	.20
Aug. 31, 1901	1,600,000	7¼	Dec. 31, 1910–'13	20,000,000	4
Aug. 31, 1902	1,600,000	8½	Dec. 31, 1914	20,000,000	6
Aug. 31, 1903	1,600,000	7¼	Dec. 31, 1915	20,000,000	6½
Aug. 31, 1904	1,600,000	6	Dec. 31, 1916	20,000,000	10

* Four months ended Dec. 31.

The Aluminum company has capacity for producing 155,000,000 lb. of aluminum annually in the United States and 20,000,000 lb. a year in Canada, a total of 175,000,000 lb. With no importations since the outbreak of the war, this company has been called upon to furnish the entire requirements of America, whereas formerly 40% of the requirements here was imported from France and England.

For 1918 delivery the Aluminum Company of America has named 37c. per lb. as its price, although it has sold as high as 60c. per lb. The April average was 35c.

Although capitalized for but $20,000,000, the Aluminum company has a plant investment of over $80,000,000, the difference representing today's surplus. Approximately $70,000,000 of undivided profits has gone back into the property since the company was organized.

Bureau of Mines To Increase Its Activity

Since 1910 the Bureau of Mines has been operating eight mine-rescue cars, each having headquarters in some one of the more important mining districts of the United States. The majority of these cars are operated in coal-mining districts; only one car, in fact, is operated in a metal-mining district exclusively, and that is in the Lake Superior iron and copper district. These cars were old Pullmans remodeled to meet the requirements of a mine-rescue car.

Some time ago Congress authorized the construction of additional all-steel cars for the mine-safety service of the Bureau of Mines, three of which have just been delivered and will take the place of three of the old cars, which were condemned a short time since as being unfit for further use. These cars will be sent to the Far West, with headquarters at Reno, Nev.; Raton, N. M.; and Butte, Mont., respectively.

It is to be especially noted that this marks the beginning of more extensive activities in metal-mining districts than it has been possible to undertake in the past.

Each of the three cars is identical in construction. The floor plan consists of:

A. Demonstration room, in which is stored all the oxygen mine-rescue apparatus, first-aid materials and accessories.

B. A corridor leading along one side of the car from the demonstration room to the rear end.

C. The first compartment off the corridor is the foreman's stateroom, which has berths and lockers for four men.

D. The second compartment is the bathroom, provided with toilet and bathing facilities, including a shower bath.

E. A third compartment is the engineer's office, in which are two desks, bookcases, and berths and lockers for three men.

F. A fourth compartment consists of a dining room provided with linen closet, center table and chairs, etc. In one corner is a typewriter desk which the clerk will make his office.

G. A fifth compartment consists of the cook's stateroom and separate toilet.

H. The sixth compartment is fitted up as an up-to-date car kitchen with range, ice chest, lockers, etc., and the regulation funnel arrangement and exhaust fan in the roof for ventilation purposes. A double-coil Baker heater system is in the kitchen end of the car.

The car is of all-steel construction and each compartment and the demonstration room are fitted with electric fans. There is a generating set in the demonstration room for generating the electric power, in other words, the car provides its own light and heat. A feature is that a place has been provided in the car for every piece of apparatus.

The rescue apparatus consists of 10 sets of oxygen mine-rescue apparatus, oxygen pump and oxygen-storage cylinders, mine-rescue lamps, life lines, etc. The first-aid equipment consists of first-aid cabinets, bandages, splints, surgeon's emergency chest, stretchers, etc., and to supplement the manual (Schaefer) system of resuscitation of those overcome by poisonous gases, there is provided a simple mask with relief valve and connection for attachment to an oxygen bottle.

The engineer's equipment consists of every feasible device for the examination of mines as to sanitation, efficiency and safety, including Orsat apparatus for analyzing mine gases, vacuum air sample tubes, barometer, sling psychrometer, anemometer, surveying compass, Haldane air tester, ore- and coal-sampling outfits, camera, etc. The cars are expected to operate 10 months out of each year.

The duty of the mining engineer is to arrange tentative itineraries of training through coöperation of the different parties concerned, to supervise the general operations of the car, to study the different safety, sanitary and efficiency features in the mines and to spread new ideas regarding those features from one camp to another. The foreman miner is to instruct classes of miners in the use of the oxygen mine-rescue apparatus and mine-rescue and fire-fighting work in general. The first-aid miner is to teach classes of miners in first-aid methods and how to move injured men. The clerk will take care of all the clerical and stenographic work on the car. The cook will also care for the living quarters.

The hearty coöperation of mine officials, state mine inspectors, labor officials and miners is hoped for by the Bureau of Mines, and the car crews will endeavor to work harmoniously with everyone concerned and help propagate the safety-first movement in their respective districts. The methods of working out itineraries in the different districts will have to depend upon the district itself, with due regard paid to the railroad facilities, the season of the year, the wishes of the mine operator, etc.

The Reno car, which will be known as Car No. 1 and which will make its headquarters on the University of Nevada campus at Reno, Nev., is manned by the following crew: Edward Steidle, mining engineer; J. V. Berry, foreman miner; Walter F. Pyne, first-aid miner; D. W. Cooke, clerk, and a cook.

The personnel of Car No. 2, with headquarters at Raton, N. M., is as follows: C. A. Herbert, mining engineer; K. H. Chisholm, foreman miner; James Dalrymple, Jr., first-aid miner; A. F. Goldbloom, clerk.

The personnel of Car No. 5, to be stationed at Butte, Mont., is as follows: C. A. Allen, mining engineer; J. J. Forbes, foreman miner; S. C. Dickinson, first-aid miner; S. S. Blum, clerk.

At a later date, in addition to the foregoing, a mine surgeon will be detailed for duty on each of these cars, his work to be carried on in coöperation with the public health service.

Spanish Ore Exports

Exports of iron ore from Spain were 4,509,214 metric tons in 1915, and 5,148,127 tons in 1916, an increase of 638,913 tons. Demand from France and England for high-grade ores has more than made up for the stoppage of shipments to Germany. Exports of manganese ore were 9136 metric tons in 1915, and 6815 tons in 1916; a decrease of 2321 tons. Exports of pyrites were 2,268,223 tons in 1915 and 2,743,487 in 1916; an increase of 475,262 tons.

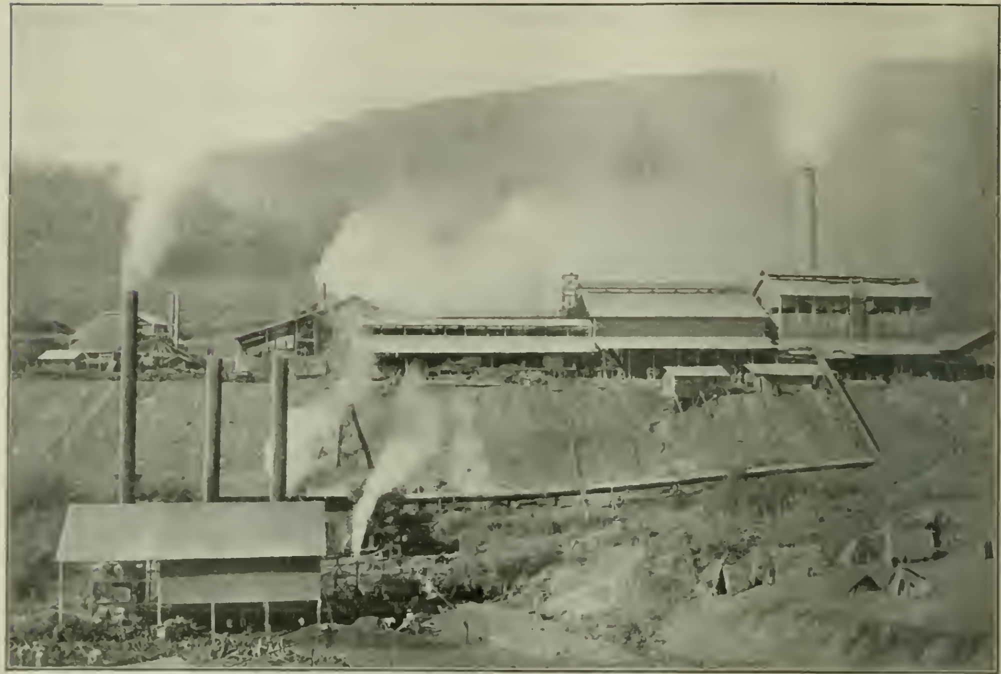
Lead Smelting at Namtu, Burma

GENERAL VIEW BURMA CORPORATION'S REDUCTION WORKS AT NAMTU, 13 MILES FROM ITS BAWDWIN MINE

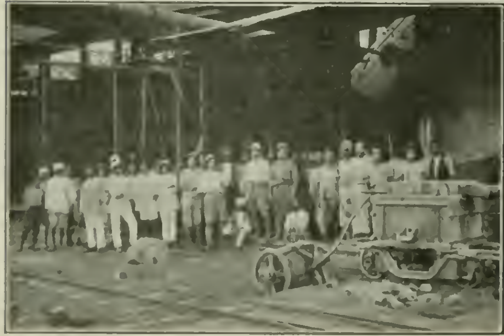
RESIDENTIAL SECTION OF THE SMELTING TOWN OF NAMTU, NORTHERN SHAN STATES, BURMA

A TYPICAL BUNGALOW AT NAMTU

THE NAMTU CLUB FOR STAFF EMPLOYEES



CLOSER VIEW OF THE NAMTU SMELTERY—TEMPORARY POWER HOUSE IN FOREGROUND

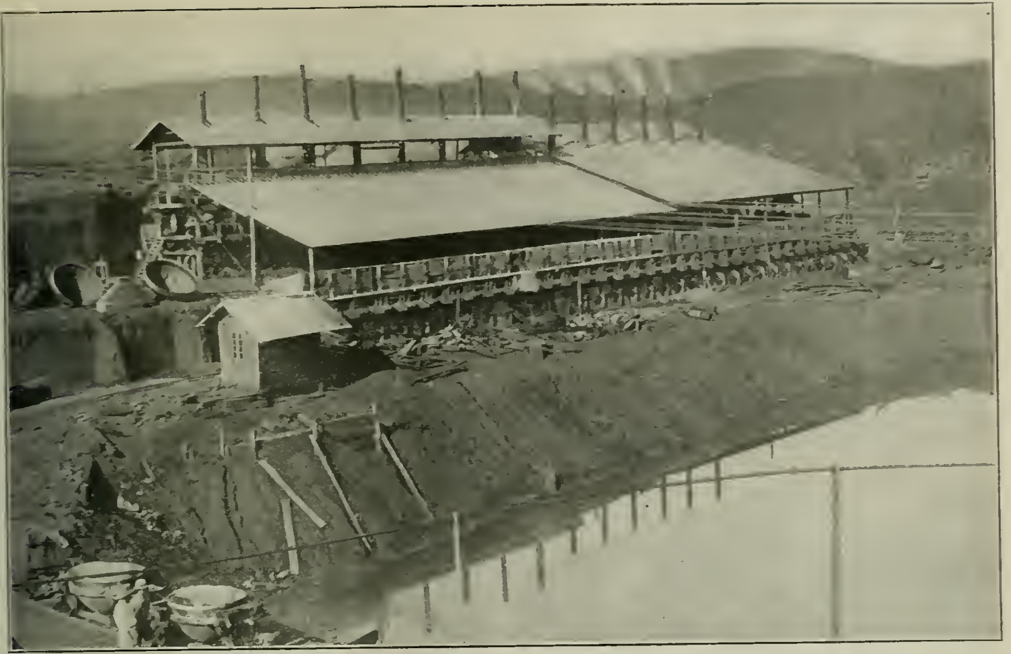


GROUP OF SMELTERY EMPLOYEES

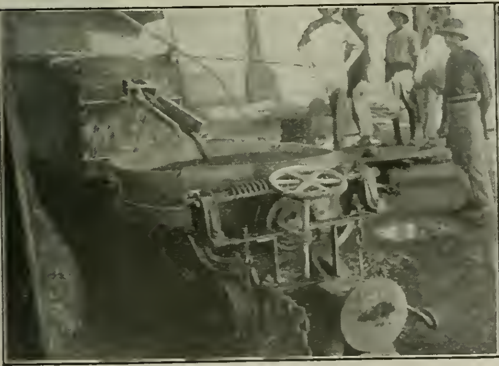
DUMPING BLAST-FURNACE SLAG

TAPPING REFINED LEAD AT NAMTU

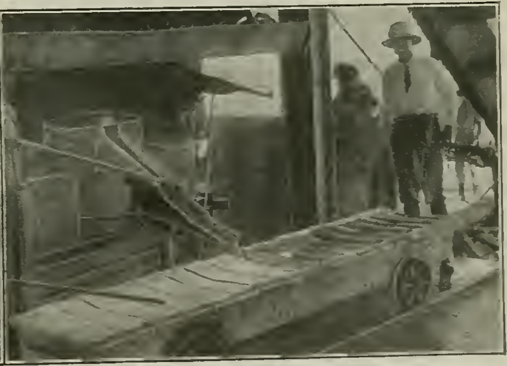
REFINED LEAD READY FOR SHIPMENT



POT SINTERING PLANT AT BURMA CORPORATION'S NAMTU WORKS, UPPER BURMA



FINISHING A FURNACE TAP



TAPPING LEAD FROM FURNACE CRUCIBLE

EXPERIMENTAL MILL—COMMERCIAL PLANT DESIGNED

AUXILIARY CRUSHING PLANT FOR SMELTING OR

Events and Economics of the War

An American army has arrived in France. The Russians have renewed their offensive. Greece has broken with the Central Powers thus probably releasing Sarrail's army at Saloniki for a Balkan campaign.

These facts and the news that the Embargo Board has begun its work, coupled with evidence from many quarters that the Defense Council is on its way to achieving great results, invite optimism in spite of the many strikes.

Price fixing and food control remain the chief topics of debate. The Administration's call for and failure to get 70,000 volunteers has strengthened its case in demanding a draft army.

Adjusting War Purchasing Machinery

How Government specifications are being changed to meet practical war conditions; how sources of supplies are being surveyed and developed to satisfy a demand heretofore unheard of; and how conclusions are being reached as to fair and reasonable prices—these are questions gone into in the first of a new series of war bulletins. The series will be issued through the Chamber of Commerce of the United States for the purpose of placing before business men authoritative statements regarding Government activities in procuring materials and supplies for the war.

The first bulletin makes it clear that the Council of National Defense confines itself to investigating, reporting, making recommendations and bringing Government officials in contact with business men. The fact is emphasized that it does not make purchases, issue orders or have any part in carrying them out. It has not the power to do this by law, and does not do it in fact. Notwithstanding all vague opinion to the contrary, the buying is still done by the War and Navy Departments through the several bureaus.

Although constantly confused with the Advisory Commission, the Council is made up of only the Secretaries of War, Navy, Interior, Agriculture, Commerce and Labor. Each member of the Advisory Commission is particularly active in some field—thus Mr. Willard has to do with transportation matters and Mr. Coffin with munitions and manufactures.

Under the Council, it is explained, there are a number of committees and under the Advisory Commission there are also numerous committees, all being for the advice and assistance of the Council. The fact is brought out that for months there have been actively at work in Washington the most competent men in each industry who, without compensation, have been doing their utmost to utilize our vast resources and industries in the prosecution of war.

Effective work has been done in adapting peace-time Government specifications to immediate needs. A difficulty immediately apparent was that they were prepared years ago for our small army in time of peace and fell far short of the present necessities of a million or more men. For example, the glove specifications called for a seamless glove, of which not more than 500,000 could be made by all the equipment in the United States in a year. The men in the trade readily pointed out how by changing the specifications, an equally satisfactory glove could be manufactured by existing equipment in quantities to meet the requirements of millions of men.

At a conference between army engineers and 15 chief engineers representing the principal truck manufacturers of the United States, a standard specification was adopted for trucks for war service and a definite beginning made in standardizing the military truck. Many of the specifications, such as those for projectiles, stated the characteristics of the finished article, but did not specify the material from which such article should be made. New specifications have now been prepared covering all points that should be covered for the effective control and guidance of the manufacturer in producing what the Government wants.

Subcommittees of railroad men have been studying the distribution of motive power on the several railways and the adjustment of passenger and freight service in accordance with the Government requirements. These committees are endeavoring in every way to conserve the car supply and assist the railroads to meet the extraordinary demands made upon them. The pooling of coal at Lake ports with the consequent great saving in car requirements is one of the results. All this is but a small part of what has been accomplished.

Planning for Mastery of the Air

Preparations for the mightiest air offensive ever known, when United States forces get fully into action, are being worked out in Paris, London, Washington and Petrograd.

Commandant de Civrieux writes in the Paris *Matin:* "America's step shows she has grasped the necessities of war. Her immense aërial army will swing the scales in our favor. The Allies are guaranteed complete mastery of the air in the spring by her step, whatever the activity of German aircraft shops during the winter."

Secretaries Daniels and Baker with the Senate subcommittee decided that both departments would jointly draft a bill that will carry the big appropriation and that will also contain an important personnel section. This section is intended to solve the problem of the joint authority of the Army and Navy over aircraft.

Both secretaries said that stress should be laid upon the production of training machines, while plans go forward for a better type of battle plane. It is impossible now to standardize airplanes because of the constant changes discovered to be important. A machine 30 days old is virtually obsolete on the battle front. There are now 10,000 volunteers for aircraft service. The ideal age for aviators is from 18 to 21.

A high ranking officer of the Navy predicts that the principal contribution of the United States to military operations will be the evolution of the entirely new type of fighting airplane. Speed will be sacrificed to weight of broadside and invulnerability, he believes. The armament may be as heavy as one-pounder Navy guns.

"The most that can be claimed for European fighting planes," says Glenn Curtiss, "has been a speed averaging 127 to 135 miles an hour. The Curtiss Aëroplane Co. has now developed a combat triplane and has under way other machines which show a speed of 140 to 145 miles an hour. We are working now on training types of 125-mile speed range."

The Aircraft Production Board, which is under the Council of National Defense, has arranged for the production of 3500 airplanes this year and for the training of 6000 aviators.

This has been accomplished by developing sources of manufacture in those lines of business best fitted by equipment and experience to undertake the production of airplanes and by securing the active assistance of six military engineering universities in the training of aviators. This latter has involved the sending of professors to take instruction at Toronto.

The same board, realizing the need for the development of a standard engine in various sizes, has succeeded in obtaining the coöperation of two of the foremost engine designers in the country, Messrs. Vincent and Hall. The fundamental idea of the engine is a unit cylinder by means of combinations of which any desired power may be obtained. It is proposed at first to build engines in four sizes of 4, 6, 8 and 12 cylinders, the corresponding horsepower being approximately 100, 200, 300 and 400.

The coöperation obtained in the design of this engine has shown the feeling of patriotism throughout the country. Requests were sent out from the foremost engine draftsmen with the various automobile and airplane companies throughout the country, and the volunteers worked night and day without compensation.

The facilities of the Bureau of Standards for the assembly of this engine have been placed at the disposal of the board, as well as the accumulated knowledge of the bureau and its staff of the various metallurgical processes necessary for the completion of the engine.

The development of this engine will in no wise interfere with or retard the development of private manufacturers, but, if anything, should stimulate them to further effort.

The Council's program further calls for an army aviation field completed every 90 days until the nine authorized by Congress are constructed.

Large forces of workmen are engaged in constructing flying fields at Rantoul, Ill., Detroit, Mich., Dayton, Ohio, and Hampton, Va. Contract for the fifth site at Belleville, Ill., has been signed and work is expected to start this week.

Each camp will cost $688,000, with 57 buildings for housing of fliers, machines and appurtenances.

Students applying for commissions in aviation corps will receive two months' training in "ground work" at various universities designated, and then will be sent to the aviation fields for actual work in the air. To every student engaged in flying the signal corps hopes to furnish five carpenters and mechanics.

To Shape French Timber

Recruiting for the rank and file of the "forest" regiment, or the 10th Reserve Engineers (forest), is actively under way. The enlisted men will be picked woodsmen. With only 2000 needed out of the vast number of woods workers which the lumber industry of the United States employs, the selection will be very careful. Trained foresters will officer the regiment.

The regiment will convert available timber behind the battle lines in France into railroad ties, trench timbers, mine props, bridge timbers, lumber and cordwood needed in the military operations of the British army. The work may fall within the danger zone and will be done largely in sprout forests of oak, beech, hornbeam and other hardwoods, with some stands of pine. The timber is small in comparison with most American forests, much of it from 8 to 12 in. in diameter. These forests resemble the woodlots of southern New England, and the operations will be similar to portable sawmill logging and tie cutting in Massachusetts, Connecticut, Maryland and Virginia. The larger logs will be sawn into boards and dimension material, while the smaller trees will be cut into hewn ties, poles, props, etc. The closest possible use of timber will be required.

The French forests have for many years been managed with great care and skill. It is the view of the Government's forestry officials that if the American forest regiment is to do creditable work, it must be able not only to cut and manufacture the timber with high efficiency, but also to avoid waste and leave the forests in good shape for future production. This is the reason for selecting mainly trained foresters as officers.

Maintenance of Existing Standards

There seems to be some misunderstanding of the scope of the statement made by the Council of National Defense when it advised "that neither employers nor employees shall endeavor to take advantage of the country's necessities to change existing standards." In order that that misunderstanding may be removed, the following amplification is made by the Council.

There have been established by legislation, by mutual agreement between employers and employees, or by custom, certain standards constituting a day's work. These vary from 7 hours per day in some kinds of work to 12 hours per day in continuous-operation plants. The various states and municipalities have established specific standards of safety and sanitation and have provided inspection service to enforce the regulations. They have also established maximum hours of work for women and minimum age limits for children employed in gainful occupations. It is the judgment of the Council of National Defense that the Federal, state and municipal governments should continue to enforce the standards they have established unless and until the Council of National Defense has determined that some modifications or change of standards is essential to the national safety; that employers and employees in private industries should not attempt to take advantage of the existing abnormal conditions to change the standards which they were unable to change under normal conditions.

The one other standard that the Council had in mind was the standard of living. It recognizes that the standard of living is indefinite and difficult to determine, because it is in a measure dependent upon the purchasing power of wages. It believes, however, that no arbitrary change in wages should be sought at this time by either employers or employees through the process of strikes or lockouts without at least giving the established agencies, including those of the several states and of the Government, and of the Mediation Board in the transportation service and the Division of Conciliation of the Department of Labor in other industries, an opportunity to adjust the difficulties without a stoppage of work occurring.

While the Council of National Defense does not mean to intimate that under ordinary circumstances the efficiency of workers is the only element that should be taken into consideration in fixing the hours of labor, safety, sanitation, women's work and child-labor standards, such efficiency is the object that must be attained during the period when the nation's safety is involved. It may, therefore, be necessary for the Council as a result of its investigations and experiences to suggest modifications and changes in these standards during that time.

It is not the purpose of the Council, however, to undertake to determine the wage rate that will be sufficient to maintain the existing standards of living. Such questions as cannot be adjusted by private negotiations should be referred to the mediation agencies previously referred to or to such other constituted agencies as may exist, to the end that such questions may be adjusted in an orderly and equitable manner to avoid the stoppage of industries which are so vital to the interests of the nation at this critical time.

Control of Exports by New Board

President Wilson, by executive order, has created a new export council known as the Embargo Board, which will have complete authority to declare embargoes on exports from this country. It is made up of representatives of the commerce, agricultural and State departments and of the food administration. It will decide all questions of policy relating to exports. It will have power, not only to head off shipments of commodities to the central powers and to neutrals, but also to cut off export of commodities needed at home. Through this powerful weapon the United States will be able to follow the exports from this country all the way to the ultimate consumer.

State Department officials will advise the board as to whether certain exports can be cut off from certain neutrals without danger of giving offense to those nations and thus creating diplomatic tension.

The new board has a staff of 200 to carry on the work of licensing exports, under the direction of Dr. E. E. Pratt, chief of the Bureau of Foreign and Domestic Commerce, who is the representative of the Department of Commerce on the board. This work is already begun. Meanwhile a rush to get exports cleared before licenses are demanded continues. Shippers fear that the "red tape" of getting licenses for each cargo will result in serious delays and are trying to get all shipments off the docks before the licensing bureau can get to work.

The work of the new board, it is said, will greatly relieve England, who has had constant friction with neutrals because of the holding up of consignments of food from America.

Until the United States entered the war, this was a thorn in the side of the Blockade Minister. Despite all watchfulness there have been vast quantities of cereals and other foodstuffs going into Germany from America. Scores of cases are on the dockets of the prize courts involving neutral ships with cargoes from New York, but these seizures represent only a small proportion of the trade actually carried on indirectly with German consumers.

American agents of the Embargo Board to be sent into neutral countries will keep the closest check on reëxports and will be charged with responsibility of seeing that American supplies stop before reaching the German border. To a large extent they will use British machinery built up during the three years that the blockade has been in operation.

Urges Greater Use of Waterways

An effort is being made to promote the use of the interior waterways of the country. The Department of Commerce has issued a circular emphasizing the shortage of rail transportation.

It continues, "Under these circumstances it is necessary that every possible use be made, both for local and through freight, of all interior waterways, canals, rivers and lakes, and this must be done not only as generally but as quickly as possible if we are to escape serious congestion.

"There is more than sufficient business for both railway and waterway for many months to come. Wherever, therefore, throughout the country a barge or a boat, a scow, a lighter or a motor vessel can be made to take the place of a railway car, it ought to be done. Such arrangements as are practical should be made along all our great waterways to develop promptly methods for using the water as a means of transportation. This is the time to get idle barges and scows into use, to repair old barges, to build new ones, and to take advantage of a patriotic duty of water transit in every practicable way.

"Cities and towns on waterways ought in their own interests to take steps to encourage water transit and to extemporize, if need be, means for bringing it quickly into service. Public bodies like chambers of commerce and boards of trade should also take the matter up actively, where conditions make it possible to do so, and give their support to the men who endeavor to develop transportation by water on a temporary or permanent basis. It is encouraging to note the proposed formation of companies to conduct transportation on the Mississippi River. Such organizations today do a patriotic and most helpful service. They should be helped forward, wherever they may be started, in every way."

Repairs to the former German liner "Kronprinzessin Cecile" have been started at an estimated cost of $110,000, and the liner should be ready for sea by the end of next month. Repairs to the "Koln" and "Wittekind" and the Austrian freighter "Erny," are nearly completed.. The "Amerika" and the "Cincinnati" are so extensively damaged they may not be ready before September.

Editorials

Win the War First

THE mining industry is beset by a plague of strikes. We all recall with what disgust we read of the Welsh coal miners going on strike when the product of the mines was badly needed by Great Britain. Now we are confronted by a similar unpatriotic move on the part of the leaders of a certain section of our own metal miners.

Needless to say, the highest officials of organized labor have given assurance of their coöperation in maintaining our productive units at their highest capacity during the war. The strikes in the metal-mining industry are not of their making, but are engineered by the two most violent labor groups in the country, the former Western Federation of Miners and the Industrial Workers of the World. When these two unions came together in Butte three years ago, the Butte district had its first suspension of operations on account of labor troubles. It had always been one of the highest-paid districts in the world, and amicable relations existed between the employers and the miners. That first suspension was not due to differences between the companies and the men, but was an inter-union fight between the I. W. W. and the Western Federation. The latter had lost its radical element to the newer organization, owing to the conservative character of its local, the Butte Miners Union. The struggle with the I. W. W. radical element resulted in the dynamiting of Miners Union Hall and the disruption of the local union. Butte mining companies declined to make any agreement with the I. W. W.'s, and Butte went on the open-shop basis. Since that time there have been no general strikes until this present I. W. W. movement. The trail of violence and murder that has followed the entrance of the Industrial Workers of the World and the Western Federation of Miners (now the International Union of Mine, Mill and Smelter Workers) in practically every district into which they have gone has caused the mine operators everywhere to decline to deal with either of these organizations as representative of their men.

Miners, generally speaking, are getting the highest wages ever paid in the industry—copper miners, especially. These are paid on a sliding scale, this profit-sharing plan being similar to that in the tin-plate industry, the employers and workers in which agreed in a recent conference not to embarrass the Administration with strikes during the progress of the war. Such patriotic sentiments, however, do not animate the I. W W. organization.

Metals are needed to win the war. But from nearly every mining district come reports of strike, strike, strike. If continued, the result will mean stoppage of metal production. How long can the soldiers of our country and those of our Allies afford to be without shells, bullets, bayonets, rifles, artillery, special alloys and the myriad of accessories into which enter the products of the mines?

Only lately has the layman realized that mining is an essential industry for the winning of the war. How long will this crippling-behind-the-line of our soldiers be tolerated? Must we actually sacrifice thousands of soldier lives before we can appreciate the effect of the limited production of his essentials? It is apparent to all that the soldier and the workman-behind-the-soldier must have enough to eat. But can soldiers fight with their stomachs alone? Is the necessity for tools too complex a problem to be fully realized by the mind of the Republic?

The soldier needs food and clothing, but also oil, coal, copper, iron, nickel, lead, zinc, aluminum, tungsten, molybdenum, graphite and a host of other subsidiary minerals and metals to keep the machinery of war going. Shall we supply these continuously or wait until a shortage in some of these essentials has caused our troops to relinquish hard-won ground and then be compelled to sacrifice thousands of lives to regain the territory that might have been held if we had the supplies on hand? Shall we think too late?

The mining industry cannot be restricted without seriously handicapping our chance of military success. What is happening in the copper-mining industry may, and probably will, be extended to the lead, zinc and iron regions. Does the country realize that the Butte district, the most intensive mining district in the world, is practically idle through the activities of the Industrial Workers of the World; that the great smelting and refining works at Anaconda and Great Falls will soon suspend most if not all their production of copper and zinc; that Bisbee, the home of the Phelps-Dodge and other copper interests, heretofore practically free from labor disturbances, has had its production cut in half by the I. W. W.'s effort to take control of these operations through its newly organized Metal Mine Workers Industrial Union? The Clifton-Morenci copper district in eastern Arizona is on strike, and word has come that in the great central districts of Arizona at Globe and Miami the union has called out its members. Across the line in Mexico, Greene-Cananea's American employees have been forced out and the Americans have been compelled to leave other Sonora mines. There are rumors of impending trouble in the Lake Superior iron and copper regions where a few years ago the violence of the I. W. W. caused such a revulsion of public feeling as to result in the enactment of a drastic law forbidding sabotage and the preaching of criminal syndicalism.

In sum, metal output is about to be interfered with in many of the principal mining camps on a pretext of seeking to establish the Metal Mine Workers Industrial Union or some other "child" of the I. W. W. or the International Union of Mine, Mill and Smelter Workers. Whether German money is supplying the sinews of this "war" on metal production, we cannot say, but it is certainly a matter of much concern to our army, our navy and to "the industries behind the line." Incidentally, it may be pointed out that the Industrial Workers of the World has a large foreign membership, and many of its leaders, if not citizens of enemy countries, are at least so-styled "citizens of the world" with no regard for the welfare of this country or its Government.

Our metal industries are running along over a bridge loaded with dynamite. Some serious and immediate attention is needed unless the industry is to be run ov the I. W. W. as is the hope and aim of its leaders. Shall it be industrial conscription? Or shall the idle be conscripted for the front?

If we took this war seriously enough, it would be regarded by everyone as unpatriotic to strike in any of the vital industries. We should lay aside petty, internal differences until the arch enemy of democracy—Pan Germanism—has been put down. Let our Government see that fair treatment is given to soldiers of industry as well as to our soldiers at the front, but our slogan should be "Win the War First."

With the breaking out of these strikes all over the West, especially in the copper-producing districts, it is hard to escape the suspicion that there is some master-hand that is stirring them up—and for a purpose that is not patriotic. Let the Government look into that.

Making New American Citizens

A move in the right direction, and one that might be well followed by all employers of alien labor, has been instituted by the Brown & Sharpe Manufacturing Co., tol and instrument makers, of Providence, R. I., which has taken a census of aliens in its employ and has offered to aid all who have not declared their intentions to do so, to become citizens of the United States.

Our desire to se our friends join our churches, our clubs and our socuieties has not yet extended to an expressed desire to have aliens become citizens. How many of us have ever taken the interest or the trouble to ask or to assist aliens to join us as citizens? Why not follow the example of Brown & Sharpe and get busy in assisting to make citizens of our alien population?

It would be an easy matter to ascertain a workingman's status in regard to citizenship at the time he is employed; a follow-up system for aliens who have not applied for naturalization papers would indicate to him at least that his becoming a citizen is a matter of interest if not of importance to his employer, and the power of suggestion would probably aid materially in bringing in applications for naturalization papers, which otherwise would never be presented.

Think it over!

Respecting Combinations

Washington dispatches in these days often cause us to rub our eyes in amazement and wonder whether we are living in the same country that we lived in a few years ago. "The combination of coal companies in this country today is one of the worst crimes in history. We feel our bearings when we hear such familiar talk. What upsets us is such a statement as that of Edgar E. Clark, member of the Interstate Commerce Commission, that "the coal companies are being allowed to combine with the railroads so that there may be no competition and waste of energy." Arrangements have been made for coal companies, railroads and water transportation lines to pool their interests in some cases. Already there has been a marked decrease in the cost of producing and distributing coal, and the Interstate Commerce Commission authorities declare that the railroads would save $600 000,000 annually under the new combination permitted by the Government. Instead of working in competition with more than a hundred different gradings, the coal companies have reduced their gradings to less than a dozen. On Lake Superior the coal companies now have common distribution points instead of individual bunkers for each company. Similar arrangements are being made at Newport News, Baltimore and Philadelphia.

Is it possible that the people of the United States are going to awake to the realization that the great corporations through their efficiency have reduced the cost of living, that although their promoters have realized great wealth from their ideas, they have nevertheless been benefactors of the people, that the real malefactors are the little fellows who make the people pay for their carelessness and wastefulness?

The French Coal Mines

The coal production of France is said now to amount to about 2,300,000 tons per month against 1,900,000 tons last December, the increase being due to the use of 7000 miners released fro mmilitary service. Manifestly such men can do more for their country in its mines than in its army.

Albert Claveille, Under Secretary of Transportation in the French ministry, was quoted not long ago as saying:

"If America could send us a coal mining contingent in addition to the engineering corps for railroad and canal work, it would be a great boon to us. It should be headed by men capable of directing necessary repairs to mines and of organizing intensified production, and should comprise coal miners, who are lacking here now. The great advantage in this would be to release for transportation and other necessities ships now bringing coal to France."

Will the Vicious Circle Be Broken

The labor leaders have more sense than those members of Congress who have been opposing the food bill. According to press dispatches they are more concerned with the reduction of food prices than they are with increases in wages. They regard food prices for the most part as abnormal and unjustified and do not believe the problem ought to be dodged by the expedient of raising the workingmen's wages in order to allow them to meet the increased cost of living. They think the root of the trouble can b ereached only by eliminating fod gambling, hoarding and wide margins of profit. Nothing could be more encouraging than this recognition of the vicious circle. This is another of the blessings that we owe to Hoover.

BY THE WAY

Our idea of zero in "inside information is the following from a Western broker's letter to customers: "Information we have from reliable sources is to the effect that gold will increase from its present price of $20 an ounce to $30 an ounce." Then comes the usual offering of the discovery of an exceptional mine, and then this clinches: "Canadian and British syndicates are searching this country for gold properties because gold is staple and the ratio of its buying power is sure to increase to meet the present unusual world conditions. The credit of the European countries is overdrawn, and they must have gold reserves."

All joy went out of the lives of 37 disheveled, unshaven "vags" at police headquarters in Salt Lake City, on June 17, when Chief J. Parley White answered their plea of inability to secure employment by producing Alexander Christensen, industrial agent of the American Smelting and Refining Co., who declared he could use the whole 37 and 200 others at once for construction work at the Garfield smeltery. The idlers reluctantly submitted to their inevitable fate, and a few hours later were on their way to Garfield, where they are condemned to toil until further notice for a daily remuneration of $2.50. Since the edict went forth from Chief White last month that every able-bodied man in Salt Lake must be a producer, the city's chain gang has swelled to proportions that exceeded the capacity of the city jail and Chief White was in a dilemma. In casting about for some other outlet for captive energy, he accidentally learned of the demand for labor at the Garfield smeltery and communicated with Mr. Christensen. Before the police court opened yesterday Chief White gave the 37 loafers the alternative of going to work or serving jail terms. The professional idlers will soon be shunning Salt Lake's "inhospitable" shores.

Every accident teaches a lesson, or should teach one; also, it occasionally happens that an accident very efficiently teaches a much-needed lesson and at the same time comes within the "Purely accidental" classification of the state mine inspector. The case of Bernardo Ortiz belongs to the latter kind. Bernardo is a machine man in the mines of the Phelps Dodge Corporation, at Morenci, Ariz. Up until ten days ago, he believed in the time-honored method of pounding on the machine with a double-jack, piece of steel or any other handy weapon in case the machine refused to respond to his expert touch. But Bernardo is not now of that faith. Something happened that suddenly changed his mind. The occurrence was this: He was drilling in a raise with a B. C. 21 Ingersoll-Rand stoper. Essaying to change to a longer drill, he found that the steel was stuck in the chuck. As per custom, he seized the 6-lb. hammer lying by and plied same with vim. For was he not working on a contract? He brought the hammer down on the fronthead, which stood just a little above the man's waist. At the last stroke he gave the machine, however, a piece of steel about the size of a .22 caliber bullet flaked off the edge of the fronthead and entered the man's abdomen, perforating his large intestine and an artery. The doctor found the bullet in the neighborhood of the man's kidneys, and the patient is getting well. The state mine inspector is satisfied the accident was not the company's fault, and the operators are satisfied the Spaniard will not hammer the machine again.

June Mining Dividends

Dividends paid in June, 1917, by 49 United States mining and metallurgical companies making public returns amounted to $38,365,938, as compared with $35,-590,478 paid by 53 companies in June, 1916. Holding companies allied to mining paid $768,433, as compared with $1,588,492 in 1916. Canadian, South American and Mexican companies paid $1,892,601 in June, 1917, and $1,931,333 in June, 1916.

The totals for the first six months of the year 1917 are as follows: Mining and metallurgical companies, $104,595,139; holding companies, $3,547,789; Canadian, Central American, South American and Mexican mines, $10,174,859. The table shows the month's payments.

United States Mining and Metallurgical Companies	Situation	Per Share	Total
Am. Sm. and Ref., com	U. S.-Mex.	$1 50	$914,970
Am. Sm. and Ref., pfd	U. S.-Mex.	1.75	875,000
Argonaut Cons., g	Calif.	.10	20,000
Bunker Hill & Sullivan, l. s.	Ida.	.50	163,500
Butte & Superior, z	Mont.	2 50	725,492
Caledonia, l. s	Ida.	.03	78,150
Calumet & Ariz., c	Ariz.	3 00	1,927,386
Calumet & Hecla, c	Mich.	25 00	2,500,000
Champion, c	Mich.	6 40	640,000
Chino, c	N. M.	2 50	2,174,950
Cons. Interstate-Callahan, l. s. z	Ida.	1.00	464,990
Copper Range, c	Mich.	2.50	987,500
Cresson, g. s	Colo.	10	122,000
Eagle & Blue Bell, s. l	Utah	.10	89,315
Eastern Talc	Vt	.15	10,454
Electric Point, l	Wash.	.03	23,812
Federal Min. & Sm., pfd	U. S.	1.75	209,757
Golden Cycle, g.	Colo.	.03	45,000
Grand Central	Utah	.04	20,000
Grand Gulch	Ariz.	.04	9,594
Hecla, l. s	Ida.	.15	150,000
Hercules, l. s.	Ida.	.30	*300,000
Homestake, g	S. D.	65	163,254
Internat. Nickel	U. S.-Can.	1 50	2,510,076
Kennecott, c		1 50	4,170,874
Magma, c	Ariz.	50	120,000
Mammoth, g. s. l. c.	Utah	25	100,000
Nevada Con., c	Nev.	1 00	1,999,457
New Idria, q	Calif.	1 00	100,000
New Jersey Zinc	U. S.	4 00	1,400,000
Old Dominion, c	Ariz.	3 00	891,213
Oroville Dredging, g	Calif.	.12	82,385
Phelps, Dodge	U. S.-Mex.	8 00	3,600,000
Prince Cons., g. s	Utah	02½	25,000
Quincy, c	Mich.	5 00	550,000
Ray Con., c	Ariz.	1 00	1,577,179
Rescue-Eula, g. s.	Nev.	.02½	35,700
Richmond, l. s	Ids.	.02	16,000
St. Joseph Lead	Mo.	.75	1,057,098
Silver King Con., s. l	Utah	.15	103,287
Star Cons. Mines, s. l. z	Colo.	.20	
Tintic Standard	Utah	.02	23,000
Tomboy, g	Colo.	.24	75,330
United Copper	Wash.	.01	10,000
United Verde, c	Ariz.	1 50	450,000
Utah Con., c	Utah	1 00	300,000
Utah Copper	Utah	3 50	5,685,715
Uvada Copper	Nev.	.01	6,000
Yak, s. l	Colo.	.57	570,000
Yellow Pine, z. l	Nev.	.06	30,000
Yukon Gold, g	Alaska	.07½	262,500

Canadisn, Mexican and South American Companies	Situation	Per Share	Total
Cerro de Pasco, c	So. Am.	1 50	999,999
Dome Mines, s	Ont	.25	100,000
Hedley, g	B. C.	.50	60,000
Kerr Lake, s	Ont.	25	150,000
Lucky Tiger-Com., s	Mex.	.09	64,380
Mexico Mines of El Oro, g	Mex.	.96	174,960
Min. Corpn. of Can., s	Ont.	18¾	311,260
Utica Mines l s.z.	B. C.	02	32,002

Holding Companies	Situation	Per Share	Total
General Dev	U. S	2 00	240,000
St. Mary's Min. Land, c	Mich.	2.00	320,000
Yukon-Alaska Trust		1.00	208,433

* Estimated

Initial dividends were paid in June by Rescue Eula, Richmond Mining, Milling and Reduction, Tintic Standard Mining, and Utica Mines, Ltd.

Personals

H. Alfred Millard announces the removal of his New York offices from 60 Wall St. to 2 Rector Street.

C. T. Griswold, geologist of the Associated Geological Engineers of New York, has gone to Wyoming.

Dr. John H. Banks has returned to New York from Arizona where he has been examining in the Jerome district.

Herbert C. Enos has returned to Denver from New Mexico, where he has been making examinations for Silverton interests.

Rudolph Agassiz, president of the Calumet & Hecla Mining Co., is making his regular summer trip of inspection to the mine.

A. G. Pérez has resigned from the position of administrator of the Boletin Minero and the Boletin del Petroleo, both published in Mexico.

Kirby Thomas has returned to New York from Ontario, where he examined silver and copper-silver properties in the Cobalt and White Bear Lake districts.

S. C. Dickinson, formerly with the United States Bureau of Mines, assumed the duties of safety engineer with Arizona State Bureau of Mines on July 1.

Samuel Mather, of Pickands, Mather & Co., Cleveland, gave $100,000 in railroad securities to Kenyon college on the occasion of its 89th commencement.

Charles Oliver, in charge of sales of the Oliver Iron and Steel Co., Pittsburgh, has enrolled with the Officers' Reserve Corps, stationed at Fort Niagara, N. Y.

H. M. Ridge, at a meeting of the Society of Chemical Industry, recently held in London, read a paper on "The Utilization of the Sulphur Contents of Zinc Ore."

Col. J. W. Boyle, a well known Yukon mining engineer and transportation expert, now overseas, has been sent to Russia to aid in the reorganization of the railroad system.

Samuel Lindsey Nicholson, formerly sales manager of the Westinghouse Electric and Manufacturing Co., has been promoted to be assistant to the vice president of that company.

Howland Bancroft, having finished examinations in Colorado, Wyoming and New Mexico has gone to New York, where he will be at the Engineers Club until the middle of July.

H. H. S. Handy, vice president of the Semet-Solvay Co., Solvay, N. Y., has been appointed a member of the committee on coal tar by-products of the Council of National Defense.

J. Volney Lewis, professor of geology in Rutgers College will spend about three months this season in the examination of gold and copper mines in Alaska and northern British Columbia

Prof. A. Ledoux, of Toronto University, is investigating for the Ontario Department of Mines the sand and gravel deposits in the neighborhood of Brockville, Ont., with a view to their economic utilization.

H. M. Roche, superintendent for the past five years of the Mt. Hope mines of the Empire Steel & Iron Co., has resigned and accepted the position of General Superintendent of Mines for the Wharton Steel Co.

H. D. Shute, recently elected vice president of the Westinghouse Electric and Manufacturing Co., will have executive charge of the company's commercial organization, succeeding Vice president L. A. Osborne.

Arthur F. Braid has assumed the duties of metallurgical engineer in charge of metal sales for the Goldschmidt Thermit Co. of Jersey City, N. J. He succeeds DeC. Brown, who has joined the Officers' Reserve Corps at Plattsburg.

E. E. Thum has resigned as Assistant Professor of Metallurgy, University of Cincinnati, to become Associate Editor of "Metallurgical and Chemical Engineering." Previous to his teaching engagement, he was for many years engineer in charge of construction at various smelting plants of the Anaconda Copper Mining Co.

J. B. Tyrrell, of Toronto, has been appointed Canadian representative of the Consolidated Mines Selection Co., one of the strongest British mining companies, which has operated extensively in South Africa and now contemplates entering the northern Ontario field. Walter McDermott, the president of the company, began his mining career in Canada in connection with the old Silver Islet mine on the north shore of Lake Superior in 1872.

Obituary

William C. Shackelford died at Birmingham, Ala., June 24, age 58 years. He was born in Alabama and had lived in Birmingham 27 years, being interested in several coal and iron properties. He was president of the Eclipse Coal Co., the Calcis Lime Co., and the Southern Iron Corporation. He took a prominent part in the establishment of water connection between the Birmingham district and Mobile by the Black Warrior River and other improvements.

Colonel Oliver Hazard Payne died in New York, June 27, aged 78 years. He was born in Cleveland, O., and graduated from Yale in 1802. He inherited a fortune from his father and was largely interested in iron and oil enterprises, being prominent in the Cleveland group of the Standard Oil Co. owners. Later he acquired a large interest in the Tennessee Coal, Iron and Railroad Co., and was mainly intrumental in the sale of that company to the United States Steel Corporation. He made some large gifts to Cornell University and other colleges. He was a director in the Standard Oil Co., the American Tobacco Co., Virginia & Southeastern Railway Co., Coal Creek Mining and Manufacturing Co., and many other corporations.

Societies

Wisconsin Mining School—The Wisconsin State Legislature has recently passed appropriations for the Mining School at Platteville amounting to $43,275. The additional funds thus provided will be used mostly for the purchase of new equipment. The course will be enlarged and extended to cover three years. Among the new branches added are Spanish, commercial law, mine accounting, rhetoric and public speaking. The next school year begins Sept. 3.

Exposition of Chemical Industries. The third exposition will be held at Grand Central Palace, New York, during the week of Sept. 24, 1917. Preparations for the event are now in active progress. The arrangements are in the hands of an advisory committee composed of Charles H. Herty, chairman, Raymond F. Bacon, L. H. Baekeland, Henry B. Faber, Colin G. Fink, Bernhard C. Hesse, A. D. Little, R. P. Perry, Wm. Cooper Procter, E. F. Roeber, G. W. Thompson, T. B. Wagner, Utley Wedge and M. C. Whitaker. The managers Charles F. Roth and F. W. Payne, report that the exposition will be larger this year and more interesting than its predecessors. At the close of the past exposition much of the space available on two floors was re-engaged by exhibitors for this coming exposition, for which the floors are now completely taken and the greater part of the available space on the third floor engaged.

American Committee of Engineers in London has been formed of American engineers and practical business men in London for the purpose of suggesting to the government of the United States plans which may be useful in carrying on the war and to offer their services for consultation and advice to representatives of the American government should this be desired. Among those instrumental in forming this committee are Col. J. W. Boyle, W. B. Poland, Col. Millard Hunsicker, R. Gilman Brown, D. P. Mitchell, Millard Shaler, Norman C. Stines and other well known men. The only officer for the present is to be an Honorary Secretary. C. W. Purington has been appointed to this office. Sub-committees will be appointed to consider proposals and other recommendations, which may be suggested. Among the plans which are now being studied, are the following: A plan of assistance to be offered by the United States to the Russian government for improving the conditions of railway transport. A recommendation covering the development of a grain producing area in the Amur district in Siberia, tributary to the Pacific, with the object of making the grain so produced available for return cargoes from Siberian ports for such tonnage as now returns in ballast; A project to build wooden ships in heavily timbered zones along the Siberian seaboard, the Amur river and the adjacent coast.

Colorado School of Mines is still the scene of grave troubles. The dismissal of Howard C. Parmelee as president was the disgraceful culmination of the past year's series of internal disturbances that were cumulative in effect. The administration of Mr. Parmelee was strictly according to his highest conceptions of principle in the enforcement of discipline as directed by the established rules of the college. But he was made to suffer because the student body secured the backing of the financial and trades people of Golden. These townspeople, through the leading banker—one of the school's trustees—pressed their demand for another change in the presidency. Though shortsighted in the extreme, this action was carried out with the notion that a new man could be readily found to fill this responsible and difficult position. In fact, the three trustees who voted against Parmelee did so, fully believing that Milo S. Ketchum, dean of the college of engineering in the University of Colorado, would promptly accept the offer at $8000 per year, a salary never before considered here. However, it required very little time for Mr. Ketchum to reach a decision and to notify the trustees of his declination. Mr. Rubey and Mr. Carlton, the trustees appointed as a committee to select a president, now have an interesting summer's task. In view of the failure of the board to support the president and faculty consistently in times when matters of student discipline and scholarship have arisen, it is doubtful if any experienced educator who would prove acceptable to all concerned can be induced to accept the presidency. Public sentiment is strong in its sympathy with Mr. Parmelee and decidedly denunciatory of the trustees' actions. At present there is no faculty whatever. The school is wholly demoralized. No appointments for next year have been made, the trustees having voted to leave the selection of next year's corps of instructors entirely with the incoming president. In consequence, the professors are totally ignorant regarding their future and several of them are seeking engagements elsewhere. The prospect is altogether dismal.

New Patents

United States patent specifications listed below may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

Acetylene-Lamp. Augie L. Hansen, Chicago, Ill., assignor to Justrite Manufacturing Company, Chicago, Ill. (U. S. No. 1,230,892; June 26, 1917.)

Amalgamating Process for Recovering Metals from Ores. Paul Kuehn, Detroit, Mich. (U. S. No. 1,231,176; June 26, 1917.)

Amalgamation—Separator and Amalgamator. Adolph P. Palmer, Oakland, Calif. (U. S. No. 1,231,420; June 26, 1917.)

Classifying — Improved Washing and Classifying Apparatus for Ores. Gustave Pinette, Saone-et-Loire, France. (Brit. No. 105,690.)

Concentration—Improvements in or Relating to the Concentration of Ores. Henry Livingstone Sulman, London, E. C., Edwin Edser, Brockley, London, S. E. and Minerals Separation, Ltd., London, E. C., England. (Brit. No. 105,627.)

Crucible Furnaces—Improvements in and Connected with Crucible Furnaces. Frederick Samuel Wigley, Birmingham, England. (Brit. No. 105,146.)

Drilling — Improvements in Percussion Rock Drills and Coal Cutters Operated by Fluid Pressure. James Fletcher, New South Wales, Australia. (Brit. No. 105,528.)

Ferrosilicon—Process of Producing Ferrosilicon of High Silicon Content in Blast-Furnaces. Joseph E. Johnson, Jr., Hartsdale, N. Y. (U. S. No. 1,231,260; June 26, 1917.)

Gold-Concentrating Plant. Nathan L. Raber, Corvallis, Ore. (U. S. No. 1,231,297; June 26, 1917.)

Magnesium—Process of Making Magnesium Compounds from Silicate Minerals. Samuel Peacock, Philadelphia, Penn., assignor, by mesne assignments, to Marden, Orth & Hastings Co., Inc., New York, N. Y. (U. S. No. 1,231,423; June 26, 1917.)

Manganese Alloys—Making Low-Carbon Manganese Alloys. Ernest Humbert, Niagara Falls, N. Y. (U. S. No. 1,228,925; June 5, 1917.)

Metal Alloy. Hugh S. Cooper, Cleveland, Ohio, assignor to The Electro Metals Products Company, Cleveland, Ohio. (U. S. No. 1,229,985; June 5, 1917.)

Mine-Door. Alonzo Blevins, Charles F. Kilgore, and Allen L. Blevins, Coeburn, Va., assignors, by direct and mesne assignments, of one-fourth to said Alonzo Blevins and one-fourth to said Kilgore, and one-fourth to Mason L. Johnson and one-fourth to Joseph J. Body, Dante, Va. (U. S. No. 1,228,613; June 5, 1917.)

Editorial Correspondence

SAN FRANCISCO—June 28

Tightner Mine, in Sierra County, is paid for. The final payment, making a total of $550,000, was made in the first week of June. And besides paying for the mine the present owners have paid dividends of $100 to $1000 per share. Just how much the total dividends amount to is not made public. But it is probably a safe estimate that the mine has produced close to $1,000,000 in the five years since H. L. Johnson, the former owner, turned it over to a group of men, chiefly of the North Star mines, in Grass Valley, who optioned the property in the belief that practical modern mining methods would develop a great mine where pocket hunting and "jewelry" mining had merely made sensational and spectacular disclosures of free gold in quartz. The same methods that have obtained at the North Star and other great mines in the Grass Valley and Nevada City districts in Nevada County were applied to the operation of the Tightner, with the result that a mine has been developed and paid for, and surplus money earned during the period of development.

Mining Legislation in California directly affecting the mining industry enacted by the 1917 session of the legislature, with the exception of the more liberal compensation act, had the approval of the California Metal Producers' Association. This is due in a great measure to the activity displayed by the committee and other members of the association in protesting the passage of some of the measures proposed. The following is a brief resume of the bills offered and the result of legislative action: H. B. 74 and 211, providing for amendments to the semi-monthly pay-day bill: No. 74 failed of passage and No. 211, as amended, passed but failed to receive the approval of the governor. H. B. 172, and others providing for Sunday closing, defeated after the adoption of numerous amendments. H. B. 250, by Williams, providing for the payment of wages in cash, was not acted upon by the committee to which it was referred. H. B. 534, by Williams, making it a misdemeanor for employers to discharge an employee for refusal to patronize a boarding-house or hotel conducted by such employer, was passed but vetoed by the governor on Apr. 20, 1917. H. B. 594 and 994, by Harris, providing for amendments to the eight-hour law and restrictions governing hospital protection or insurance were reported from committee without recommendation and no further action taken. H. B. 1324, by Goetting, in reference to publicity of ownership of stock, etc. failed of consideration by the committee on corporations. S. B. 437, by Lyon, providing for the payment of wages by draft drawn upon some bank or established place of business within the county where the work is performed was passed after amendment but vetoed by the governor on June 1, 1917. S. B. 1017, by Lyon, providing for the issuance of a certificate or contract of employment was denied consideration by the committee on labor and capital. S. B. 1035, by Flaherty, known as the anti-injunction law was passed but vetoed by the governor on June 1, 1917. S. B. 816 and 823, providing for an amendment to the act relating to the storage and transportation of powder and the repeal of the mine bell-signal law, were passed and approved by the governor. Senate bills by Luce practically re-enacting the Workmen's Compensation, Insurance and Safety Act to be made effective Jan. 1, 1918, were passed after the adoption of a great many amendments and have received the approval of the governor. Senate constitutional amendment No. 30, by Luce, providing for social or health insurance was adopted. H. B. 1441, by Brackett, known as the eight-hour "collar-to-collar" bill was tabled by the committee on mines and mining by a vote of 8 to 1, and received no further consideration.

BUTTE—June 28

Butte Mines Working Day Shift with about one-quarter of the normal crew. No attempt has yet been made to work in the mines at night. The action of the local unions of the electricians, machinists and blacksmiths going on strike without the approval of the national officers has complicated the situation. Some of the machinists and blacksmiths went on strike while others remained at work. On Wednesday night, June 27, the engineers held a largely attended meeting and decided by a vote of 352 to 295 to endorse the demands of the electrical workers as far as they applied to an increase of wages for themselves but declined to endorse the demands of the electrical workers as far as the backing of the Metal Mine Workers Industrial Union was concerned. The Butte mill and smeltermen held a meeting also and turned in their charter that connects them with the American Federation of Labor. The committees from the Metal Trades, the Building Trades and the Silver Bow Trades and Labor Council also held conferences, endorsed the electrical workers' demands for more wages but did not endorse the miners. Representatives of the international unions represented in Butte have arrived here and also W. H. Rodgers, representing the U. S. Bureau of Labor. Conference after conference has been held in an effort to straighten out the tangle. The representatives of the mining companies have declared that under no circumstances will they have any dealings with the Metal Mine Workers Industrial Union. The leaders of this organization are the same men who helped three years ago to destroy the old Butte Miners' Union and organized the new I. W. W. union. Evidence has been secured to show that they are being helped in their organization by W. D. Haywood and organizers of the I. W. W. The leaders who were recently active in the efforts to defeat conscription in Butte, consisting of radical Irish and Finlanders, are running the new union. For these reasons the mining companies look upon these men as foes of the mining industry in Butte, as well as enemies of the United States. It is possible that the mining companies and the regular unions connected with the American Federation of Labor will be able to get together and that both sides will make some concessions that will result in patching up the matter. This would bring back all the electricians, machinists and blacksmiths and engineers and put the companies into a position where the mines can be operated steadily. If this be done, the companies have no fear about securing plenty of miners and within a week or two the conditions would probably be normal once more. Mr. Rodgers representing the Federal Government is holding conferences with all the parties interested and is reported to be encouraged over the prospect of a settlement. The Government is directly interested for the mines of Butte produce about one-seventh of all the copper produced in the United States and nearly one-half of the zinc produced and these metals are absolutely necessary in the manufacture of munitions of war.

DENVER—June 29

Smelter Investigating Committee has appointed O. R. Whitaker, of Denver, technical advisor. Mr. Whitaker is a mining engineer of wide experience, and under his direction the investigation of smelting charges, for which purpose the committee was appointed by the last general assembly, will be carried to a conclusion. Much information has already been gathered by the board in the form of affidavits by mine operators. Later, hearings will be held at which smelting-company officials will be asked to appear.

Strike Threatened at Leadville by the International Union of Mine, Mill and Smelter Workers. Dissatisfaction is over the refusal of the mine owners to make a flat raise of $1 per day in wages. Mines have made an increase of 50c. per day already this year and it is contended that profits do not warrant a further increase. An investigation by the state industrial relations commission, asked for by the miners' union, confirmed the decision of the mine owners. If the union workmen strike, it is probable that the nonunion men, who outnumber them two to one in the camp, will also walk out, simply to avoid the usual disturbances. The situation is complicated by the fact that Leadville contains many Austrian subjects hostile to our Government. Many of these refused to register on June 5, and 42 were imprisoned. Sheriff Henry Shraeder, of Lake County, states he expects to arrest about 50 more. On account of threats made to blow up the transformer station of the Colorado Power Co. and mine buildings, a detail of the First Colorado Cavalry has been hurried to the district from the Golden encampment, and is now under command of Lieutenant Hawksworth. The cutting off of electric power would be serious as many of the mines would then be flooded and an immense monetary loss, as well as curtailment of metal production this year, would result. Authorities believe that even in case of strike, which now seems almost unavoidable, the situation can be handled without serious disturbances.

Bull Domingo was a well-known Colorado lead-silver mine 30 years ago. It is at Westcliffe, in Custer County. Production continued until the combined effects of heavy zinc penalty in smelting and the demonetization of silver rendered further operations unprofitable. In mining, it was impossible to prevent the mixing of considerable amounts of sphalerite with the desirable silver-bearing galena. Louis Wagner, of Denver, who was instrumental, some years ago, in reviving the Mary Murphy mine at St. Elmo, has undertaken the resumption of mining in the Bull Domingo, where he believes large bodies of ore will average 25% zinc. He states that former operators did not exploit more than a fraction of the mineralized ground so that there remain potentialities for a further production of good silver ore as well as much zinc ore. The large mine dumps are said to constitute good feed for a concentration mill.

OATMAN, ARIZ.—June 28

Diamond-Drill Exploration will be tested out thoroughly in the Oatman district for the first time on two properties. Manager McIver, of the Telluride, is preparing to prospect that company's ground from the surface by diamond drills. The Telluride adjoins the Tom Reed and two shafts have been sunk, one 250 ft. deep and one 635 ft. deep, both opening up the Telluride vein, which is regarded as an extension of the Tom Reed-United Eastern vein system. At the Mohawk Central, diamond drills will be used to crosscut from the 400-ft. station to all parts of the claim. M. J. Monette, formerly of the Hayes-Monette lease in Goldfield, is president of the Mohawk Central.

CLIFTON, ARIZ.—July 2
(By Telegraph)

Strike Closed Mines of the Clifton-Morenci district on July 1. Miners, millmen and smeltermen went on strike for the Miami scale of wages. Properties of the Detroit, Arizona Copper and Shannon Copper Co., ceased operating at 10 o'clock on Sunday morning. The companies have the properties well guarded with loyal men. Sheriff Slaughter has added extra deputies to his force and has control of the situation.

HOUGHTON, MICH.—June 26

Utilizing Waste Sands from old mines in the Lake country is attracting further attention. Some day the abandoned and waste sands at many of the old mine locations of Keweenaw County are going to yield profits either to the owners or to persons who may lease them for the purpose of working out the copper lost therein. Some of these sands, particularly at the old Cliff mine, now controlled by the Calumet & Hecla and allied interests, and others, are said to be richer in copper than the Calumet & Hecla sands, which are now yielding millions of pounds of copper each year, at a low cost of recovery. The old mine sands were deposited from 20 to 50 years ago, in the days when milling machinery was by no means what it now is, consequently a great deal of copper that would now be recoverable from the rock was discarded with the waste sands. There is one old mining man, and his son, working now on the sands and old rock burrows at the Cliff mine, picking over the rock by hand. They are taking out considerable copper, working the material in a crudely arranged mill, which contains a "rough," two Wilfleys and other equipment, most of which is rather out-of-date, but enables them to make something more than a living. It is probable that the sands at at least one of the old mining locations of Keweenaw that gained fame for its copper output in the 50's and 60's will be leased by interests now forming and that the sands will be thoroughly tested for their copper content. Calumet & Hecla has proved conclusively that its sands can be reworked; after being dredged from Torch Lake, they are reground and run through the leaching plant, producing copper at a cost of not more than 6c. per lb. and eventually costs will likely go even lower. The Tamarack, Quincy, Franklin and other sand heaps contain great amounts of recoverable copper that will be worked some day. Many of these sands have already been tested.

TORONTO—June 30

Labor Conditions in Northern Ontario are still unsettled and the outcome doubtful. Due to the action of several of the mines in Porcupine in increasing the wages by 50c. a day, the situation there is much better and there is now little chance of trouble. At a vote taken last Sunday in Cobalt, however, 1100 out of 1200 men voted in favor of a strike and the matter is now in the hands of the union executive. As the men are now receiving as much money as the union scale calls for, the operators consider that the attempt to force wages to be paid as a flat rate instead of bonuses, is simply for the purpose of trying to gain recognition of the union. This body they refuse to recognize and it is stated that a number of the mines will close in the event of a strike being called. However, it is impossible to forecast what will take place because, unfortunately, the operators do not work together so well as the men. Some of the operators, it is rumored, have already decided to grant the flat rate.

JOPLIN, MO.—June 30

Railroad to Picher, Okla., will be part of the Fourth of July celebration at this richest camp of the Joplin district. On that day the first passenger train will enter the town over the tracks of the Mineral Belt Railroad, which connects with the Frisco at Quapaw, Okla. The road was laid from Quapaw to Century, some time ago, then on to Tar River, or Cardin, as it is still called by some, and then on to Picher, making a semi-loop. It is expected that eventually the line will be built on to Baxter Springs, Kan., or to Columbus, Kan. While it is supposedly an independent line, it is on friendly relations with the Frisco and it is even reported that the freight for it was "dead-headed." Meantime, the building of the Southwest Missouri R.R. Co.'s interurban extension from Galena to Baxter is progressing rapidly, and A. H. Rogers, president of the road, has announced that he hopes to have cars running to Picher by Oct. 1. Picher now claims over 1000 people. It has no sewer system and can have none because most of the land on which it is located is owned by Indians and sewer bonds cannot be voted. Sanitary conditions are fairly good and there has been no epidemic of sickness as yet, and the new town's authorities are doing their best to prevent any. Water has been obtained from one deep well, and another has just been put down. Water sells about the town at as high as 35 cents a barrel.

WASHINGTON—July 2

No Material Decline in Spelter may be expected, according to C. E. Siebenthal, the zinc specialist of the U. S. Geological Survey. Should there be a decline in the price of spelter, Mr. Siebenthal argues, "it probably would so reduce the output of sphalerite concentrates from the sheet ground of the Joplin region as to react upon the price of spelter, causing it to rise again." Commenting further on the zinc situation, Mr. Siebenthal says: "The zinc reserves of the country have shown themselves to be equal to all demands made upon them. In fact, the production of zinc ore has been so large that further decline in ore prices with resultant demoralization of the domestic zinc-mining industry can be prevented only by a material increase in the demands for spelter or by a lessened supply of foreign ore. An increase in the demand for spelter seems probable and imports of zinc ore may decrease also, if shipments from Spain and Australia are interfered with by submarines, or if shipments of zinc ore from Mexico are prevented. The zinc content of zinc ore imported in 1915 amounted to 57,669 short tons and in 1916 to 148,147 tons. Mexico and Australia each furnished about one-third of the imports. The imports of zinc ore for the first four months of 1917 indicated a falling off of 40% from the average monthly imports in 1916."

HAVANA, CUBA—June 30

Oil Drilling in Cuba has been stimulated by the commercial production obtained at the Union Oil Co.'s No. 5 well, about 13 miles from Havana. The Pearson interests, which were drilling here several years ago sold their outfit to the Antillian Corporation about a year ago, and the latter is drilling a well on the Georgina claim near the town of Guines in Havana Province. The well is down over 3000 ft., and it is reported that work has been stopped for the present. The company is drilling a well on another claim the Antillana, near the village of Managua on the road from Havana to Batabano, on the backbone of the Island. Some encouraging gas and oil showings have been encountered. The geology both of the Georgina and Antillana claims apparently differs from that of the Bacuranao district where the Union Oil Co. and the Cuban Petroleum Co. are drilling. The formation is composed of limestone, and probably sandstone, strata forming a large anticline which runs nearly east and west through the center of the Island. On June 20 a bill was passed by the Cuban Senate declaring fuel oil practically free of duty on entering Cuban ports. The bill is now in the House for discussion and the chances are that it will pass. Of course, this measure does not interfere with the oil-producing industry of the country, as the oil produced in Cuba is not a fuel oil, but a high-grade distilling oil. Asphalt mines at Mariel in the Province of Pinar del Rio have been leased by a company recently formed which is experimenting with the product in order to make it fit for road work. It is reported that an order for a few hundred thousand tons has been placed with the people working the Mariel mines by the South African government for road-metal binder.

The Mining News

ARKANSAS

Batesville County

BATESVILLE MANGANESE FIELD is producing 1000 tons monthly. Walter Dennison, largest producer and ore buyer. Most of the ore is going to Alabama furnaces. Mined from openpits and shallow shafts.

Baxter County

ANNA MAY (Buffalo)—Temple Mining Co., of Pittsburg, Kan., has leased this zinc mine; ore blende and carbonate. C. A. Ludlow in charge.

Marion County

HELVA (Rush)—H. Sour has started 150-ton mill.

BELLE (Rush)—This zinc mine owned by James McCarty, of Yellville, is receiving machinery for 100-ton mill.

UNION DEVELOPMENT CO. (Buffalo)—A. Christianson, of Chicago and associates leased 100 acres of zinc land.

WILLETT (Yellville)—Carbonate-of-zinc mine, owned by W. R. Willett leased to C. D. Murphy and associates, Oklahoma City, Okla. Will build 100-ton mill at once.

Searcy County

TOMAHAWK (St. Joe)—Being operated by Tomahawk Copper Co.; building 10-ton furnace. Only active copper mine in state. C. H. Burke, manager.

ARIZONA

Cochise County

STRIKE of miners started on July 1 by members of the Metal Mine Workers Industrial Union. From 10 to 50% of men quit the Copper Queen and Calumet & Arizona mines on the first day; the Shattuck Arizona is not working any men in the mine but mechanics and surface crews are working.

PEERLESS (Dragon)—Charles Stark and C. L. Graves developing contact copper deposit in this property adjoining the Centurion. In sulphides at 350 ft. C. L. Graves in charge.

Gila County

STRIKE called July 1 in Miami district by the Metal Mine Workers Industrial Union, the I. W. W. local. Mines and reduction plants of the Miami, Inspiration and International companies completely tied up. In Globe, only about 75 miners obeyed the strike call at 3 p.m., but tie-up was expected to be practically complete on July 2.

GLOBE-DOMINION (Globe)—Shaft on this property, about two miles from Globe, is down 360 ft.; progress 5 ft. per day. Objective is 1000 ft. but crosscut will be started at 600 ft. James H. Barr, of National Supply Co., president; B. O. Thralls, superintendent.

Greenlee County

ASH PEAK EXTENSION (Duncan)—Sinking shaft, now down about 125 ft. George Powell, manager.

ARIZONA MAYFLOWER (Duncan)—Preparing to resume at both the Water and Wampoo shafts. Low-grade copper orebodies sought. W. B. Duvall, manager.

ASH PEAK MINES (Duncan)—Now being operated by the Goldfield Consolidated company which has arranged to sink Commerce shaft from 200- to 500-ft. level. Additional machinery being installed. The Commerce shaft is about 2200 ft. from the main shaft, the Shamrock, sunk by present operators from 500- to 600-ft. level. Considerable milling ore, silver, in quartz. William H. Kinnon in charge.

Mohave County

UNITED EASTERN (Oatman)—Sinking of the main shaft 300 ft. has been started; concrete bulkhead will be installed near bottom of present shaft and a supplementary hoist used for sinking; crosscuts are to be run at 815 ft. and at 965 ft. Three new Dorr agitators are to be added to increase mill capacity to 300 tons; crushing capacity 400 tons daily. J. A. Burgess, superintendent.

Pinal County

RAY CONSOLIDATED (Ray)—May production of copper was 8,015,281 lb., comparing with 7,902,724 in April and 6,278,611 lb. in May, last year.

Yavapai County

CONSOLIDATED ARIZONA SMELTING (Humboldt)—Directors have declared two quarterly dividends of 5c. each, payable Aug. 15 and Nov. 15—the first disbursements of this or its precedent company. The smelting plant was built 12 years ago, by the Arizona Smelting Co.

CALIFORNIA

Amador County

KENNEDY (Jackson)—Orebody recently disclosed in the 3900 level has been developed for width of 52 ft. While it is of milling grade, the exact assay has not been stated.

Calaveras County

PENN MINING (Campo Seco)—May copper output 282,420 lb.

MANHATTAN (Murphys)—On San Domingo Creek; optioned to Mr. Greenburg and A. R. Folsom. Development in progress on the Hidden Treasure, lower mine of the group. Two shafts are being sunk. Vein about 4 ft. wide and 300 ft. long. Thomas J. Denslow, owner.

Del Norte County

CHROME DEPOSITS found on Cedar Creek, 17 miles south west of Waldo, Ore., by John Taggert.

DIAMOND CREEK CINNABAR (Crescent City)—Preparing to install machinery; L. C. Cole, owner, is in charge.

BRITTEN & WILSON (Waldo, Ore.)—Another rich vein of copper ore encountered at this mine, 17 miles south west of Waldo. J. N. Britten, manager.

COLD SPRING (Crescent City)—This chrome property, 25 miles northeast of Crescent City, under lease to M. A. Delano of Grants Pass, Ore., will begin shipping by steamer to San Francisco. Owned by G. W. Gravlin.

LUCKY BOY (Waldo, Ore.)—Leasers unable to proceed on account of lack of money. American Exploration Co. contemplates taking it over. Owned by Otto Anderson.

AMERICAN EXPLORATION CO. (Crescent City)—Chrome properties on French Hill and Low Divide, operated by this company, have 8000 tons of ore ready for shipment; five auto trucks expected for hauling ore to Crescent City; thence by steamer to San Francisco. Thomas Galvin, manager.

Eldorado County

BEEBE (Georgetown)—Sinking completed. Crosscutting on 250-ft. level.

GREEN CHROME MINE (Georgetown)—Extraction suspended, owing to lack of transportation; 250 tons ready for hauling to the railroad. Road repairs contemplated to Placerville. Property situated in Volcanoville section. Developed to depth of 200 ft. Owned by Warren Green.

Kern County

TEHACHAPI CINNABAR CO. (Marcel)—Development in progress and good ore reported; 10 men are employed.

MINNESOTA (Randsburg)—On north side of Rand Mountain; developed by 30-ft. tunnel and winze sunk on vein. Last ore from winze ran $27 per ton. East extension of the Yellow Aster. Robert Gurderson, owner.

Inyo County

TUNGSTEN development on Mt. Morgan, west of Round Valley, near Morgan Creek, by Cooper Shapley, has attracted attention of men who contemplate plant for mining and milling. Claims are owned by Beauregard, Vaughn and Stroud, and optioned by Mr. Shapley. Reported that examination will be made for Messrs. Close and McIntyre, of Los Angeles.

Nevada County

RED LEDGE (Washington)—Chrome shipments from this and other mines in Washington district attracting attention. Ore hauled by wagon to Nevada City and shipped by rail to Pittsburgh, Penn. No definite lens yet developed, but 150 tons of ore are in sight. Teams hauling ore return with lumber for the Ocean Star and Columbia mines; shipment of ores depends largely upon return freight for the ore wagons.

Placer County

EXCELSIOR (Forest Hill)—Pete Fereria. reported to have confessed to high-grading $200 worth of gold, is under arrest. This is said to be the tenth case of high-grading from this mine within a month. When arrested Fereria was trying to dispose of $600 worth of gold dust.

Shasta County

AFTERTHOUGHT (Ingot)—The 300-ton flotation plant is nearing completion; expected to be in operation about middle of July. George L. Porter is manager.

REID (Redding)—Thirty miners at this gold mine in Old Diggins district walked out, demanding an increase all around of 50c. a day. Machine men are paid $3.50 per 9-hr. shift, muckers $2.75. Harvey Sallee, superintendent, was absent at the time.

San Bernardino County

SLATE RANGE (Randsburg)—This operation at "Benny Truman's camp," is employing 30 men. Regular shipments going to Salt Lake.

OSDICK, TREASURY AND SCHEELITE (Atolia)—These properties producing total of about one ton of placer, tungsten a day.

LEONARD (Atolia)—Clarence Kirk leased block of claims west of the Churchill, one of the Atolia Mining Co. producing claims.

Siskiyou County

MANGANESE reported by Florian LeMay, on north fork of Greenhorn Creek. Several years ago manganese was reported at Red Rock point, which heads into Greenhorn. Prospectors going into the district.

Tuolumne County

DUTCH-SWEENEY-APP (Jamestown)—Ore from 2150 level is being treated in a portion of the old Dutch mill; 47 men employed. W J. Loring, manager; C. H. Fry, superintendent.

ITALIAN CAMP (Sonora)—McCormick, Rolleri and others have given option on this low-grade group of claims situated near Phœnix Lake and development will begin on June 28.

TABLE MOUNTAIN MINING CO. (Tuolumne)—Incorporated for $1,000,000 with I. J. Lipsohn, M. Harrison, E. J. Doyle, G. F. Allen, M. A. Pickett as directors. Installation of equipment in progress. Mine formerly known as the Buckeye. Employing 14 men.

COLORADO

Boulder County

RED SIGN (Boulder)—Mill again in operation; treating both company and custom ores.

EUREKA (Boulder)—Four sets lessees working. Old dumps being jigged; good saving tungsten minerals.

CONSOLIDATED LEASING CO. (Boulder)—Reported will build mill in Eldorado section; custom ore to be treated. Now operating Swarthmore property.

Gunnison County

GOLD BELT (Pitkin)—Making good progress in driving tunnel.

SAW TOOTH (Gunnison)—In Beaver Creek district, 17 miles southwest. Installing compressor plant. Tunnel now in 1050 ft.

JOHNSON MOLYBDENUM (Pitkin)—Resumption of operations delayed by road blockade. Concentrates shipped from plant last season, and product now sold ahead. Chief molybdenum producer of state.

La Plata County

BESSIE (Durango)—Operations will be resumed at this property 17 miles northwest of Durango in La Plata Mountains. Considerable high-grade ore shipped last autumn.

Ouray County

GENESEE-VANDERBILT (Ironton)—Milling plant ready for operation. Property under lease to James M. Hyde.

San Juan County

SUNNYSIDE (Eureka)—Good progress being made in construction of new 500-ton mill.

GOLD KING (Gladstone)—Operating force will be increased and recent production doubled.

ZANG (Silverton)—Mine plant will be installed on this tungsten property. C. C. Eddy, manager.

DORA CONSOLIDATED (Silverton)—Examined recently for American Smelting & Refining Co.

HEMATITE LEASING (Silverton)—This company in Howardsville district has commenced shipping.

CARLSON (Silverton)—This group sold recently to R. E. L. Townsend and associates; work will start at once.

ELK (Gladstone)—Active development is to be resumed; several buildings erected and additional machinery installed. J. J. Custick, manager.

PRIDE OF THE WEST (Silverton)—New aerial tramway being erected to transport ore to the Green Mountain mill. A. W. Harrison, manager.

SAN JUAN CHIEF (Silverton)—Half interest in this mine on Engineer Mountain sold recently to Joseph Terry. Work will be started as soon as trails are opened.

LACKAWANA (Silverton)—Will be developed by the newly formed Lackawana Mining & Reduction Co. Last year developed bodies of lead, copper and silver ore.

BAGLEY TUNNEL (Silverton)—Formerly known as the Frisco; sold recently to Eastern men. Mill, bunk and boarding house built and development work under way.

SUMMIT (Silverton)—Will be worked ny lessees. Good-grade copper-silver ore opened in five shallow shafts and crosscut tunnel, now in 600 ft., being driven to cut ledge at greater depth.

TELESCOPE (Ironton)—Will develop through main tunnel which now has a length of 1500 ft. Payable ore opened Vein is 5 to 6 ft. wide Compressor will be installed. C. B. Sheehan, manager.

San Miguel County

CARRIBEAU (Ophir)—New flotation equipment installed. George L Bingham is manager.

SANTA CRUZ (Ophir)—Being developed by Clements Wichmann. Carload of ore, from development, shipped to smeltery at Durango recently.

SMUGGLER-UNION (Telluride)—Flotation plant completed and in successful operation. High saving being made. Walter Reed, superintendent.

ALTA (Telluride)—Fire June 17 caused damage estimated at $1000 to mill building. Heavy water pressure in fire lines saved building from complete destruction.

CARBONERO (Ophir)—George B. Pickett has secured five-year lease. Shoofly tunnel, now in 2700 ft., will be advanced. Installation of compressor and machine drills under consideration.

BUTTERFLY (Ophir)—Being developed by Juricn Mining and Leasing Co. Ten stamps dropping on ore recovered from old workings and from development. Ten additional stamps will be placed in commission as soon as water supply is sufficient.

Teller County

CAMP BIRD (Cripple Creek)—Electric driven compressor being installed by this leasing company on Rose Nicol.

TRAIL (Cripple Creek)—New oreshoot opened on 500-ft. level of this lease on United Gold Mines Co. ground.

CAROLINE (Victor)—Working Ajax mine. Station being cut on 1800-ft. level. Several sets of lessees producing ore.

GRANITE (Victor)—Sinking in Dillon shaft suspended until water, struck at 1775-ft. level, drains off through Roosevelt tunnel.

KOMAC (Cripple Creek)—Will take over lease on Victor mine, working through main shaft as soon as electric hoist is repaired.

VICTORY GOLD MINING (Cripple Creek)—This new company will take over the properties of the Albert Beacon Gold Mining Co., the Cripple Creek General and the Gold Camp Syndicate. Harry J. Newton, of Denver, is president and general manager; Frank Vetter general superintendent. Well-known mines included in the consolidation are the Prince Albert, Beacon and Eureka mines, on southeastern slope of Beacon Hill; the Little May, Katie Holis, Missouri, Placer and part of the Unexpected, on Newton Hill; and the Grouse, Humboldt, Emma Aimee, Josie S., and parts of the Bob Tail, Mud Hen and Leora V. claims. Part of these properties already under active development, and scope of operations will be enlarged. Low-grade ore available in old and new workings and on dumps, which it is now estimated can be profitably handled. Surface strike of 2-oz. ore, a rare occurrence in this district, was recently made by lessee on north end of Prince Albert ground.

IDAHO

Idaho County

UNITY GOLD MINES (Warren)—Tunnel at 1450 ft. cut the Banner vein, about 5 ft. wide; will continue to cut the Giant vein about 600 ft. beyond and the Charity mine about 3000 ft farther which will be opened at 2000-ft. depth Erecting 50-ton mill; hydro-electric power. R. A. Beall, superintendent; J. A. Csizek, consulting engineer.

MICHIGAN

Copper

HOUGHTON (Houghton)—Three drills in operation on sixth level; good rock taken out here and on eighth level.

AHMEEK (Calumet)—Has increased output to average established in March of 4200 to 4300 tons daily. Conglomerate openings have not disclosed especially rich rock.

HANCOCK (Hancock)—Sending slightly richer rock from deeper levels in Quincy No. 7 shaft to the Quincy mill. Output from both shafts about 900 tons daily.

ALLOUEZ (Calumet)—Sending about an average of 1750 tons daily, as compared with former 2000 tons. Two of the five locomotives installed and as soon as the five are in operation, increase in production is expected.

SENECA (Calumet)—Will not start sinking shaft until about middle of July Equipment being moved to site, and work on spur of Keweenaw Central R R. started Negotiating for second-hand machinery in order not to delay operations.

TAMARACK (Calumet)—Sending only occasional shipment to Tamarack mills, most of product now going to Calumet & Hecla mills at Lake Linden. Increase in output anticipated shortly. Shafts will be equipped with larger skips.

FRANKLIN (Hancock)—Reopening No. 2 shaft as fast as possible to get into rich territory; opened by drifts from No. 1 shaft at depth of 2000 ft Shaft badly choked by caveins at 14th and 15th levels. Production running as high as 1300 tons of rock daily.

CALUMET & HECLA (Calumet)—Steel up for addition, which will treble capacity of the distilling plant or "still house," at Lake Linden. This plant recovers ammonia used in the leaching process. Foundations for substation for power transmission and for big steel addition to coal docks completed; material on hand for the new office building. Calumet & Hecla sending 9300 to 9800 tons of rock a day to mills The smaller C. & H. subsidiaries, such as Allouez, Superior, LaSalle and Centennial are still low in production, because of shortage of men. Allouez is making slight increase since first of month, or 1600 tons daily, Centennial and Superior 500 tons each, and La Salle 600 tons.

Iron

BREITUNG IRON CO. (Marquette)—This Delaware corporation will be the holding company for the following Breitung properties: Mary Charlotte Mining Co., Breitung Hematite Mining Co., Washington Iron Co., Hopkins Mining Co.; a Minnesota corporation, Clifford Extension Iron Co. and the Breitung Iron Co., a Michigan corporation owning the Loon Lake Mining company, at Wilde, Ont. The new company has $15,000,000 common stock and $3,000,000 preferred, the latter is to be sold (1) to make cash payment of $501,000 on one of the properties, (2) to provide $1,000,000 working capital and (3) to retire bond issues of $600,000 each on the Mary Charlotte and the Breitung Hematite. Of the common stock, Edward N. Breitung holds $12,000,000 awarded for stock of subsidiaries.

MINNESOTA

Mesabi Range

STATE OF MINNESOTA has purchased the E. J. Longyear office building and sample warehouse at Hibbing and will use same as headquarters for the mining-inspection department on the Mesabi range. Price, $35,000. Warehouse will be remodeled into a chemical laboratory and changes made in office building.

BENNETT (Keewatin)—This Pickands Mather Co. property has let contract for additional buildings to Challberg & Baum, of Grand Rapids.

OLIVER IRON MINING (Hibbing)—Making preparations for opening Carson Lake mine, west of Hibbing; a state lease; underground operation.

SMITH (Hibbing)—Butler Bros. have two shovels at work in this pit loading ore; a state lease; shipping 10,000 to 12,000 tons a week to the docks.

ARTHUR (Hibbing)—This company has turned over all operating mines, not already leased, to the M. A. Hanna Co., of Cleveland. These mines include the Harold, Dale, South and North Uno at Hibbing, Leonard at Chisholm, and the Thorne at Buhl. Contract calls for employment of all former workers.

INTERSTATE IRON CO. (Hibbing)—Has five diamond drills check-drilling the South Agnew property, preparatory to opening as an underground mine; one of the three new properties lately leased from Great Northern Ore Properties. Loading the stockpile at the Mississippi mine, Keewatin, and shipping ore from the Hill Annex pit, at Calumet, Minnesota, the two other new properties.

MISSOURI

Joplin District

GRAND CENTRAL (Joplin)—C. D. Fletcher opening this mine, worked 15 years ago. Sinking new shaft.

ST. JOE (Joplin)—Completing new 100-ton mill, just south of Picher, Okla. J. W. Grounds, Joplin, president.

VELIE (Miami, Okla.)—Completed first mill west of Picher, Okla., recently, and has now started construction on second. Frank Weeks, Joplin, interested.

REPUBLIC (Tar River, Okla.)—Completed 250-ton mill on Wright land. Shaft down to 221 ft. with 40-ft. face of good ore developed. Company has leases on two other tracts.

POTOSI (Century, Okla.)—New 200-ton mill ready. Deep drilling has shown five ore levels, 65, 110, 136, 200 and 300 ft. T. F. Blunt, Potosi, Mo., president; W. H. Burt, manager.

ADMIRALTY ZINC (Century, Okla.)—Broke ground for fourth mill. Sinking three new shafts. Now using six shafts. Producing about [illegible] tons zinc and 100 tons lead concentrates weekly.

PATHFINDER (Joplin)—Planning 300-ton mill on lease southeast of new St. Louis camp in Oklahoma. Put down 18 drill holes, majority showed ore from 110 to 180 ft. George Glade and Adam Scott, Joplin, principals.

RAINBOW (Miami, Okla.)—Building 300-ton mill on leased Buffalo land northwest of Quapaw. Two mill sites blocked out and will start building No. 2 as soon as first is completed. Former Governor Haskell, of Muskogee, president.

BIG EIGHT (Baxter Springs, Kan.)—Developing mill site on [illegible] land in Oklahoma just south of Baxter. Eight drill holes showed good run of ore beginning at 130 ft. with assays ranging from 6 to 15% blende. F. W. Fra[illegible], Galena, Kan., manager.

MONTANA

Lewis and Clark County

BARNES-KING DEVELOPMENT (Butte)—Increasing its forces at the properties in Marysville since the Butte strike started. Men who were getting $4.75 in Butte have gone to work in the Piegan-Gloster and Shannon gold mines for $3.50 per shift. Fine board and room, with modern accommodations, are obtainable in Marysville however for $1 per day, which would probably cost $2 per day in Butte.

Silver Bow County

STRIKE continues with practically all mines affected; working day shift only with about one-quarter of a normal crew.

TUOLUMNE (Butte)—This property which was closed down is again in operation on day shift with practically a full crew.

BUTTE & SUPERIOR (Butte)—Mill still in operation on June 28. No hoisting being done but some men are working underground.

NEVADA

Clark County

CONTACT (Goodsprings) — Important strike of zinc carbonate. Shipping three cars per month to Jean, 15 miles.

DAWN (Goodsprings) — Zinc carbonate in considerable quantity recently encountered. Will install hoist. A. Munzebruck, manager.

COPPER WORLD (Cima) — Machinery for new 100-ton copper smeltery practically all on ground. Expects plant to be operating in 30 days.

CHRISTMAS (Goodsprings)—Important strike of lead-silver ore of milling grade recently made in No. 3 tunnel, lowest working in mine. Expected that milling will be resumed.

ANCHOR (Goodsprings)—New compressor and hoist recently erected. Milling about 30 tons of lead ore daily; also ships crude lead and zinc ores. R. W. Moore, superintendent.

TAM O' SHANTER (Goodsprings)—Owned by John R. Newberry of Los Angeles. New hoisting plant will be erected at once. Shaft 300 ft. deep; will be sunk. Former producer of silver-lead ore.

PRAIRIE FLOWER (Goodspring)—At this property, which adjoins Yellow Pine on the north, new shaft down 200 ft.; crosscutting for ore zone. Recent discoveries in the north end of the Yellow Pine have important bearing on prospects. Compressor and Jackhamer drills installed. Old dumps being worked by hand jigs for lead content.

Esmeralda County

ATLANTA MINES CO. (Goldfield)—Regular shipments copper-gold ore being sent to smeltery. Low-grade ore, being blocked, will later be treated by flotation at Goldfield Consolidated mill.

NEVADA CO-OPERATIVE MINES CO. (Goldfield)—Operating old Empress mine on Gold Mountain, about 36 miles south of Goldfield. Several thousand feet of development done, exposing milling-grade ore.

Nye County

TONOPAH ORE PRODUCTION, for week ended June 23, was 9262 tons, valued at $166,716, comparing with 9117 tons for the previous week. Producers were: Tonopah Belmont, 2959 tons; Tonopah Mining, 1975; Tonopah Extension, 2380; Jim Butler, 650; West End, 851; Rescue, 254; Montana, 55; Cash Boy, 105; Monarch Pittsburgh, 60 tons.

WHITE CAPS EXTENSION (Manhattan)—Surface equipment being installed for prospecting ore-bearing limestone adjoining the White Caps. O. McCraney, superintendent.

White Pine County

NEVADA CONSOLIDATED (McGill)—May copper output 7,239,978 lb., comparing with 6,727,192 lb. in April and 7,743,118 lb. in May, last year.

CONSOLIDATED COPPER MINES (Kimberly)—Mill now treating over 500 tons daily; in 30 days this will be doubled; about 100 tons of direct smelting ores, averaging from 8 to 12% Cu, shipped daily. Underground development from Giroux shaft in charge of Capt. Hogan, of Butte, showing up exceptionally well.

UNITED NEVADA (Ely)—From the Ward mine, as this property is generally known, 50 to 60 tons daily of ore averaging over $20, is being shipped. Hauled by contract in trucks; last three miles to mine heavy grade—from 6500 to 8000 ft. Leasers will immediately put in three-mile tramway to deliver 200 tons daily at bottom of hill. Ore is iron-silver-lead, valuable for fluxing. Mine is 18 miles south of Ely.

NEW MEXICO

COAL MINES of the Victor-American Fuel Co., near Gallup, McKinley County, purchased by Hayden, Stone & Co. for joint account of Ray Consolidated Copper Co., Chino Copper Co. and southwestern department of the American Smelting and Refining Co. to assure a coal supply during coming winter. Consideration approximated $3,000,000. Gallup-American Coal Co. will be the title of the new company.

Grant County

CHINO (Santa Rita)—May copper output was 6,924,457 lb., comparing with 6,368,874 in April and 6,359,294 in May, last year.

AUSTIN-AMAZON COPPER (Silver City)—Cutting station at 200-ft. level, from which crosscut will be run to tap the large orebody opened at 100-ft. level. About 70 men employed.

UTAH

COAL SUPPLIES interfered with by damage to Denver & Rio Grande R.R., between Kyune and Helper, as result of breaking of Price River reservoir dam. Every effort being made to restore service to coal mines in Carbon and Emery counties so as to supply mining and smelting industries depending on this source of fuel. Expect to have single track restored through entire washed out area by July 11 to July 15.

Salt Lake County

UTAH COPPER (Garfield)—May copper output was 19,262,856 lb., comparing with 17,231,512 lb. in April and 15,950,215 in May last year.

Tooele County

INTERNATIONAL SMELTING (Tooele)—Dispatches of June 30 announce that the striking smeltermen decided to return to work by a vote 198 to 190. About 800 men were out. Sliding wage scale adopted.

CANADA

Ontario

TOUGH OAKES (Kirkland Lake)—Increased wages 50c. a day.

PETERSON LAKE (Cobalt)—Cut new vein 3 in. wide, carrying some silver.

SCHUMACHER (Schumacher) — Has closed down on account of labor shortage and high operating costs. Mill construction continued on second 150-ton unit.

VIPOND (Porcupine)—Stopped all underground work on account of labor shortage and high costs. Mill will be run on dump ore and on some broken ore in stopes.

McINTYRE (Schumacher) — Granted raise of 50c. a day. Development on 1200- and 1300-ft. levels highly satisfactory, vein being wider than on 1000-ft. levels and the grade higher.

DOME (South Porcupine)—Has granted increase of 50c. a day to its men, until cost of living approximates ante-bellum conditions. Mill is treating about 1300 tons a day; grade only about $3; ore all coming from the openpits so costs are low, being about $2.10 per ton.

HOLLINGER (Timmins)—In four weeks ended May 20, milled 35,337 tons averaging $7.49; gross profit $92,809—less than 50% of the profit for the preceding period. Mill ran 65% of possible running time. Costs per ton milled were $1.66. Expended $87,809 on new construction. Deficit reduced to $81,375. Central shaft has been placed in operation and will be used exclusively for hoisting ore.

MEXICO

ESPERANZA (El Oro, Mex.)—Milled in April 22,721 tons of higher grade than average of reserves. Estimated operating profit about $57,608.

TIGRE (Esqueda, Son.)—Reported that local government officials have taken over the operation of the Lucky Tiger mine, recently closed by the labor strike and enforced departure of American employees.

REAL DEL MONTE Y PACHUCA (Pachuca, Hidalgo)—Has accumulated sufficient supplies to run both mills at capacity. Good earnings expected for June as against deficits in preceding five months.

GREENE-CANANEA (Cananea, Son.)—Mines and reduction works continue closed, owing to difficulties with government officials arising out of company's refusal to pay taxes on relinquished claims and other trumped-up charges, and interference by local officials of the late state administration. Attitude of new administration, taking office July 1, not yet known.

The Market Report

Metal Markets

SILVER AND STERLING EXCHANGE

June	Sterling Exchange	Silver New York, Cents	Silver London, Pence	July	Sterling, Exchange	Silver New York, Cents	Silver London, Pence
28	4 7540	78½	39⅞	2	4 7540	77⅞	..
29	4 7540	77⅞	39½	3	4.7540	77⅞	39½
30	4 7540	77⅞	39½	4	.	.	. . .

New York quotations are as repoted by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

DAILY PRICES OF METALS IN NEW YORK

June July	Copper Electrolytic	Tin Spot.	Lead N. Y.	Lead St. L.	Zinc St. L.
28	29 @30	62	11 @11¼	11 @11¼	8¾ @9
29	28¾ @29¾	62	11 @11¼	11 @11⅛	8¾ @9
30	28¾ @29¾	62	11 @11¼	11 @11⅛	8¾ @9
2	28¾ @29¾	62	11 @11¼	11 @11⅛	8¾ @9
3	28¾ @29¾	62	11 @11⅛	11	8¾ @9
4	..	.	.	. .	

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

The quotations for electrolytic copper are for cakes; ingots and wirebars. Electrolytic copper is commonly sold on "regular terms" (r.t.), including freight to the buyer's works and is subject to a discount for cash. The difference between the price delivered and the New York cash equivalent is at present about 0.25c. on domestic business. The price of electrolytic cathodes is 0.05 to 0.10c. below that of electrolytic. Quotations for spelter are for ordinary Prime Western brands. We quote New York price at 17c. per 100 lb. above St. Louis.

Some current freight rates on metals per 100 lb. are: St. Louis-New York 17c.; St. Louis-Chicago, 6.3c.; St. Louis-Pittsburgh, 13.1 cents.

LONDON

June July	Copper Standard Spot	Copper Standard 3 Mos.	Copper Electrolytic	Tin Spot	Tin 3 Mos.	Lead Spot	Zinc Spot
28	130	129½	142	245¾	240¾	30½	54
29	130	129½	142	244	238½	30½	54
30	. . .	. .				. .	. .
2	130	129½	142	243½	237½	30½	54
3	130	129½	142	243¼	238	30½	54
4	. . .		.		.	. .	

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2,240 lb. For convenience in comparison of London prices, in pounds sterling per 2,240 lb., with American prices in cents per pound the following approximate ratios are given, reckoning exchange at 4.80. £15 = 3.21c.; £20 = 4.29c.; £30 = 6.43c.; £40 = 8.57c.; £60 = 12.85c. Variations, £1 = 0.21⅜c.

NEW YORK—July 3, 1917

Most of the metal markets came to a standstill this week, owing to continuance of the uncertainty as to what Washington is going to do with respect to business. Two large government orders—one for copper and one for zinc—were placed, but as for industrial business there were only one or two transactions for round lots in copper, and only a few in zinc. However, in lead a rather large business was done.

Copper, Tin, Lead and Zinc

Copper—At the beginning of the week, June-July copper was sold on the basis of 30c. net cash, New York Third-quarter copper was to be had right through the week at 29¾c. There were sales of later deliveries, such as September-November and October-November at lower prices. The aggregate of the business was small.

The sale of copper to the government, which we reported last week, was for 60,000,000 lb. at 25c., time of delivery being indefinite, but extending nominally for 12 months. Contrary to some reports, the price was a firm bargain and is not subject to readjustment.

During April, refined copper to the amount of 2,446,960 lb. was exported from Baltimore to France; 10,741,144 lb. to England, 5,127,708 lb. to Italy and 2,240,068 lb. to Russia.

Copper Sheets—The price of copper sheets remains the same as quoted last week. We quote hot rolled at 39@40c. per lb., cold rolled 1c. higher. Wire still quoted nominally 35c. f.o.b. mill.

Tin—The market was very narrow, and the price for Straits tin was 62c. right through the week. Banka tin was quoted at 60c. The deliveries of tin during June were large, having been 3600 tons at Atlantic ports and 2798 tons at Pacific ports.

Belated cablegram from London quoted spot tin at £245¾ and futures at £240¾ for Wednesday, June 27.

Lead—A rather large business was done, chiefly for July delivery, the supply of which is evidently going to be larger than was expected a little while ago. In the St. Louis market business was done at 11@11¼c., but the tonnage sold at the lower price was larger than at the higher. By the close of the week the premium over the price of the A. S. & R. Co. had all but disappeared.

Zinc—On June 28 some large business was done at about 8⅞c., including one large block to a domestic consumer. Following these transactions, the volume of business was relatively small, and was at unchanged prices.

During the week the government bought, through the Zinc Committee, 23,250,000 lb. of high-grade spelter at 13½c., delivery extending through the next 10 months.

High-grade spelter is quoted at 13½c. and intermediate at 12c. Brass special is quoted at 9¾@10c. St. Louis, offers at 10c. failing to secure business.

Zinc dust is quoted at 16@17c.

It is reported that the new smelting works of the United Zinc Smelting Corporation, at Moundsville, W. Va., will be ready for operation this month.

The Société le Zinc des Pyrénées is operating a little plant of 1000-hp. at Fosdans, in the Pyrenees, for the treatment of local zinc ores by the Thierry electric furnace.

Zinc Sheets—Price of zinc sheets has not been changed. Market is still at $19 per 100 lb. f.o.b. Peru, Ill., less 8% discount.

Other Metals

Aluminum—The aluminum market continues quiet and without any new features of special interest. Quotations continue at about the same level. 59@61c. per lb. for No. 1 ingots at New York.

Antimony—This metal continued to be dull and was again a little weaker in tone. We quote spot at 18@19c. July-August shipments from China remain unchanged, however, at 15½c. c.i.f., New York, duty unpaid.

Bismuth—Quoted at $3@3.50 per lb.

Cadmium—Quoted at $1.50@1.75 per lb.

Cobalt—Quoted at $1.70 per lb.

Magnesium—Ingot is quoted at $2.50.

Nickel—The market remains steady at 50@55c. per lb for nickel. Electrolytic commands an additional 5c. per lb.

Tungsten—The metal is quoted at $2.40 per lb.

Quicksilver—Market more active and stocks light; quotations being at $85, New York. San Francisco reports by telegraph, $83.50, active.

Gold, Silver and Platinum

Gold—Gold coin to the amount of $490,000 has been withdrawn from the New York subtreasury for shipment to Spain. The sum of $6,698,000 has been transferred to San Francisco on account of an equal shipment to Japan.

Silver—The demand for silver for the Far East market has been very good, but prices have not been maintained at the highest level reached, that is, 39⅞ pence as supplies have been going forward quite freely. Shipments to London during the past week were about 600,000 ounces. The volume of business going in this direction has not been so large because the London price has not been able to attract the bullion and meet the freight and war rate differential as against the Pacific route.

The United States Treasury in May purchased 3,000,000 oz. of silver for coinage purposes. An extra amount of coins will be needed for payment of soldiers and sailors abroad.

It is stated in an official French report that, owing to the increasing demand for silver coins, the total mined in 1916 amounted to 154,283,813.50 francs in nominal value, representing a total 78.7% above that of 1915, and a weight of silver exceeding 20,700,000 fine oz. This coinage is applied to replace small paper notes in circulation.

Mexican dollars at New York, June 27, 61⅝c.; 28, 61¼c.; 29, 61¾c.; 30, 61¾c.; July 2, 61¾c.

Platinum—This market was a little weaker, business having been done at $102@104, which we quote for the week.

Our correspondent at Petrograd reports, under date of May 7, that the situation is generally without change. The total transactions for the last fortnight were not large. The demand has increased, especially by the jewelers. Prices varied widely. Small quantities have been sold in Petrograd at the price of 108,000 rubles per pood of crude platinum. The price reported last week was 105,000 rubles per pood.

Palladium—This metal was again stronger, sales having been made at $110, and at the close of the week there were reported to be buyers at $115. We quote $110@115 for the week.

Zinc and Lead Ore Markets

Platteville, Wis., June 30—Blende, basis 60% Zn, $75 for premium ore down to $70 for medium grade. Lead ore, basis 80% Pb, $130 per ton.

	Zinc	Lead	Sulphur
Week's shipment in tons	3640	102	858
Year to date	70177	2949	13934
Corresponding period of last year	59858	2167	15000

Shipped during week to separating plants, 3777 of zinc ore.

Joplin, Mo., June 30—Blende, per ton, high $84.30; basis 60% Zn, premium $80@75; medium to low, $70@65; calamine per ton, basis 40% Zn, $40; average selling price, all grades of zinc, $71.04 per ton.

Lead, high $135.50; basis 80% Pb $130@120; average selling price, all grades of lead, $120 per ton.

Shipments the week: Blende, 9889 tons, calamine, 1188 tons, lead, 1731 tons. Value, all ores the week, $994,640. Value, all ores six months, $23,347,660. Shipments six months: blende, 230,296 tons, calamine, 22,434 tons, lead, 41,255 tons. Increase over first half last year: blende, 50,288 tons, calamine, 8005 tons, lead, 10,393 tons.

Prices declined $5 per ton on all grades of zinc this week, after six weeks without change. Lead declined $15, recovering $5 today, closing at $120 basis. Each week one or more mills close in the sheet ground area on account of high cost of material and supplies.

Other Ores

Antimony Ore—Sales reported at $2.20 per unit.

Iron Ore—Prices, delivered lower Lake ports are for old-range bessemer, $5.95; old-range nonbessemer $5.20; Mesabi bessemer, $5.70 and Mesabi nonbessemer, $5.05.

Manganese Ore—Prices have advanced, $1.05 per unit being reported paid for high grade metallurgical ore.

Molybdenum Ore — Small transactions were reported at $2.10 per lb. of molybdenum sulphide in concentrates assaying 90%.

Pyrites—Spanish lump quoted at 15c. per unit on basis on 10s. ocean freight, buyer to pay war risk, excess freight and any duty. Ocean freights from 35s. to 42s. 6d. Available domestic supply is light, since most of the supply is contracted for.

Tungsten Ore—The market was all but bare of supplies and consequently prices have stiffened materially. Spot wolframite of high grade realized $22, while scheelite sold at $25, basis of 60%, for both spot and forward deliveries, with buyers over. We quote the market firm at $22 for wolframite and $25 for scheelite.

Iron Trade Review

NEW YORK—July 2

Far from there being any deviation from the upward course of the pig-iron market, the prices each day are higher for practically every grade. There is no certainty over night what the next quotation will be for any brand of iron. The consumers are at a loss to determine a proper course to pursue.

PITTSBURGH—July 2

Opinion in the iron and steel trade is now rapidly swinging toward the idea that there will have to be some form of Government regulation as to prices or deliveries or perhaps both. While the opinion is far from general it is held by many who look the farthest ahead and who realize that the present prices, averaging in the neighborhood of $50 a ton above prices at which material is now being delivered, cannot be paid by the average consumer, and who realize also that deliveries on existing contracts must be delayed by the priority given to Government work and that if these delays are not properly apportioned the prosecution of the war will be interfered with.

The fixing of coal prices on June 28 at a reduction of about one-third has greatly encouraged the idea of regulation of steel prices, without much consideration being given to the important fact that the coal operators had nearly clear order books while the order books of steel mills are congested, yet with much Government buying in prospect. Regulation of deliveries therefore seems to be at least as important as regulation of prices.

The scrap market, always sensitive, declined a week ago as already reported and the lower prices have continued, being attributed to fear that finished steel price regulation will come and reduce the buying power of the mills. Pig iron has not declined, but on the whole has not stiffened. In billets and sheet bars the market is very narrow. In finished steel products transactions continue to decrease in volume, and prices are made by the few consumers who are specially positioned so as to be able to pay the very high prices to the few small mills that can still make deliveries in from three to six months. There is no regular market at all for forward delivery, say after six months, as the large mills will not sell and buyers are in no mood to contract. Apparently the whole iron and steel market is in chaos, but there is really good reason to believe that it is simply awaiting the new order of things to be developed either by the authority or at the suggestion of the Government.

Pig Iron—Some sales are reported at prices above those quoted a week ago but buyers on the whole are more timid on account of the high prices and the possibility of Government regulation, and the market as a whole can hardly be quoted above the figures of last week: Bessemer, $56@57.50; basic, $51@55; foundry and malleable, $53@55, f.o.b. valley furnaces, 95c. higher delivered Pittsburgh.

Steel—There is no general demand, while offerings are light. Middlemen are unwilling either to buy or to sell except for the earliest deliveries, fearing the price bubble may be punctured within a few weeks. The market is generally quoted at $95@100 for billets and $105@110 for sheet bars.

Coke

Connellsville—Heavy demand for spot furnace coke [illegible] up for decreased contract shipments expected this week on account of the [illegible] the market up to $15.50 in the closing days of last week for P. R. R. or P. & O. equipment, P. & L. E. holding to $[illegible]. The previous maximum was $1[illegible] reached in February. Demand is now [illegible] lighter and the market will be [illegible] until after the holiday. Few of the contracts expiring June 30 have been renewed at a fixed price, the disposition being to arrange to continue shipments at [illegible] prices [illegible] in accordance with the spot market.

STOCK QUOTATIONS

N. Y. EXCH.†	July 2
Alaska Gold M	5¼
Alaska Juneau	4½
Am.Sm.& Ref.,com	106½
Am. Sm. & Ref., pf	113¾
Am. Sm. Sec., pf., A	99
Am. Sm. Sec., pf. B	‡90
Am. Zinc	31½
Am. Zinc, pf	60
Anaconda	80½
Batopilas Min	75
Bethlehem Steel	‡141½
Bethlehem Steel, pf.	‡120
Butte & Superior	39¾
Cerro de Pasco.	35¾
Chile Cop	21¾
Chino	55¾
Colo.Fuel & Iron	52¼
Crucible Steel	89½
Dome Mines	11¼
Federal M. & S.	14
Federal M. & S., pf	42
Great Nor., ore ctf.	32
Greene Cananea	40
Gulf States Steel	128
Homestake	100¾
Inspiration Con	61½
International Nickel	39¾
Kennecott	44½
Lackawanna Steel	96½
Miami Copper	40½
Nat'l Lead, com	56
National Lead, pf	109
Nev. Consol	23¾
Ontario Min	5¾
Quicksilver	1½
Quicksilver, pf	1¼
Ray Con	28½
Republic I & S., com.	91½
Republic I & S., pf	102¾
Sloss-Sheffield	58
Tennessee C. & C.	17¼
U. S. Steel, com	128¾
U. S. Steel, pf	117½
Utah Copper	109
Va. Iron C. & C	70

N. Y. CURB†	July 2
Big Ledge.	2¼
Butte & N. Y	1½
Butte C. & Z	10½
Caledonia	57
Calumet & Jerome	1¼
Can. Cop. Corpn	2¾
Carlisle	4½
Cashboy	08
Con. Ariz. Sm.	2 1/16
Con. Coppermines	5¼
Con. Nev.-Utah	3/16
Emma Con	1¼
Ferber.	.61
First Nat. Cop	3¼
Goldfield Con.	52
Goldfield Merger.	06
Greenmonster.	1
Hecla Min	9 1/16
Howe Sound	5½
Jerome Verde	1¼
Joplin Ore & Sp. L.	‡ 15
Kerr Lake	4¼
Magma	46
Majestic	40
McKinley-Dar.-Sa	47
Mohican	75
Mother Lode	26½
N. Y. & Hond	‡12
Nipissing Mines	6¾
Ohio Cop	1 3/16
Ray Hercules	4
Rochester Mines	51
St. Joseph Lead	18½
Standard S. L.	½
Stewart	5/16
Success	37
Tonopah	6¾
Tonopah Ex	2
Tribullion	5/16
Troy Arizona	28
United Cop	81
United Verde Ext	37
United Zinc	1½
Utah Mines	26
White Knob, pf	1
White Oaks	‡2
Yukon Gold	1¼

SAN FRAN.*	June 30
Alta	‡ 03
Andes	‡ 10
Best & Belcher	‡ 01
Bullion	‡ 02
Caledonia	‡ 11
Challenge Con	‡ 01
Confidence	‡ 10
Con. Virginia	28
Gould & Curry	‡ 01
Hale & Norcross	03
Jacket-Cr. Pt	‡ 06
Mexican	11
Occidental	‡ 65
Ophir	11
Overman	‡ 04
Savage	‡ 08
Seg. Belcher	‡ 02
Sierra Nevada	14
Union Con	18
Utah Con	‡ 01
Belmont	‡ 15
Jim Butler	80
MacNamara	29
Midway	09
Mont. Tonopah	23
North Star	10
Rescue Eula	21
West End Con	68
Atlanta	09
Booth	07
Comb. Frac	04
D'field Daisy	03
Florence	18
Jumbo Extension	11
Kewanas	3
Nevada Hills	24
Nevada Packard	‡ 4
Round Mountain	40
Silver Pick	11
White Caps	1 37
Big Jim	81
United Eastern	4 1[illegible]

BOSTON EXCH.*	July 2
Adventure	2¼
Ahmeek	98
Algomah	60
Allouez	62¾
Ariz. Com., ctfs	14½
Arnold	‡ .40
Bonanza	‡ 20
Butte-Ballaklava.	58
Calumet & Ariz	79¾
Calumet & Hecla	535½
Centennial	17
Copper Range	60¾
Daly West	1¼
Davis-Daly	5¾
East Butte	12
Franklin	6¾
Granby	81½
Hancock	14
Hedley	‡15
Helvetia	25
Indiana	2
Isle Royale	31
Keweenaw.	1¾
Lake	11½
La Salle	3
Mason Valley	7½
Mass	13
Mayflower.	2½
Michigan	2½
Mohawk	93
New Arcadian	2¾
New Idria	14¾
North Butte	17½
North Lake	1
Ojibway	1½
Old Dominion	59½
Osceola	86
Quincy	85½
St. Mary's M. L.	‡81
Santa Fe	1
Seneca Mines	9½
Shannon	8
Shattuck Ariz	‡27
So. Lake.	3½
So. Utah	‡ 25
Superior	8¾
Superior & Bost	4¾
Trinity	6½
Tuolumne	1
U. S. Smelting	60
U. S. Smelt'g, pf	5[illegible]
Utah Apex	2¾
Utah Con	1[illegible]
Utah Metal.	4¾
Victoria.	3¾
Winona	3½
Wolverine	44
Wyandot	50

BOSTON CURB*	July 2
Alaska Mines Corp	75
Bingham Mines	12½
Boston Ely	42
Boston & Mont	59
Butte & Lon'n Dev	14
Calaveras	3¾
Calumet-Corbin.	01¼
Chief Con	2½
Cortez	20
Crown Reserve.	28
Crystal Cop	1¾
Eagle & Blue Bell	2¾
Houghton Copper	‡ 95
Intermountain	1 1/16
Iron Cap, Com	16¼
Iron Cap Con., pf	6½
Mexican Metals	28
Mines of America	1½
Mojave Tungsten	44
Nat. Zinc & Lead	65
Nevada-Douglas	1¾
New Baltic	1¾
New Cornelia	18½
Oneco.	‡ 50
Pacific Mines	25
Rex Cons	25

SALT LAKE*	June 29
Bannack	1 00
Big Four	53
Black Jack	06
Cardiff	6 00
Colorado Mining	20
Daly-Judge	8 50
Empire Copper	[illegible] 25
Gold Chain	18
Grand Central	68
Grand Gulch	19
Iron Blossom	1 02
Lower Mammoth	03
May Day	06
Moscow	12
Prince Con	1 15
Silver-King Coal'n	3 07
Silver King Con	3 77
Sioux Con	11
So. Hecla	1 02
Uncle Sam	04
Wilbert	19
Yankee	‡ 10

TORONTO*	July 2
Bailey	0[illegible]
Beaver Con	4[illegible]
Buffalo Mines	1 [illegible]
Chambers Ferland	10
Coniagas	3 90
La Rose	35
Peterson Lake	11
Right of Way	03
T. & Hudson Bay	‡18 00
Temiskaming	37
Wettlaufer-Lor	05
Dome Exten	10
Dome Lake	14
Foley O'Brien	60
Hollinger	4 60
Jupiter	[illegible]
McIntyre	[illegible]
Newray	40
Porcu. Crown	48
Schumacher	[illegible]
Vipond	[illegible]
West Dome	[illegible]

STOCK QUOTATIONS—Continued

COLO. SPRINGS	July 2
Cresson Con.	5 12½
Doctor Jack Pot	05
Elkton Con.	06¾
El Paso	30
Gold Sovereign.	04
Golden Cycle	2 16
Granite	50
Isabella	.10
Mary McKinney.	.16½
Portland	1 45
United Gold M	20
Vindicator	77

LONDON	June 15		
Alaska Mexican	£0	10s	0d
Alaska Tre'dwell	1	5	0
Burma Corp	4	3	9
Cam & Motor	0	8	6
Camp Bird	0	7	0
El Oro	0	10	0
Esperanza	0	11	0
Mexican Mines	4	7	6
Nechi, pfd	0	11	9
Oroville	0	16	3
Santa Gert'dis	0	10	0
Tomboy	0	19	3

* Bid prices. † Closing prices. ‡ Last Quotations.

MONTHLY AVERAGE PRICES OF METALS

Silver	New York 1915	New York 1916	New York 1917	London 1915	London 1916	London 1917
January	48.855	56.775	75.630	22.731	26.960	36.682
February	48.477	56.755	77.585	22.753	26.975	37.742
March	50.241	57.935	73.861	23.708	27.597	36.410
April	50.250	64.415	73.875	23.709	30.662	36.963
May	49.915	74.269	74.745	23.570	35.477	37.940
June	49.034	65.024	76.971	23.267	31.060	39.055
July	47.519	62.940		22.597	30.000	
August	47.163	66.083		22.780	31.498	
September	48.680	68.515		23.591	32.584	
October	49.385	67.855		23.925	32.361	
November	51.714	71.604		25.094	34.192	
December	54.971	75.765		26.373	36.410	
Year	49.684	65.661		23.675	31.315	

New York quotations cents per ounce troy, fine silver. London, pence per ounce, sterling silver, 0.925 fine.

Copper	New York Electrolytic 1916	New York Electrolytic 1917	London Standard 1916	London Standard 1917	London Electrolytic 1916	London Electrolytic 1917
Jan	24.008	28.673	88.083	131.921	116.167	142.895
Feb.	26.440	31.750	102.667	137.895	133.167	148.100
Mar.	26.310	31.481	107.714	136.750	136.000	151.000
April	27.895	27.935	124.319	133.842	137.389	147.158
May	28.625	28.788	135.457	130.000	152.522	142.000
June	26.601	2[illegible]2	112.432	1[illegible]0.000	137.455	142.0[illegible]0
July	23.865		95.119		125.500	
Aug.	26.120		110.283		126.304	
Sept	26.855		113.905		134.071	
Oct	27.193		122.750		142.523	
Nov	30.625		134.659		155.432	
Dec	31.890		145.316		162.842	
Year	27.202		116.059		138.281	

Tin	New York 1916	New York 1917	London 1916	London 1917
January	41.825	44.175	75.548	185.813
February	42.717	51.420	81.107	198.974
March	50.741	54.388	93.609	207.443
April	51.230	55.910	199.736	220.171
May	49.125	63.173	196.511	245.114
June	42.231	62.[illegible]5	179.466	242.083
July	38.510		168.357	
August	38.565		169.870	
September	38.830		171.345	
October	41.241		179.307	
November	44.109		186.932	
December	42.635		183.368	
Av. year	43.480		182.096	

Lead	New York 1916	New York 1917	St. Louis 1916	St. Louis 1917	London 1916	London 1917
January	5.921	7.626	5.826	7.530	31.167	30.500
February	6.246	8.636	6.164	8.595	31.988	30.500
March	7.136	9.199	7.375	9.120	34.440	30.500
April	7.630	9.288	7.655	9.158	34.368	30.500
May	7.463	10.207	7.332	10.202	32.067	30.500
June	6.936	11.[illegible]	6.749	11.123	31.011	30.500
July	6.[illegible]		6.185		28.137	
August	6.241		6.088		29.734	
September	6.810		6.699		30.786	
October	7.000		6.898		30.716	
November	7.042		6.945		30.500	
December	7.513		7.405		30.500	
Year	6.853		6.777		31.359	

Spelter	New York 1916	New York 1917	St. Louis 1916	St. Louis 1917	London 1916	London 1917
Jan	16.915	9.619	16.745	9.449	89.810	48.329
Feb	18.420	10.045	18.260	9.875	97.762	47.000
Mar	16.846	10.300	16.676	10.130	95.048	47.000
April	16.695	9.459	16.525	9.289	99.056	54.632
May	14.276	9.362	14.106	9.19[illegible]	94.217	54.000
June	11.752	9.371	11.58[illegible]	9.201	68.591	54.000
July	8.925		8.755		50.750	
Aug	8.730		8.560		51.587	
Sept	8.990		8.820		52.095	
Oct	9.829		9.659		54.159	
Nov	11.592		11.422		56.023	
Dec	10.665		10.495		55.842	
Year	12.804		12.634		72.071	

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton. ‖ Not reported.

Pig Iron, Pitts.	Bessemer‡ 1916	Bessemer‡ 1917	Basic‡ 1916	Basic‡ 1917	No. 2 Foundry 1916	No. 2 Foundry 1917
January	$[illegible] 60	$3[illegible] 9[illegible]	$18.78	$30.95	$19.70	$30.95
February	21.16	3[illegible] 37	18.93	30.95	19.51	30.95
March	[illegible] 81	[illegible] 37	19.20	33.49	19.45	35.91
April	[illegible] 65	42 [illegible]	18.95	48.[illegible]	19.45	40.06
May	21.78	4[illegible].04	19.11	42.84	19.58	43.60
June	[illegible] 95		18.95		19.34	
July	21.95		18.95		19.20	
August	21.9[illegible]		18.95		19.22	
September	22.88		19.58		19.51	
October	24.61		21.26		[illegible]1.5[illegible]	
November	30.07		28.18		[illegible] 55	
December	35.16		30.95		30.70	
Year	$23.88		$20.98		$21.15	

‡ As reported by W. P. Snyder & Co.

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(See also "Gold and Silver")

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7505—NOTES ON FLOTATION—1916. Discussion of paper of J. M Callow. (Bull. 125, A. I. M. E., May, 1917; 3½ pp., illus.)

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7507—PHILADELPHIA FLOTATION DECISION, The. (Eng. and Min. Journ., June 23, 1917; 3¼ pp.)

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Engineering and Mining Journal

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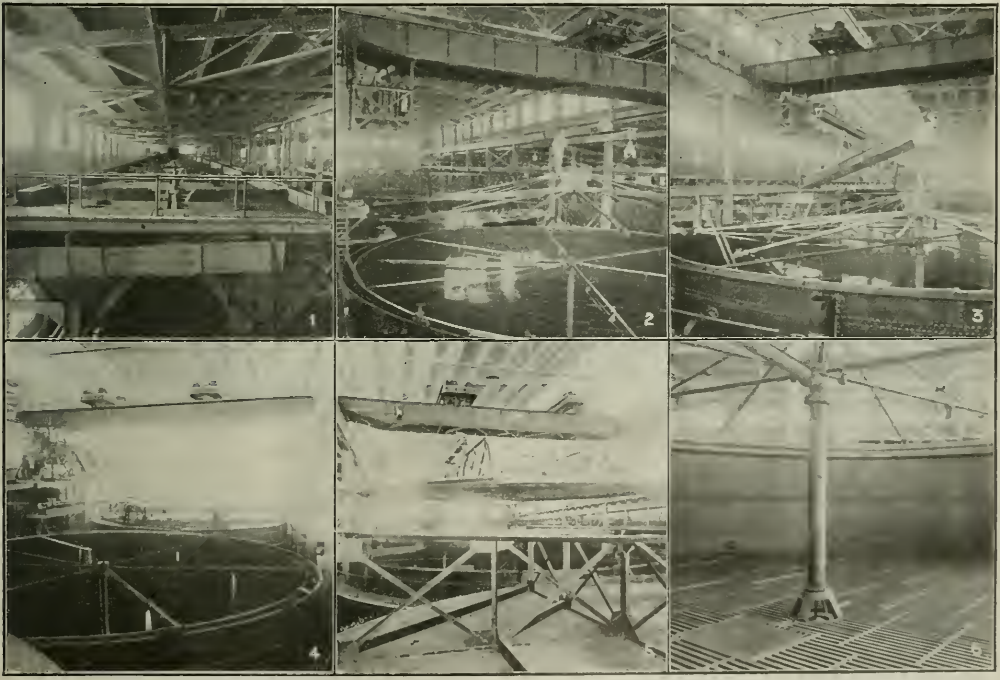
Ammonia Leaching of Calumet Tailings

BY C. HARRY BENEDICT
Metallurgist for the Calumet & Hecla Mining Co.

The ammonia leaching plant of the Calumet & Hecla Mining Co. is probably the first large-scale installation of its kind. It is handling 2000 tons per day of sands, recovering an average of about 75% of the copper content at a cost of about 6c. per lb. of copper sold.

THE ammonia leaching plant of the Calumet & Hecla Mining Co. went into commission on a limited scale in July of last year. By February of this year the entire plant of 2000 tons daily capacity was finished, and at present the foundations are in for doubling it. There have been no difficulties of any kind in starting the plant, and one sand tank after another was put into commission as quickly as the construction work on it was finished. So far as I know, this is the first example of the successful commercial operation of an ammonia leaching process, and its apparent simplicity in operation has been such as to make it difficult to understand why such a method, or a similar one, had not been devised years before. As far back as 1871, in discussing a paper before the American Institute of Mining Engineers, the matter of the native copper losses in Calumet & Hecla tailings was taken up and the fact was brought out by a Mr. McFarlane that this copper, in the fines at least, could be almost completely dissolved in solutions of ammonium salts. The matter was evidently not followed up, although there were some investigators in the field, and in 1904 a

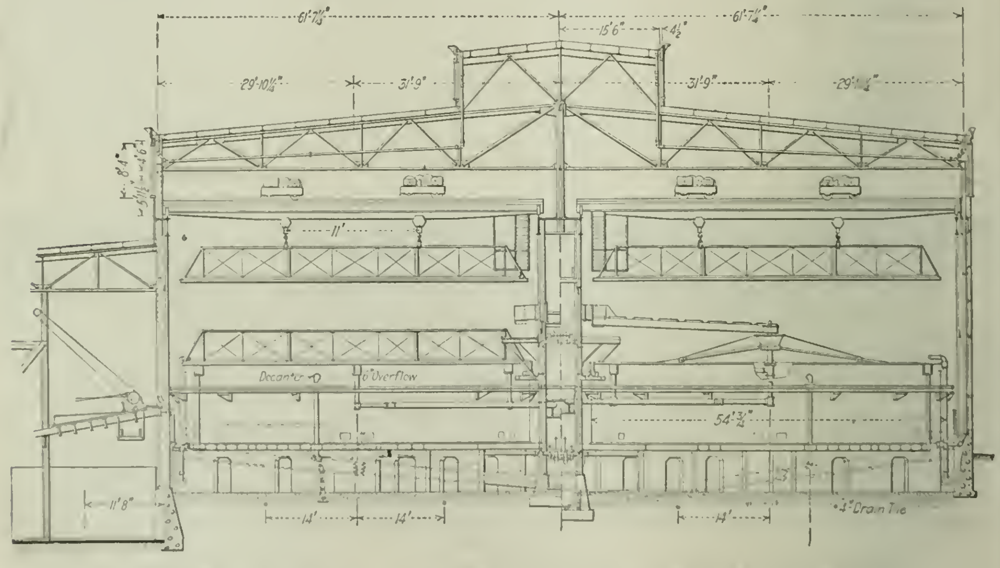


INTERIOR VIEWS OF THE CALUMET & HECLA AMMONIA LEACHING PLANT, LAKE LINDEN, MICHIGAN

Fig. 1—Settling tanks
Fig. 2—Crane handling the distributor
Fig. 3—Distributor in place, portable launder being adjusted
Fig. 4—Solution inflow
Fig. 5—Crane handling the tank cones
Fig. 6—Inside of tank, showing filter grating on the bottom and the central standard for the distributor

patent was issued to Ernest A. LeSueur, of Ottawa, for an ammonia process, and in his patent description he mentioned the Calumet & Hecla sands. This patent was called to my attention about ten years ago, and Mr. LeSueur and myself did a little work on the matter; and while it was evident that it was easy to get the copper into solution, we were not able to hit upon any method that seemed feasible for getting back the copper after once it was dissolved.

The matter was dropped entirely until the fall of 1912. At this time, having occasion to familiarize myself with the distillation of ammonia products, the idea occurred to me of using this method of recovering copper from solution. A test of the process on a laboratory scale at once gave great promise, and it was not long before a one-ton plant was in operation. This plant only tended to confirm results obtained on a smaller scale, and the next step was to build a 20-ton plant. This too, proved successful and while there were many points that could not be proved in a plant of this size, still the apparent cost of the operation was so low and the margin of profit indicated so large that we felt we could take a chance on many of the doubtful factors and begin the construction of the full-sized plant. The decision to go ahead with this work was made in the spring of 1914, and the contracts for much of it had been let when the European War broke out. The unsettled condition of affairs caused the company to cancel these contracts, and it was not until toward the end of the year 1914 that we had sufficient financial courage to go ahead. Work was begun in earnest in the spring of 1915, and thanks to good deliveries of material, the plant was in partial operation within 15 months of the time ground was broken for the foundations.



SECTION SHOWING THE TANK ARRANGEMENT OF THE CALUMET & HECLA REACTING PLANT

Before giving a detailed account of the process as finally applied, it may be well to give briefly some of the chemistry of the process. Oxide of copper or native copper with the free access of air, dissolves in ammonium carbonate to form cupric ammonium carbonate, probably according to the following reactions:

$$Cu + O = CuO$$

$$CuO + (NH_4)_2CO_3 = CuCO_3 . 2NH_3 + H_2O$$

This cupric ammonium carbonate, in the presence of native copper and without free access of air, is reduced to the cuprous state as follows:

$$CuCO_3 . 2NH_3 + Cu = Cu_2CO_3 . 2NH_3$$

The cuprous ammonium carbonate in the presence of air oxidizes rapidly to the cupric state, and as such is capable of dissolving a further amount of copper. Now either the cuprous or cupric ammonium carbonate, when subjected to boiling or distillation with steam, loses its ammonia and carbonic-acid gas, both of which can be absorbed in water and recovered, and as these are driven off, the cuprous or cupric oxide is thrown out of solution either as a heavy powder or as a scale, according to this reaction:

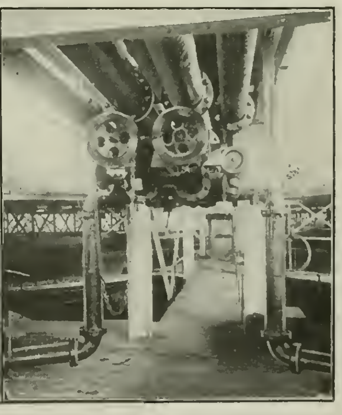
$$CuCO_3 . 2NH_3 + H_2O + Heat = CuO + (NH_4)_2CO_3$$

If these reactions are followed through, it will be found that the solvents are quantitatively regenerated and that the only consumption of a chemical element is that of oxygen from the air. Not only is this theoretically the case, but it was demonstrated in the experimental work on Calumet conglomerate ore that these reactions did take place about as indicated and it was possible to make a recovery in the laboratory of practically 100% of the ammonia. This was done, however, by heating the tailings after the copper had been dissolved and the sand washed—an operation which of course is impracticable. The amount of ammonia remaining in the tailings before heating was small enough to assure the economic possibilities of the process.

It will be observed from the reactions that the solvent is cupric ammonium carbonate and that this is reduced to the cuprous state in dissolving the native copper. To reoxidize this solution and restore its solvent power, only oxygen of the air is used, and the success or failure of the process depends upon the ability to oxidize the solutions quickly and without loss of ammonia. It is impossible to work entirely in inclosed vessels because to do that would prevent oxidation, and on the other hand to work entirely in open tanks is impractical not only because of the smell and discomfort, but also because it is almost sure to result in excessive loss of ammonia from volatilization. In working with a single tank, as was done in the experimental plant, it is easy to get sufficient oxidation of the solution by superficial action in the storage tanks, for the cuprous solutions have a great avidity for oxygen, and since the cupric salt formed is heavier than the cuprous, convection currents are set up that aid materially in the complete oxidation of the cuprous solutions. It was realized that in a large plant where the effluent solution from one tank would be in storage for only a limited time before being used again as a leaching solution, there would be much less opportunity for oxidation. However, this was worked out as the size of the plant increased, and we have found it a simple matter to oxidize the leaching solutions by blowing air through them and to absorb what little ammonia gas is driven off with the air in a wash solution. This particular feature, which caused the most concern in experimental work, was thus easily met as the plant developed.

SAND TANK PARTIALLY FLUSHED

COMPLETION OF SAND FLUSHING


SOLUTION PIPING AND VALVES

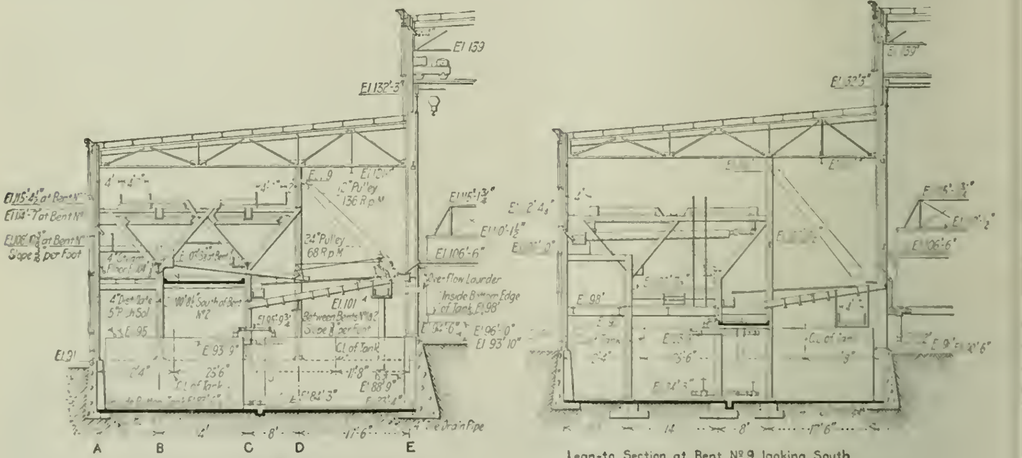
The other matter that caused a good deal of difficulty in the experimental work was the boiling-out of the solution. The oxide of copper as it was thrown down in the laboratory was a very fine powder which settled rapidly. It was hoped that on a large scale this powder might stay in suspension with sufficient agitation and then settle into a pocket and be easily removed by means of a trap discharge. What was actually found, however, was that while a part of the oxide could be handled by the foregoing methods, that part of it which had an opportunity of becoming superheated, as it would above the solution level, formed a scale so hard that it could be removed with nothing short of a hammer and chisel. It became evident that in order to distill this copper ammonium carbonate continuously would require a type of still different from anything on the market, and we set about making our own apparatus. We started out with a still consisting of twelve cylindrical sections, each 15 in. in diameter and 4 in. high and with a vertical shaft extending the full length of the still, fitted with a scraper for each section. The general principle of operation was similar to that of any continuous still, the solution passing downward from section to section against the ascending current of steam. This apparatus demonstrated that any scale of copper oxide formed could be handled by means of these scrapers, and a second still, 36 in. in diameter, was built, followed by the present commercial stills 84 in. in diameter. They have a capacity of over 150 cu.m. per day of copper ammonium carbonate solution assaying about 20 grams NH_3 per liter, and the same in copper.

The material treated in the present leaching plant consists of mill tailings as free from copper as the mechanical processes and water concentration will permit. A part of the material comes from the current tailings from the mine rock and a part of it from corresponding tailings that have been in Torch Lake for many years. No matter what the source, this material had been originally put through $\frac{3}{16}$-in. screens in a steam stamp and is now further ground in pebble mills to pass a 28-mesh screen. This product is then concentrated upon Wilfley tables, and it is the tailings from these tables that enter the leaching plant. In this leaching plant the feed, or heading, is lead to 16 V-shaped settling tanks, each 19½ ft. long, 10½ ft. wide and 6½ ft. deep. The overflow from these settling tanks contains practically all minus 200-mesh material and is at present a waste product, although plans are under way to treat it by flotation. The thickened product from these V-tanks is drawn off by means of plugs and led to eight quadruplex Dorr classifiers, the slimes from which go to waste and the sands to leaching tanks. This classified product is an ideal one for leaching, and while it carries some slimes, it has not been found necessary to observe any of the precautions sometimes taken in sand-leaching processes for eliminating all traces of colloids. There seems to be no serious obstruction to a satisfactory leaching rate.

The leaching tanks in the present building are eight in number and arranged in two rows. Above each row there is an 18-ton traveling crane. The tanks are of steel, 54 ft. in diameter and 12 ft. high, and are provided with removable covers. The joint between the cover and the tank is water-sealed and is made by a channel on the cover projecting into a water-filled annular launder. The covers are supported by the sides of the tanks themselves, and there is sufficient headroom over the tanks to permit three covers being piled one on top of the other so that the crane can move the distributor or cover over a tank which is covered and which has upon it the cover of an adjoining tank. There is but one outlet for solutions, and that is in the bottom of the tank, near the center. On the inside of the tank at the top is the overflow launder, from which there are six outlets. This launder, during the leaching process, has its outlets plugged and is used to form the water seal for the cover, as already indicated. In order to drain the water rapidly from the sand after filling, there are provided two 6-in. decanter pipes. There are seven discharging doors for sands in each tank, six along the sides at the bottom and one in the bottom at the center. The center gate is operated from above by means of a rod that extends up through the center column of the tank. The center column acts also as a support for the sands distributor, of the Butters and Mein type, which cannot be hung from above, as in the usual leaching tank, because of the clearance necessary for the cover. These leaching tanks are carried on 12-in. I-beams which in turn rest on concrete cross-walls of sufficient height to permit ready access to and inspection of all parts of the bottom. The tanks are provided also with a platform or runway 3½ ft. below the top, which forms the main working floor.

The method of distributing the sands is of interest. The main distributing launder runs the length of the building, and in the center between each set of four tanks discharges into a distributing box that can be closed off by means of a tipple. This tipple is pivoted at the low point of the launder and is capable of being raised and lowered. Each distributor box is fitted with four outlets which are in turn provided with rubber-gasketed cast-iron gates. The gates, when open, permit the discharge of material into a portable launder extending from the distributor box to the hopper of the tank distributor. By means of the tipple already mentioned, and the two distributor boxes with their four gates each, it is possible to divert the feed to any tank.

For supporting the sands in the tanks a filter grating of wood is provided, and a filter consisting of a lower layer of coco matting over which is 8-oz. duck. The coco matting and the duck are held in place by calking them with hemp ropes into grooves around the center gate casting and also around the periphery of the tank. After a year of use the first set of filter cloths and matting are still in commission and show no great evidence of wear. The details of these filters are similar to those used at the Homestake Mining Co., at Lead, S. D., and we are indebted to Allen J. Clark, of that company, for their design, which has proved eminently satisfactory.



Lean-to Section between Bents Nº 1&2, looking South

Lean-to Section at Bent Nº 9, looking South

DETAILS OF ARRANGEMENT OF THE CALUMET & HECLA LEACHING PLANT

For storing the leaching solutions and the wash there are at present 18 steel tanks, 22 ft. in diameter and 11 ft. high. For storing the concentrated solution of ammonium carbonate, as purchased or distilled, there are steel tanks with a total capacity of about 200 cu.m. In addition to this, there is a mixing tank 16 ft. in diameter and 1 ft. in height, in which one of the leaching solutions is made up to strength, and also constant-level tanks at the highest point of the building so as to give gravity flow under a constant head.

There are four ongoing solutions as follows: First leach, second leach, first wash and second, or water wash. There are four corresponding effluent solutions: Rich solution for distillation, new first leach, new second leach and new first wash. The rich solution, first leach and the ongoing second leach will all assay about 20 grams NH_3 per liter, with copper content respectively of about 18 grams, 12 grams and 9 grams per liter. These assays are subject to some change, depending upon the copper content of the sands and upon the exigencies of operating conditions. The process is controlled by analysis of the copper and ammonia in the leaching solutions, and the aim is to keep these constant. To do this requires vigilance and necessitates regenerating by distillation a volume of solution containing copper equivalent to the amount extracted from the sands.

The general operation is as follows: The sands, as they leave the Dorr classifiers, are diluted with about four times their weight of water and run into the sand tanks through the distributor until the charge has reached the desired height. During this operation the excess water overflows from the tank, and the launders are so arranged that the bulk of this water can go back to the discharge of the Dorr machines as conveying water. When the tank is full, the water is drained off as rapidly as possible by means of the decanter. With the aid of a valve in the solution-outlet pipe, discharging to waste, the sands are drained until the surface is firm enough to work on. As the water goes down, any irregularities of the surface are evened up by poking the sand with sticks, which tends to break up all ridges and has no harmful effect upon the rate or uniformity of percolation. What little slimes are left remain on top of the settled surface as a very thin film, and this is broken up by means of a garden rake. The decanter-pipe covers are again put on, likewise the plugs in the overflow pipes, and the overflow launder is filled with water to form the seal. The tank cover is put in place, and the tank is ready for leaching. With the waste valve open, the first leaching solution is led upon the sand as rapidly as possible and displacement of the water by the pregnant solution begins. After a period of about 2½ hr. the first traces of ammonia appear at the waste valve, which is then immediately closed and circulation through the effluent leaching-solution piping begun at the normal percolation rate. The first portion of the solution coming through is naturally low in copper and ammonia, owing to diffusion and imperfect displacement, and is run into the second leach. This solution builds up very rapidly, however, in copper and ammonia, and the subsequent course of the cycle, so far as effluent solutions is concerned, is determined by conditions existing, it being essential that the first and the second leaching solutions be maintained at their proper assay, and the amount of rich solution drawn off for distillation is governed accordingly. Naturally, over a series of tanks the amount of copper in this rich solution is equal to that extracted from the sands, but it may vary considerably from one tank to another. The aim is to have this rich solution for distillation as low in volume and as high in copper as possible, for the distillation is an important item in the total expense and the volume distilled is maintained at a minimum. As soon as the desired volume of first-leaching solution has been run on the sands, the second leaching solution is run on in the same manner, and after this is drained below the surface of the sands, it is followed by the first wash and this in turn by the second wash, which is water. The volume of water added to the cycle at this point is equal to the amount removed by distillation. This is the invariable practice so far as the ongoing solutions are concerned, although the quantity of these solutions is occasionally varied to suit the feed. The effluent solutions are not regulated with quite the same nicety, as they are affected, not only by conditions within the sand tank itself, but more particularly by the volume and assay of the solutions in storage. In general, one may say that the solution first coming off goes to the second-leach tanks until built up in copper and ammonia, after which the rich solution for distillation is drawn off. This is followed in turn by the full volume of the first leaching solution, this by the remainder of the second leaching solution and finally by the wash. This completes the leaching cycle proper, which in the ordinary operation requires about 70 hr. The tank is then flushed out through the seven gates provided for that purpose, by means of two high-pressure streams and some low-pressure water, this being completed ordinarily in 3 hr. With the 12 hr. allowed for filling, the entire operation is accomplished within 90 hr.

Before describing the distillation process, it may be of interest to explain how the leaching solutions are made and controlled. The only solvent required is purchased in liquid form, and thereby some of the difficulties attendant upon dissolving a solid for use as a solvent are avoided. We purchase carbonated ammonia liquor in tank cars from the Semet-Solvay Co., of Syracuse, N. Y., shipment being made from the company's Detroit plant. The amount of carbon dioxide in this liquor is varied by us so as to keep the percentage in the leaching solutions about the equivalent of that of ammonia. The railroad track comes directly into the leaching plant, and the contents of the tank car are forced by means of compressed air into the strong-liquor storage tanks and from these run by gravity into the mixing tank at the desired rate for maintaining the ammonia contents of the second leach. All other solutions are made up from the effluent solutions by proper selection and control. If there is any tendency for the volume of any given solution to increase or decrease, or its assay to vary, it can be compensated by varying the amount of solution to be distilled. There is absolutely no fouling of the solutions, and there is never any necessity for throwing away any portion of a leaching solution or of a wash. The total volume of all ongoing solutions and of the effluent rich solution is measured by means of recording V-notch meters, and the rate of flow of the effluent solutions from the individual sand tanks is indicated by means of gages connected to Pitot tubes and by measurements of the solution-storage tanks. These means, in connection with hourly assay samples, have been found ample for complete control of the leaching solutions and of the cycle.

Distillation of Pregnant Solution

The distillation of the rich solution with the recovery of the ammonium carbonate and the precipitation of the copper oxide is carried on in an apparatus analogous to that used in the byproduct coke industry for distilling ammonia, with the exception of the still previously described, which was developed for this particular liquor. The plant for this distillation was designed by us in connection with the engineers of the Semet-Solvay Co., who furnished all the apparatus except the stills mentioned and their accessories. About

90% of the copper content of the liquor is deposited in this still, which we call a roughing still, and is trapped off into a chamber that is discharged periodically directly into a filter box and from this loaded into concentrates cars. The other 10% of the copper remains in solution or suspension and passes through a second still of a standard type, which we call a finishing still, and from which the final solution, barren of ammonia, runs into a settling tank to permit the settling out of the copper oxide. There are two roughing stills connected in parallel, as to solution and steam, with one finishing still, and the rest of the distillation unit is made up of a reflux column, condenser, etc. The oxide of copper as precipitated by this operation will assay about 80% copper and is practically pure. It goes direct to the smelting works, where it is mixed with the native copper concentrates, and as such, since it is free from gangue, it is highly prized by the smeltery men, since the oxygen it contains aids in slagging off the impurities of the rest of the charge.

As at present operated, the daily capacity of the leaching plant is 2000 tons. The plant is run by three shifts of eight men each, and in addition to these there are six men on the day shift for repair work, the bulk of which is in connection with the stills. These with the head chemist make up the working force. Allowing an average rate to these men of $3.50 per day, there is indicated a labor cost of 5c. per ton of material treated. The repairs will be very slight, judging from the ten months of operation of the plant. The wear and tear on Dorr classifiers is not appreciable as yet, and the same is true of the sand distributor. Centrifugal sand-pump liners give some trouble, but nothing that cannot be easily handled on the Sunday morning shutdown. There has been no evidence of corrosion in the cast-iron solution pipes or in the leaching tanks. The strong liquor as received and the distillate made is somewhat corrosive, but hardly sufficient to warrant a protective lining. Fortunately, the extent of this strong-liquor line is limited and its maintenance will not become laborious. The amount of electric power consumed in the plant is equal to 225 kw., most of it being used in the operation of sands pumps which, on account of the local conditions, are numerous, since it is necessary to pump the mill tailings into the leaching pant, to pump the sands from the Dorr classifiers to the leaching tanks and also to pump the tailings from the plant back to the lake. The steam for distillation amounts to about 35% by weight of the liquor distilled and, as now operating, costs about 4c. per ton of sands treated. The greatest single item of expense is the ammonia, the loss of which is just under one pound per ton of sands treated. Under ordinary economical conditions this ammonia should not cost over 15c. per lb., but at present, owing to the excessive demand, the cost is almost double that figure. The complete record of cost for March is given in the accompanying table.

COST OF AMMONIA LEACHING

	Per Ton
General expense, including foremen and chemists	$0.031
Ammonia	.255
Sand conveying and classification	.020
Labor, power and supplies for leaching	.027
Steam for distillation	.038
Labor and supplies for distillation	.035
Total cost	$0.406

During this month there was a recovery of 8.18 lb. copper per ton of material treated, giving a cost per pound, up to smelting, of just 5c. For the first four months of the year the cost per pound of copper has been less than 4.75c. up to smelting, or about 6c. per pound sold. The present production is at a rate in excess of six million pounds per year.

The extraction varies with the fineness of the product, which so far as the leaching plant is concerned, should all be through 48-mesh, but which actually is very much coarser. As operating at present, there is some 28- and 48-mesh material on which the extraction is less than 60%, whereas on the material passing through the 150- and 200-mesh the extraction is as high as 85%. The average extraction is now about 75%. The data in the accompanying table are for April.

SANDS LEACHING PLANT, APRIL, 1917

Size of Sand Particles	Feed % Sand	 % Cu	Tailing % Sand	 % Cu	% Extraction
On 28-mesh	3.6	0.707	2.1	0.416	29.7
28- to 48-mesh	18.3	0.619	16.9	0.214	65.4
48- to 100-mesh	44.0	0.607	46.0	0.136	77.6
100- to 200-mesh	24.2	0.575	25.1	0.094	83.7
Through 200-mesh	9.9	0.994	10.8	0.114	88.5
Average for month—total		0.644		0.141	78.1

The process was originated and developed entirely by Calumet & Hecla engineers. The mechanical details were designed by H. E. Williams and Robert MacIntosh, with helpful suggestions from Allan J. Clark, of the Homestake Mining Co. The general design of the plant and the chemical development of the process was taken care of by the writer and H. C. Kenny, the latter now in charge under Henry Fisher, mill superintendent.

Dividing a Mortar-Box

By Charles Labbe
Mechanical engineer, Johnie, Nev

In the case where a five-stamp battery mortar-box is to be divided to provide two smaller boxes or where the division is necessary for other purposes, the following method may be adopted:

With the mortar-box in its normal position a line is traced around the outside and inside, at the required distance from one end, with cold chisels, then deepened to a groove about ¼ in. deep. The position of the mortar-box is then reversed and the base of the sole-plate divided in a similar way with a cold-chisel cut and, later, with a cape-chisel groove ⅜ in. deep by ⅜ in. wide, beveled on both sides with a cold chisel. A crack is then started from the top of the mortar-box where the thickness of metal is less by means of blows from a hammer on a chisel held in the groove. Two and a half sticks of 40% powder are then firmly pressed into the groove across the sole-plate and the cap placed in the center on the top of the powder, the whole being covered with soft clay and sand to act as tamping media for the exclusion of air. Half a dozen old dies are then piled on the tamping and the fuse is lighted. The explosion will result in the division of the mortar-box along the lines traced by the cold chisels, but possible damage and injury from falling dies must not be overlooked.

In the case in point it was found necessary to construct a two-stamp battery from a five-stamp mortar-box and equipment. The method outlined proved successful for the division of the mortar-box, the only difficulty present, and the rough edges of the exposed side were afterward chipped and filed to allow the placing of a heavy sheet of iron which was attached by means of cap-screws in the ordinary way.

Inhibitory Films in Flotation

BY WILL H. COGHILL

Consulting metallurgist in the coöperative work of the Oregon Bureau of Mines and Geology, and the U. S. Bureau of Mines, at Corvallis, Ore

The selective action of oils toward various substances, minerals and rocks, being most important from the mining engineer's point of view, is ascribed to the presence or absence of films of other substances. These substances may inhibit oil filming. Proper knowledge and control of these films is believed to be essential to the highest development of flotation.

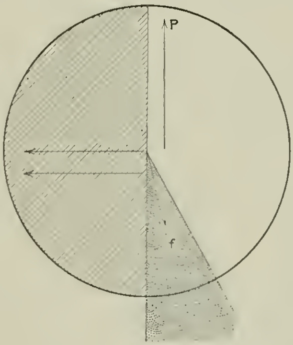
WE ARE told by W. D. Bancroft[1] that the problem of ore flotation is a very simple one or a very complex one, depending on our point of view. I believe that I am qualified to speak for the mining engineer and saying that from our point of view the problem is a very complex one. We feel that we are justified in this view because we find that the problem is complex. If a few men of Dr. Bancroft's type could find time to give flotation a little more than a passing glance they would, no doubt, in time give us a different point of view.

T. A. Rickard has said:[2] "Acified water has a greater wetting power than neutral water. For this fact also no satisfactory explanation is forthcoming." R. C. Canby[3] feels that "the question of selective affinity of oil for sulphides is confusing"; and we find that these problems which confront us today were the problems of ten years ago, as attested by Swinburne and Rudorf[4] when they say: "The strange thing is that bodies like stibnite, which have small adhesion for water and thus resemble grease, have aparently greater adhesion for grease."

I offer no panacea for this confusion of ideas. Since knowledge by our experience alone is not an ideal source because "experience teaches a dear lesson," let us see what we can learn from the experience of others.

A FUNDAMENTAL PHYSICAL PRINCIPLE

I believe it possible to learn from them and make the subject seem less befogged than do Rickard, Canby, Swinburne and Rudorf. One simple physical principle is fundamental to the conception that I am going to try to convey. I quote from "Mechanics, Molecular Physics and Heat," by Milliken. In discussing the spreading of a liquid on a solid, Milliken says: "The law of transmission of pressure by liquids easily accounts for this, at first view, somewhat surprising result. For, in accordance with this law, the molecular pressure P existing because of adhesion at a point in the liquid close to the limit of contact, as shown in Fig. 1, is transmitted undiminished in a direction parallel to the surface of the solid, and therefore constitutes a force pushing out the molecules. The only opposing force acting to prevent the limiting molecules from moving up along the surface is the vertical component of the attraction f exerted upon these molecules by such portion of the liquid as lies within the sphere of influence about the center. Hence, unless the ratio of cohesion to the adhesion exceeds a certain limit, a thin film of the liquid must spread out indefinitely over the surface of the solid. This conclusion is not surprising, since it means simply that a body that attracts a liquid strongly enough will draw every particle of it as near as possible to itself." Milliken goes on to say that perfectly clean surfaces with great adhesive power are very difficult to obtain, and that on account of the prevalence of this very phenomenon. I see here two very important lessons: The liquid with the highest value for $\frac{P}{f}$ is the most likely to spread and will spread if the adhesive force of the solid is sufficiently great; second, on account of the great surface tension of some of the solids, it is nearly impossible to secure an uncontaminated surface. With those two principles as a basis, we can correlate the observations of the amalgamator, galvanizer, ceramist and horticulturist, also the specialists in lubricants, dyes and soaps. We know full well how very thoroughly a copper plate must be cleaned before mercury will spread on it. When a fresh surface is once secured, the mercury spreads freely and adheres with such tenacity that it defies even fire. The amalgamator says it "bites." The force P is so great that f is really negligible when the molecules of the mercury and copper come within the effective range of molecular attraction.



OPERATION OF SURFACE FORCES

Liquid zinc will not "bite" an iron wire unless the wire's surface is freed from all impurities. The impurities lack the adhesive power that the iron possesses and therefore must be removed. When the wire is clean, the zinc spreads freely and a galvanized surface is the result. Mercury spreads freely on gold when there is no contaminating film.

There may be those who, looking upon amalgamating and galvanizing as chemical and not physical phenomena, object to this correlation. But the barrier is more apparent than real, for Irving Langmuir[5] says, in speaking of solids and liquids: "In gases there is usually no uncertainty as to the size of the molecules, but in liquids and solids no really satisfactory methods have been found for determining molecular weights. So long as we cannot definitely determine the molecular weights, it thus remains impossible to distinguish sharply between chemical and physical phenomena. Nevertheless, much discussion has arisen of late years over such questions whether adsorption and surface tension are chemical or physical phenomena. The overwhelming consensus of opinion seems to be that these are both physical phenomena. In the following pages the writer hopes to show that there is no present justification for this distinction between chemical and physical forces. Cohesion, adsorption and surface tension are all manifestations of forces similar in their nature to those acting between the atoms of solid bodies. It is therefore advantageous to look upon these forces as direct results of chemical affinity." Mr. Langmuir, in placing surface tension among chemical phenomena, does not ask us to unlearn things once learned, but on the other hand, comes to our rescue with a more complete equipment for our task.

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[1] "Met. and Chem. Eng.," June 1, 1916.

[2] "The Flotation Process," by Rickard, p. 131.

[3] "Eng. and Min. Journ.," July 1, 1916, p. 30.

[4] "Eng. and Min. Journ.," Feb. 10, 1906, p. 276.

[5] "Constitution and Fundamental Properties of Solids and Liquids," "Jour. Am. Soc.," November, 1916, p. 2225.

Mercury spreads on copper and gold, and zinc, tin and lead spread on iron because $\frac{P}{f}$ "exceeds a certain limit." If we take advantage of the interchangeability suggested by Langmuir, we can interchange terms and substitute surface tension for P and f and establish the hypothesis that the surface tension of these solids is greater than that of the respective spreading liquids. The appended table, compiled from "Handbook of Chemistry and Physics," justifies this hypothesis for the solids, at the temperatures shown in the table, have a greater surface tension than the respective spreading liquids and it would doubtless be even greater when they were at the working temperature. It is likely, therefore, that a solid has greater surface tension than the spreading liquid and that the tension of the solid could be predicted by testing its power to make liquids of a large range of tension spread upon it.

SURFACE TENSION OF SOLIDS AND SPREADING LIQUIDS

	Solid			Spreading Liquid		
No.	Metal	Temp. C.	Sur. Ten.	Metal	Temp. C.	Sur. Ten.
1	Copper	1,100	580	Mercury	15	436
2	Gold	1,070	612	Mercury.....	15	436
3	Iron.. .	1,200	1,000	Zinc. ..	360	877
4	Iron.. .	1,200	1,000	Tin	250	352
5.	Iron.. . .	1,200	1,000	Lead	330	448

It is commonly stated in physical literature that solid substances do not manifest their molecular forces as freely as do liquids for the reason that their surfaces are fixed. This must not be taken to mean that we cannot approximate their surface tension, for we have just done that very thing in the case of copper, iron and gold. The interchangeability of cohesion, adhesion and surface tension permits this approximation, but it is not infallible. For example, the surface tension of platinum at 2000° C. is 1658. It is difficult to account for the failure of mercury to spread on it (amalgamate). If we cannot attribute its rebellious nature to inhibitory films that the mercury cannot dissolve (and films are the result of high surface tension), we shall have to await a clearer conception of surface tension from a chemical point of view.

The force P at the surface of coal, is not sufficiently great to make pure water spread freely upon it. This spreading is desirable in the sprinkling of coal mines, and since it is not feasible to increase P by polishing as is the custom with a copper plate, or by using acid as in galvanizing, f must be altered. Reducing f is just as effective as increasing P. This reduction is accomplished by adding soap to the water. If Mr. Rickard had known this and had he known also that certain acids[6] reduce the surface tension of "neutral" water, he could have answered his own question.

Returning to the subject of the wetting of coal, I quote[7] as follows:

"These dust-laying processes have been duly considered by Dr. Thornton, who has made experiments favoring the view that an efficacious spraying mixture can be made with soap and water. He demonstrated that the whole question of the wetting of dust was one of surface tension of the liquid used, and that the water alone did not possess the property of readily wetting the coal dust, unless indeed it was used in large quantities. On the other hand, the soap and water mixture completely wetted the dust, turning it into a liquefied form of mud, the chief component of which was coal dust." The coal miner has thus applied nature's laws to commercial work. Thanks to him for putting his results on record.

COMPARISON WITH THE PRINCIPLE OF DETERGENTS

The incorporation of this principle of Milliken's into the science of detergents, according to W. E. Hillyer,[8] antedates its application in coal mining. What he suggested in 1903 as a "possible factor" is now a generally accepted fact in the literature on detergents. He says: "We have seen before that another possible factor in cleaning, namely, the power which soap solutions have of wetting oily substances, is due to the soap itself. But this wetting power may be experienced only by the strong adhesion of the soap to the oil (P) and the low cohesion of the soap solution itself (f). The latter will more easily spread out over the surface if its cohesion is small, and a stronger force will be acting to spread it out if it is strongly attracted to the oily surface."

We have concerned ourselves much about oil spreading on water, but we see that the soap specialist must make a water solution that will spread on oil, otherwise his soap is a failure. Indeed, his soap acts as a solvent upon certain oils, but in addition to this property the spreading and lubricating power of the soap solution is essential. Soluble oil is only one form of dirt. There are many others, and they must be lubricated by a spreading or wetting liquid before they will slip off the fiber. If they slip off and become permanently suspended in the soap solution, the cleansing of the fiber is complete.

Knowledge of the principles governing the spreading of liquids is fundamental in flotation. I am trying to indicate where this literature can be found, the nature and application of it. In the tardy recognition of the importance of these principles we—as mining engineers—do not stand alone. I refer to our own United States Department of Agriculture. Cooper and Nuttall[9] write very interestingly about this while discussing the subject of dipping and spraying the solutions. We read as follows: "No proprietary dip is now recognized unless the manufacturer can furnish a 'Field Tester,' by means of which the stock breeder can himself determine in a simple and fairly trustworthy manner the percentage of active constituent in his bath. The underlying idea upon which all these regulations are based is that the principal factor, which determines the efficacy of a dipping fluid, is the quantity of toxic substance present. It has been shown, however, in experience derived from field experiments and routine dipping, that this assumption is unwarranted. There is another factor of almost equal importance; namely, the capacity of the dipping fluid to wet the greasy hide or fleece. The fact that the Queensland official dip contains soap as a basis may be quoted as an indication that the importance of the wetting power of dipping fluids is recognized in actual practice." Continuing, they say: "What has been said of dipping fluids refers with equal force to horticultural spraying fluids—a high percentage of toxic substance is no criterion of the efficiency. The supreme importance of the spraying fluid having a high wetting power is gradually becoming more and more recognized, though not generally by government authorities. In the United States compulsory spraying is rapidly becoming the rule, and the standardization of spraying fluids is its natural consequence. This standardization merely considers the percentage of toxic agent and entirely disregards the equally important point of the wetting power."

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[6] Organic acids are more likely to depress the tension of water than are the inorganic acids.

[7] "Eng. and Min. Journ.," Mar. 11, 1911, p 531

[8] "On the Cleaning Power of Soap," "Jour. Am. Chem. Soc.," Vol. 25.

[9] "Journal of Agricultural Science," Vol. 7, 1915; "The Determination of the Wetting Power of Dipping and Spraying Fluids"

We see from the foregoing that spreading is facilitated by removal of an inhibitory film, as for example, on copper plates and iron wire, thus increasing P, or by adding a contaminant to the liquid, as for example, when spraying coal or trees and, when washing or dipping, with a consequent reduction of f.

THE PROBLEM OF IMMISCIBLE LIQUIDS

The problem becomes more difficult when we have two immiscible liquids and wish to determine which will spread on a given solid. Let us take some examples for illustration. R. C. Canby says that "sulphide surfaces are so delicate that even the merest drying of wet surfaces may have an effect that is sufficient to prevent successful flotation." This trouble is doubtless due to inhibitory films. We should have foreseen the possibility of this obstacle, since it is known that at one extreme there is a group of solids on which water inhibits the spreading of oil, an intermediate group which is uncertain, and at the other extreme there are solids on which oil inhibits the spreading of water. Some examples will be of value. They appear here in the order just given.

1. The first, though stated in a manner possibly out of the ordinary, is one of the most familiar. It is: Water inhibits the spreading of oil on quartz. It has not been our custom to take into account the inhibiting power of the water, but I think that this interpretation will be correct when considered with what follows.

2. We have a striking parallel in the testing of lubricating oils. It is recorded by Archbutt and Deeley.[10] Concerning the testing of lubricating oils in a film on a glass plate, they say: "It is not easy to obtain a continuous film, nor films of uniform thickness, and unless they are uniform the results are not comparable. The least trace of moisture on the surface of the glass, even the film of moist air condensed on all apparently dry cold surfaces, causes some oils to draw up into irregular patches and drops. This may be avoided by first heating the glass strongly and painting it with the oil while still hot."

3. Similar conduct is experienced in making asphalt pavements[11] where it is found that the paint coat, consisting of asphalt cement dissolved in benzine, cannot be successfully applied to concrete that is in the slightest degree damp, as the adhesion is then imperfect.

4. The ceramist has had experience with oil and water. We read[12]: "Ether, gasoline, kerosene, engine oil and similar liquids form an inhibitory coating over the clay grains and prevent the display of plastic properties. These liquids are insoluble in water. Though they are to some extent able to prevent the formation of the plastic bond, they are unable to break this bond once it has been formed." If the clay grains could be dried thoroughly and then oiled, the inhibition of water would be complete.

5. The magnetic paint for the Murex process could not be made in the presence of water. It was therefore made up in a separate apparatus and added to the pulp. Mr. Ralston[13] notes that some difficulty was met in the tendency of the ground magnetite or other material to leave the oil and go into the water.

APPLICATIONS OF PRINCIPLES IN ROAD BUILDING

6. The road builder has found it difficult to make the oil film inhibit water. He says[14]: "The different kinds of rock surfaces behave quite differently toward asphalt cement. The porous limestone surface absorbs it and, of course, adheres very firmly. To the quartz surfaces the bitumen adheres in most cases well, but in others only slightly, being readily washed off with water. A sand from the London gravels has a surface such that asphalt cement would not adhere to it in the presence of the dampness of a London fog, so that it would be found in the gutter after a rain, washed quite clear and free from bitumen."

7. Archbutt and Deeley, in discussing lubricants, say that water, although it has a greater surface tension, cannot, as a rule, displace oils, fats, grease, etc., from surfaces of solids (they have metallic surfaces in mind), for such substances are insoluble in water and insinuate themselves among the surface particles of the solid, from which they are not easily separated. George B. Upton[15] deals with lubrication and selective spreading more intelligently. He says: "This (surface tension) and the adhesion of oil to metal surfaces are the forces which cause oil to spread over the metal and to crawl into the thin spaces between bearing and shaft, or piston and cylinder, while the metal parts are at rest. Animal and vegetable oils adhere better to metal surfaces than do mineral oils. This property is especially important in steam-engine valve and cylinder lubrication, where the oil must adhere to the metal so strongly that water, and the tendency of oil to float on water, cannot remove the oil film. Mineral oils, pure, may be displaced from a steam-engine cylinder wall or valve seat by hot water. The adding of small amounts of animal or vegetable oil to the mineral steam cylinder oil helps the oil film to adhere. The good effect is important enough to counterbalance the bad tendency of the animal or vegetable oil to form acids. Where water

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[10] "Lubrication and Lubricants," p. 304.

[11] "The Modern Asphalt Pavement," by Richardson.

[12] "Physics of the Clay Molecule," by R. F McMichael, American Ceramics Society, Vol. 17, 1915, p. 622.

[13] "Eng. and Min. Journ.", Apr. 29, 1916, p. 765

[14] "The Modern Asphalt Pavement," by Richardson.

[15] "Properties of Oil and Their Relation to Lubrication," by Upton, "Sibley Journal of Engineering," June 1916."

is absent, the mineral oils stick well enough on metal surfaces. Surface tension of lubricating oils is not usually noticed in testing."

8. Grease or oil displaces water on diamonds, graphite and sulphides. The first five examples need no further comment; the last three do.

In (6) the impression is given that, since the "porous" limestone surface absorbs the oil, the quartz could not be expected to adhere to oil because it is not porous. This is not correct; porosity is no measure of adhesion. An ink blotter is porous, but it will not soak up mercury because f is too great as compared with P. All substances are porous, but it is only when f is sufficiently small that a liquid will soak in, thus making the porosity apparent.

In (7) where the authors say, "insinuate themselves among the surface particles of the solid," they show an adherence to the fallacy that I tried to expose in (6). If a porous surface were the only prerequisite in order that a liquid might "insinute itself among the surface particles and not be easily separated," artificial magnetite would have been an ideal material from which to make magnetic paint for the Murex process, but we know that it was not. There must be more than a porous surface. The liquid must have a capillarity such that it will be drawn into the pores.

The apology in (7) for water not being able to displace grease, though it has a greater surface tension than grease, is prompted by an early impression emanating from Lord Rayleigh. He showed that "when several liquids are brought into contact with a solid whose surface tension is greater than that of either of them, the conditions of equilibrium or of minimum potential energy are satisfied when the liquid of greatest surface tension is in contact with the solid, and the other liquids assume the order of their relative surface tension." This orderly arrangement maintains when, as is well known, water replaces oil in the wick of a lamp and makes the flame sputter, but when water will not replace grease on metal (7), the lubrication expert attributes it to insinuation. Any lack of coördination with Rayleigh's principle needs no comment further than to say that if one liquid is not replaced by another on a solid, the fact that the one has spread and formed an inhibitory film that prevents the other from coming within the effective range of attraction is good and sufficient reason.

The last (8), is paramount; and with it we have Canby's "paradox," "The strange thing is that bodies like stibnite, which have small adhesion for water and thus resemble grease, have apparently greater adhesion for grease." This bugbear has confronted the mining engineer for ten years. I wish it could be removed. I believe that a working knowledge of the principles that I have outlined will enable us to remove it. The problem is: Given, that water does not spread on sulphides; why does oil spread on them at the air and water interfaces?

Proper Distribution of Molecular Forces

When oil spreads on sulphides at the air interface, it is because molecular forces are distributed in such a way that $\frac{P}{f}$ is sufficiently great to make it spread.. This is a natural consequence of reducing surface tension of the spreading liquid and finds a striking analogy in the case of the soap solution and coal. Analogies are, in fact, abundant and there is no reason why one should be looked upon as a paradox while the others are passed without comment.

Again, we can apply well-known principles and show that the spreading of oil at the water-sulphide interface is far from paradoxical. It will be recalled that our working definition of surface tension incorporated the principle that the combined effect (from the viewpoint of energy expended) of a molecule moving about within a liquid was zero. Now imagine a drop of oil in water. It can move about with perfect freedom because the retarding force caused by pulling the molecules apart on the advance side equals the accelerating force of reunion at the rear. But assume that this drop of oil has moved to the water-sulphide interface. Here it receives a net accelerating force along the solid surface because the energy of the water molecules closing behind it is greater than that required to separate the water layer from the solid. Because of this unbalanced force the oil droplet will spread between the water and the sulphide just as putty spreads between the fingers when squeezed in the hand. This is, of course, in opposition to the law of minimum potential energy of surfaces, for it is obvious that the droplet experiences an enormous increase in surface, and therefore surface energy, but it must be borne in mind that liquids only tend to reduce surface to a minimum. There are many ways in which this tendency meets opposing and even controlling forces.

The oil therefore spreads between the two phases. It spreads on either water or sulphide at the air interface, therefore it seems natural rather than paradoxical for it to spread at the water-sulphide interface if the water has not already spread. Having once spread, it forms an inhibitory film that checks other liquids from coming within the range of molecular activity of the sulphide. When the sulphides have depressions filled with entrapped air, as they doubtless have, the oil does not have to break the adhering bond at these spots, but spreads freely on both the air-sulphide and air-water interfaces.

Oil cannot spread upon quartz in water because water has spread upon it and formed an inhibitory film. It might be urged that oil will spread on water-filmed quartz in the air, but such an oil film could not be expected to remain unaltered when submerged because it is well known that a drop of oil between layers of water draws up into a sphere. If we increase the surface tension of water so that f is sufficiently great to prevent water from spreading on the quartz, then oil will doubtless spread at the quartz-water interface. If we add pine oil to our water with a consequent reduction in f so that the water spreads on the sulphides, it will be useless to add tar. But it is not done that way. The tar is added first, and after it has formed an inhibitory film over the sulphides, we add pine oil.[14] The pine oil doubtless assists by producing a contaminated water that is more effective than pure water in spreading over quartz, but if it were of such a nature that it made f so small that the liquid spread on tar we would be defeated in our tarring; we would, in reality, convert the flotation machine into a washing machine.

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[14] I understand fully that the tar and pine oil are sometimes added at once, and will show later that it is not impossible to do this in conformity with natural laws.

It may be that with those ores where it is difficult to get the tar to spread on the sulphides, we should use a calcium-chloride brine to increase f during the tarring period. If $\frac{P}{f}$ of the sulphide-tar interface, were not sufficiently great, this process would be defeated again.

If sulphides become refractory on exposure to the air, it is probably due to the formation of a film with sufficient adhesive power toward water to make it spread. It seems consistent, therefore, in this case to undertake the tarring in the presence of strong calcium-chloride brine and then, after the removal of the brine, proceed in the ordinary way. There is the possibility, of course, that the tar will peel off prematurely, as it did in the steam cylinder, the Murex process and on the London streets. A tar with a very low surface tension should be chosen. If this fails we have, as an alternative, the privilege of visiting the dyer and cleaner for a method of removing films.

Drying Flotation Concentrates

By H. H. Adams*

The problem of drying flotation concentrates appears to be as trying now as in the early days of flotation practice. The pressure-type filter, in which the pulp is subject to varying lengths of treatment, will produce material containing less moisture than the vacuum type, but at a higher cost per ton treated. The tonnage of this type of filter will not be so great, but in cases of small plants remote from smelteries, where a high freight rate is to be contended with, the extra cost of operation will be offset by the saving in freight charges. The vacuum-type machines are ideal for plants in close proximity to smelteries, because of their capacity and ease of operation. It is noted that the latter-type machines will in some cases produce a product of very low moisture content, but conditions must always be favorable; that is, the pulp must consist of at least 50% solids, contain considerable granular material and be free from fine insoluble matter.

In the treatment of a low-grade copper ore the economic mineral being chalcopyrite, in which a vacuum-type machine 8 ft. diameter by 6 ft. face is used, it is found that the moisture content varies directly with the amount of insoluble and minus 200-mesh material contained in the pulp; that a speed of one revolution of the drum in 12 min. will give a drier cake than with a speed of one revolution in 8 min., and as moisture content is reduced below 50%, a corresponding reduction in the cake will be noted within certain limits, as well as an increase in the capacity of the machine.

As a rule, when the thickness of the cake becomes greater than ¾-in., the amount of water carried in it will be more than in a cake of less thickness. Heating of pulp to 90° F. before filtering is found to increase the capacity of the machine, but does not lower the moisture content of cake. The addition of lime to the pulp at the rate of 10 lb. per ton of concentrates adds materially to the capacity of the machine and gives a drier product. Covers of the twill type have been found to give longer service than those of more open weave, likewise a cake containing less water, although more fine insoluble material will work into the fabric and resist the action of the "blow," causing the cloth to blind. Usually, a thorough scrubbing of the cloth with a stiff-fiber brush or one made of fine wires, after which a wash with a solution of 10% hydrochloric acid, followed by a wash with clear water, will relieve trouble and add greatly to the life of a cloth.

Mechanical agitation of the pulp after its introduction into the filter tank is more satisfactory than agitation by air alone, since coarse particles in the pulp do not have a tendency to build up on the sides of the tank. Application of air in connection with a mechanical agitator is generally unnecessary, and where the capacity of a compressor is limited, the air pressure should be conserved as much as possible for the "blow." A high vacuum is absolutely essential to good work, and care should be taken to see that it is maintained at the maximum point at all times.

Magnesite Furnace Lining

The Western Metals Co., of Los Angeles, which is operating a smeltery near that city for antimony ores, uses magnesite from the Bissell, Calif., deposit for lining its firebrick furnaces, says Charles G. Yale of the United States Geological Survey.[1] The bottoms are lined with ordinary dead-burned magnesite, tamped in a moist condition, without binder. Corrosion takes place on the side walls only, for the plastic or fine-ground magnesite is mixed with a solution of sulphate of magnesia and this with the coarser dead-burned magnesite, and the mixture is laid on the walls by plastering to make a body. The outer brick wall of the furnace is thus lined with 5 in. of plastering at the top and 9 in. at the bottom. This inner-wall lining is monolithic.

The sulphate solution is made by dissolving a pound of sulphate of magnesia crystals in a pint of water, making about a pint and a third of solution. The concrete mixture for the walls requires about eight hours to set hard, after which it should stand a week to dry out before firing and be fired gradually. For the furnace roofs molds are used to make blocks of the mixture described, and the blocks are allowed to stand a week or two before using. One part of the ground plastic to two parts of the dead-burned grain magnesite is used.

Cyanides from Atmospheric Nitrogen

In a paper read before a recent meeting of the American Institute of Chemical Engineers, J. F. Bucher claims to have devised an economical process for manufacturing cyanide by causing atmospheric nitrogen to act on a mixture of sodium carbonate, graphite and powdered iron at comparatively low temperatures.

In his experiments, nitrogen was passed over briquets made of soda ash, coke and powdered iron, in equal proportions without binding medium, at a temperature not exceeding 920° C., in a "batch" furnace At the end of half an hour the briquets contained 30% NaCN. Considerable quantities are formed even below 820° C. Air, producer gas, flue gas or combustion gases give as good results as nitrogen. Iron must be present.

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*Utah Leasing Co., Newhouse, Utah.

[1] "Magnesite in 1915."

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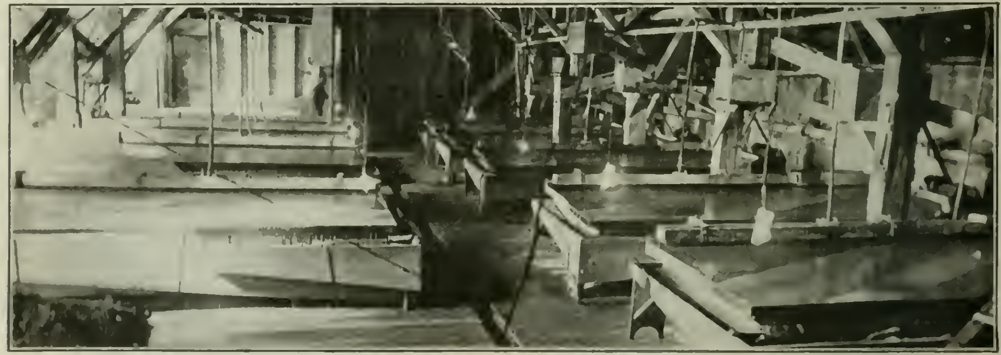
Hints About Mill Lighting

By A. L. POWELL
Engineer for the Edison Lamp Works, Harrison, N. J.

The illumination of a plant affects its output. The selection of lamps and reflectors for the different parts of a mill should depend on the heights at which they must be hung and on the amount of light desired. The development of the mazda lamp has greatly helped table recovery. Artificial light should simulate daylight as nearly as possible.

INVESTIGATIONS in every industry have shown without doubt that proper lighting is a most important factor in increasing production. It increases the speed of operation. It lessens spoilage because of the increased facility of inspecting each step. It promotes safety by revealing obstructions and the moving parts of all machinery.

Good lighting means a sufficient amount or intensity of illumination in all parts of the room. The illumination should be evenly distributed. Sources of bright light should be kept out of the field of view. Glare and flicker should be avoided, as both are annoying and trying to the eye. The color of the light used should be adapted to the class of work.



INTERIOR OF ONE MILL, SHOWING METHOD OF LIGHTING UP TABLES

The two important elements of a lighting unit are the lamp and the reflector. The mazda lamp has become practically the standard illuminant for interior lighting. It is cheap and simple and requires no repairs or adjustments. It has long life without decreasing materially in candlepower, does not flicker, and is available in a wide range of sizes from 8 to nearly 2000 candlepower. The color of the unmodified light is practically white with a slight yellowish tint, but by the use of special bulbs, or auxiliary glassware, this can be modified to give various effects.

A reflector is necessary to redirect the light in useful directions. It gathers the light that would go upward and sideways and send it to the work. It shields the eye from the bright lamp filament and often serves to protect the lamp from injury. The nature of the work in a concentrator makes it advisable to install well-made, substantial reflectors. One made of thin metal or cheaply put together is poor economy. Its useful life is short. For practically all industrial lighting steel reflectors have become standard. These are made either with a porcelain enameled finish or with aluminum reflecting surfaces. Where the air is moist, as in most mills, a good grade of porcelain enamel is desirable to protect the metal against rust. The enameled reflector can, moreover, be easily cleaned. Dust will accumulate on reflecting equipment and, if not removed, will lower the efficiency of the installation. This latter point cannot be impressed too strongly.

The standard types of reflectors for interior lighting are the bowl, the dome and the angle. The bowl comes down well over the lamp and prevents light escaping near the horizontal. It should be used where lamps are hung far above the object to be lighted or where the light at high angles would be wasted on the side walls. The dome reflector is the one most commonly used. It is the most efficient of the three types, and at medium hanging height is the most satisfactory. It lights up vertical surfaces better than the bowl type. The angle reflector is similar in shape to the bowl, but has its holder or socket so placed that the maximum light is directed to the side rather than downward. It is well suited for use along the side of a room.

In all parts of the yard, tracks, ditches and other obstructions must be visible. The danger of accidents is minimized if the light is well distributed from a number of relatively small units. Such a system may not be more economical than employing a few large lamps, but the use of a medium-sized unit enables one to place lights near important points, such as crossovers and switches. Mazda lamps of 60 to 150 watts are well suited for low-intensity yard lighting, while 200- to 500-watt units are adapted for high-intensity illumination. If typical street-lighting equipment, such as the radial wave reflector, is used, it is possible to space the lamps widely and yet have no dark spots between units. Yard-lighting equipment can be suspended from cables strung between buildings or placed on brackets on poles or on the sides of the building.

On the ore bins general illumination of a low intensity is adequate, light being needed only for safety. The runway should be lighted by rows of medium-size mazda lamps so spaced and hung that the illumination is fairly uniform. As with any lighting problem, the size of lamp will depend on the maximum available hanging height. If, on the bins, the lamps could be hung from 15 to 18 ft. above the walk, then 200-watt mazda lamps with dome-shaped enamel steel reflectors on 30-ft. centers will give sufficient illumination.

As to apron feeders and conveyors, no specific recommendation could be made which would hold good for a number of plants. Each proposition is peculiar to itself. Lamps with suitable steel reflectors should be located at the spots where loading and dumping takes place, or where the mechanism may have to be repaired.

In modern mills, grizzlies and crushers are usually in a part of the plant with high headroom and a combination of two types of lighting proves most satisfactory. Large mazda lamps of 500 to 1000 watts in deep-bowl steel reflectors placed close to the roof above the crane travels, spaced so that overhanging parts do not cast shadows, form one type. This should be supplemented by medium-sized mazda lamps in angle steel reflectors below the crane travel on the wall opposite the machines. These units provide illumination on vertical surfaces and tend to send the light into the mechanism. In this and other parts of the plant where vibration is severe, flexible rather than rigid suspensions for the lamps are desirable.

General illumination from medium-sized mazda lamps with deep-bowl steel reflectors placed above the crane travel suffices where ball or tube mills are used. From 0.3 to 0.6 watt per sq.ft. of floor area are rough figures on which to base calculations for such work as this, where the operators must see that the machinery is feeding properly and make occasional adjustments.

The low ceilings in many mills where roughing tables and classifiers are used, necessitates rather small lamps spaced quite closely. The enameled dome steel reflector gives a suitable distribution of light for such work. Particular attention must be paid to the placement of lamps to prevent shadows from surrounding equipment.

The improved finishing tables have enabled the mills to obtain much better recoveries than was dreamed of in the early days. This fact has made mining of lean ores profitable, and in many cases the dumps and tailings are being worked over with good results. Years ago zinc and iron were not readily separated. Iron-laden zinc concentrates could not be smelted when much of the former was present. In fact, iron mixed with zinc, lead, silver or copper was a great nuisance, and a mill could not have been made to successfully work such ore at a satisfactory profit.

Improved tables have enabled the mills practically to separate the iron and zinc streaks as they are washed over the table. It is difficult to distinguish the colors of the two streaks. Yet it is necessary for the operators to detect the difference and separate most of the iron from the zinc. In other plants it is necessary to separate scheelite from quartz, a difficult problem under ordinary artificial illumination. The development of the mazda lamp has greatly helped in this respect.

With each increase in efficiency of the incandescent lamp, the filament has operated at a higher temperature and the emitted light has been nearer white. The light from the Gem lamp was whiter than that from the carbon lamp. The vacuum mazda lamp was superior to the Gem and the gas-filled mazda lamp a still greater step forward.

A new mazda lamp has been developed with its object that of producing light whose spectral or color composition closely simulates that of daylight. If one analyzes the light from the ordinary mazda lamp with a spectrophotometer, it is found to possess a preponderance of light in the red end of the spectrum with a relatively smaller proportion of light at the blue end. As previously stated, the higher the operating temperature of the filament, the nearer the emitted light is to white, or the greater the proportion of blue light to red light. Therefore, the first step in the design of a lamp to give approximate daylight is to equip it with a filament operating at as high a temperature as economically feasible. Further by using bulbs of a specially selected blue glass it is possible to filter out some of the preponderant red and yellow rays, producing a resultant light similar to sunlight.

New South Wales Mineral Production

The report of the New South Wales Department of Mines for 1916 has just been issued, and gives the figures of production shown in the accompanying table.

NEW SOUTH WALES MINERAL PRODUCTION, 1915 AND 1916

Substance	Unit	1915	1916
Alunite	tons	1,420	327
Antimony (metal and ore)	tons	637	616
Bismuth (metal and ore)	tons	18	39
Coal	tons	9,449,008	1,127,161
Coke	tons	417,753	437,587
Copper (ingots, matte and ore)*	tons	6,973	6,171
Diamonds	carats	839	1,901
Gold	oz.	132,498	108,145
Iron	tons	76,318	52,557
Iron, "oxide"	tons	2,294	2,461
Ironstone flux	tons		1,472
Lead (pig, etc)	tons	30,305	25,466
Lime	tons	33,010	26,063
Limestone flux	tons	71,720	64,928
Molybdenite	tons	32	54
Platinum	oz.	56	82
Silver (ingots and matte)	oz.	3,237,432	2,801,507
Silver-lead, ore, concentrates, etc	tons	282,776	249,849
Shale (oil)	tons	15,474	17,425
Scheelite	tons	33	81
Tin (ingots and ore)†	tons	2,188	2,129
Wolfram	tons	50	183
Zinc (spelter and concentrates)	tons	190,916	209,741

* Does not include copper produced in New South Wales from ore imported from other Australian states. † Does not include tin refined in New South Wales from imported ores.

In addition to the foregoing, marble valued at £1625; opal, £21,273; portland cement, £420,928; building stone, £65, and sundry minerals and ores valued at £41,184 were produced in 1916.

The total value of the mineral yield in 1916 was £10,975,742, an increase of £911,173 over that of the previous year.

The number of persons employed in mining in 1916 is estimated at 31,304, a decrease of 107 from the figures of the previous year.

The Broken Hill Proprietary Co., of Australia, in its report for the year ended Nov. 30, 1916, notes that the zinc-flotation plant was completed and treated 13,232 tons of tailings, producing 2805 tons of zinc concentrates assaying 47.41% Zn, 13.02 oz. Ag and 5.72% Pb. The plant is designed to produce separately zinc and lead concentrates from the slimes and does so satisfactorily, the lead concentrates assaying 56% lead and containing most of the silver, about 80 oz. per ton.

Oil Concentration of Lead Carbonate at Darwin, California

By H. S. REXWORTHY

Mill Manager, Darwin Lead and Silver Mines and Development Co.,
Darwin, Inyo County, Calif.

The Murex process is in successful operation at Darwin, Calif., on lead-carbonate ores. The process depends upon the selective property of oils for minerals, which is depended upon to coat the mineral particles with a magnetic paint. The painted mineral is then separated from gangue by the use of a magnet.

THE Darwin Lead and Silver Mines and Development Corporation have in operation an experimental mill for the treatment of lead carbonates and sulphide ores from its several properties situated in the vicinity of Darwin, Inyo County, California.

The company's holdings consist of seven groups, known as the Lucky Jim, Lane, Promontory, Columbia, Independence, Defiance and Thompson. The ores of these properties are widely different in character, both as regards the occurrence of the minerals and the gangues. Some of these consist of lead carbonate, carrying silver, disseminated through a hard jasper gangue, while others are a mixture of lead carbonate, galena and silver chloride in a gangue of hematite, quartz and calcite. They are mined from the upper levels down to a depth of about 600 ft., while the ores below the 600-ft. level consist of galena and some native silver in a calcite gangue.

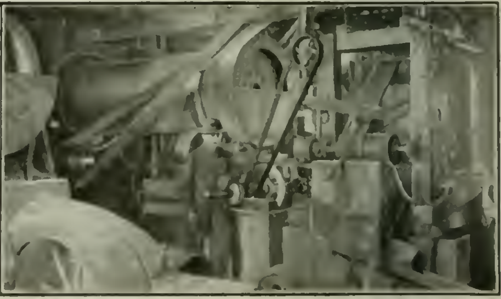
The mill was built on the Lane group, owing to its central position as to the other properties and to its having within easy access a good water supply. The ores from the various properties are hauled by motor trucks and delivered from a central station by means of an aerial tramway the capacity of which is 10 tons per hour.

A 25-ton Murex oil-concentration plant has been in operation for about six months, during which time ores from the various properties have been sent down for treatment. As already stated, these ores vary considerably, each one necessitating a separate study with a view to defining the best method of treatment and, contrary to general experience with this process, it has been found that the same reagents were in most cases applicable, and good results were obtained on the different ores, including dumps, carrying considerable amounts of fines of many years' standing.

The plant is now making recoveries of from 80% to 85% of the mineral content, treating lead carbonate carrying silver and a mixture of carbonate, galena and silver chloride in gangues of hematite, quartz and calcite. The success of the process has justified adding another unit, which has now been completed, making a plant capacity of 50 tons per day.

The mill is of the gravity type, as shown in the accompanying diagram. The mill flow is as follows: Ore is drawn from the lower tramway terminal discharge shoot, weighed and delivered upon a grizzly provided with 1-in. spaces. The oversize is then fed to an 8 x 12-in. Blake-Hendy crusher, breaking down to 1-in. ring and discharging into a bin of 100 tons' capacity. The ore is fed from this bin by means of a Challenge feeder into a 20-mesh, rotary, conical screen which passes the oversize, with an addition of water in the proportion of two to one of ore, into a 4 x 3-ft. Hendy ball mill, the discharge end of which is fitted with a screen delivering a 20-mesh product mixed with the undersize from the Challange-feeder screen. The oversize in the latter case is returned to the ball mill for regrinding. By adopting this system a considerable amount of fines is eliminated from the ball mill. The pulp is then fed with a regulated mixture of oil and ground magnetite to two horizontal Murex tube agitators, each a plain steel cylinder 3 ft. diameter by 10 ft. long, revolving slowly, containing several hundred pounds of ¼-in. iron or steel punchings. These become oiled with the mixture and collect the mineral particles both fine and course in the form of a paste which adheres to the punchings. This paste is continously broken away by attrition and flows, with the pulp, through a slotted screen at the opposite end of the agitator, upon a brass shaking conveyor tray, which feeds it under a powerful electromagnet. The coated

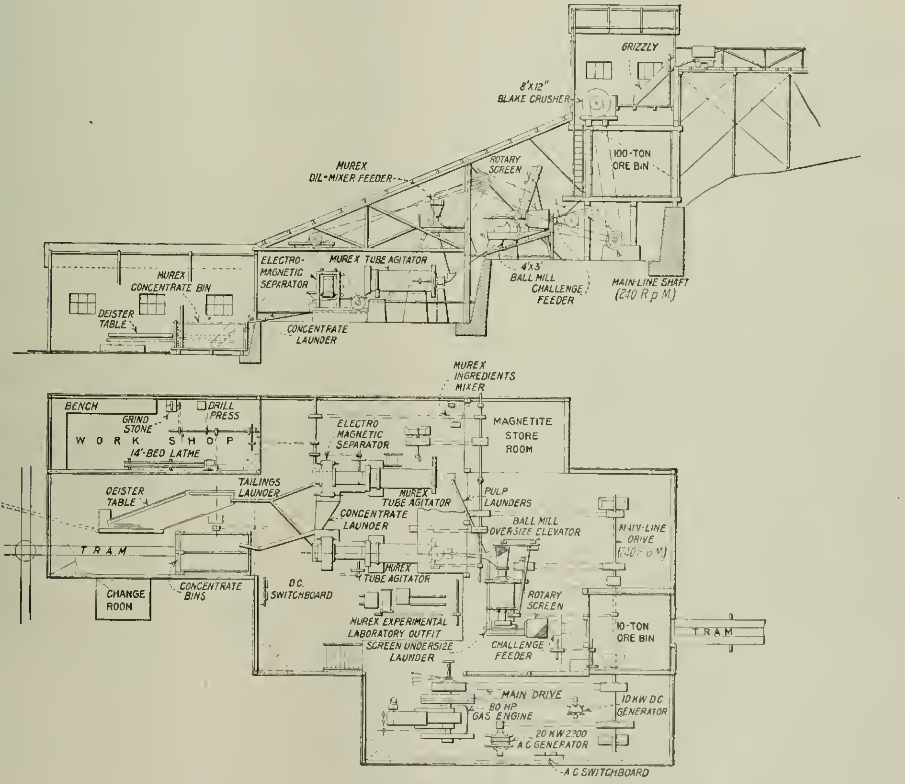
THE MUREX MILL AT DARWIN, CALIF.



MUREX UNIT IN OPERATION AT DARWIN

mineral particles are attracted by the magnet from the thin flowing stream of pulp to the undersize of an endless belt traveling at right angles to the shaking tray, thereby suspending them until out of the magnetic field, when they are washed off by water into a concentrates bin of large capacity, provided with a divisional bulkhead and end doors in which the concentrates are delivered and discharged alternately. They are finally hauled by tram wagons and sacked ready for shipment.

The overflow water from the concentrates bin and tailings together is passed over a Deister concentrating table. This is employed as a means of indicating to the millman any inefficiency brought about by bad coating or change in crude-ore feed, etc., at a glance. This can be seen by a small mineral streak appearing on the table. In such cases the operator makes the necessary adjustments in the oil-mixture feed to meet the new conditions.



PLANT OF THE DARWIN LEAD AND SILVER MINES AND DEVELOPMENT CO., AT DARWIN, CALIF.

The tailings finally pass to a large wooden spitzkasten where the coarse sands are settled out and the overflow discharges into four 20-ft. square settling ponds, from which the clear water is returned to the mill, to be used over again. This water contains a certain amount of emulsified oil, and is found to be beneficial to the Murex process, since the oil can be made use of in further ore treatment.

An 80-hp. gas engine provides power for the mill and a 10-kw. d.c. generator current for the magnets and lighting of the camp. Also a 20-kw., 2200-volt a.c. generator supplies power at the well, situated about two miles from the mill. The well pumps are electrically driven, of the vertical triplex type, provided with three 3-in. rams and 8-in. stroke and a working pressure of 450 lb. per sq.in. Special electrical equipment enables this installation to be controlled from the mill.

In addition to the plant as described, a complete Murex laboratory outfit is installed in the mill, to be used when the various ores are sent for experimental treatment by the Murex process.

The Murex system differs from all other processes as it is not necessary to produce those conditions in which the oiled mineral particles will float. Practically all other oil-concentration methods can be equally well made by the Murex process. In addition, certain separations can be made that previously have been considered impossible. Thus lead, zinc and copper carbonates containing sulphides can be concentrated from their various complex gangues. Blende and galena can be separated from heavy spar and from pyrite. In the cases of some ores it has been found that material of 2 or 3 mm. section can be treated successfully by this system, provided the mineral is freed from the gangues, and the latter can be eliminated in one operation, leaving the mineral values in such a form as to be easily smelted.

Various blends of oils, such as crude petroleum and residuum, are used in proportions of ¾% to 1¼% of oil per ton of ore to which is added equal quantities or more of ground magnetite. This mixture of oil and magnetite forms a permanent paint which, no matter how finely it may be divided or broken up, will always be found to be composed of the two substances in the same ratio.

Considerable skill is exercised in blending the various oil mixtures so as to make them amenable to each individual ore to be treated. The thickness of pulp, quantity of water and method of agitation are all important, particularly in cases of differential treatment, as in separating lead from zinc.

MILLING AND MUREX-TREATMENT COSTS AT THE DARWIN PLANT OVER A PERIOD OF 30 DAYS

15 lb oil @ 1 43 cents	$0 2145
17 lb magnetite @ 20 cents	2040
0 8 lb olaic acid @ 15 cents	1120
Labor three men @ $4 00	7500
Power and water supply	5000
Cost per ton	$1 7805

In the Murex process the ore need be ground only fine enough to free the mineral from the gangue. Both sands and slimes are treated together in one operation so that no classification is necessary, thereby reducing the crushing and running costs to a minimum.

The Phelps Dodge Concentrator at Morenci, Arizona

At the Morenci concentrator of the Phelps Dodge Corporation, at Morenci, Ariz., 14 cylindrical steel ore bins serve as storage for the run-of-mine ore. They are installed in parallel rows and have a combined capacity of 3000 tons. From these bins a belt conveyor carries the ore to the crushing plant, in which is installed a Gates No. 7½ gyratory machine, followed by three 48-in., horizontal, Symons disk crushers that reduce the ore to ¾-in. diameter. The crushing plant has a capacity of about 300 tons per hr. and is operated for one 8-hr. shift only each day. The dust is collected and drawn out of the crusher room by an electrically driven exhauster, thus making the department comfortable for men to work in.

From the crushing plant a belt conveyor carries the ore over an 18° incline, past a Blake-Denison weighing machine that records the weight of the ore passing up the belt, and this is checked by a Richardson measuring-type scale at the head of the conveyor. This conveyor delivers the ore to an automatic sampler, after which the general run of ore is distributed to the mill bins by a system of distributing belt conveyors. The mill is divided into two units, each having a capacity of 1000 tons, and both units draw ore from the same mill bin.

In each section the ore is fed by automatic plunger feeders to three Cole shaking screens, having 3½-mesh wire screen cloth. The oversize from these screens is sent to two sets of dry rolls. The material then passes into a closed circuit consisting of four wet Cole shaking screens and a pair of wet rolls, which reduces the entire product to 3½-mesh. The 3½-mesh product passes without classification to five Wilfley tables, equipped with Butchart riffles, which take out the first concentrates. The tailings from these Wilfleys are deslimed in a 6 x 20-ft. duplex Dorr classifier and pass to three 4 x 8-ft. Marathon mills, where the material is reduced to 48-mesh. The slimes overflow from the Dorr classifier is thickened in tanks with Dorr-thickener mechanisms. The thickened slime is then combined with the product of the Marathon mills and passes to a 4-ft. 6-in. by 15-ft. Dorr classifier, followed by two 6 x 20-ft. classifiers. The sands from these classifiers are treated on tables, the tailings going to waste. The overflow from the classifiers passes to flotation machines of the Rork type, and the flotation tailings are treated on Frue vanners. The flotation oils are added in the Marathon mills. This practice gives a rather poor oiling of the primary slimes, and experiments are being conducted with a view to securing better treatment of material of this class.

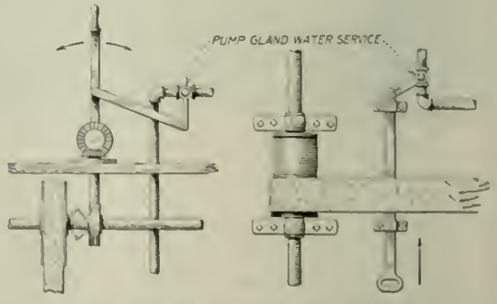
All table concentrates are dewatered in vacuum tanks, while the flotation concentrates pass to a 39-ft. Dorr thickener and are finally dewatered in a 14 x 14-ft. Oliver filter. All water from the concentrates is reclaimed, and all from the tailings except that which is necessary to transport them to the 14,000-ft. launder that conveys them to the tailings pond.

The recovery by gravity concentration amounts to practically 66% and that by flotation 10%, making a total of 76%. An efficiency of 12 tons per man-shift is obtained, and the plant operates about 95% of the time. The ratio of concentration is about 7:1; the water used is 510 gal. per ton of ore. Flotations concentrates average 19% copper, while the grade of the combined concentrates is about 12% copper per ton.

Clearance Water for Pump Glands

By A. W. Allen*

An automatic regulation of clearance water to the glands of centrifugal or plunger pumps handling sand or slime eliminates the personal element. Minimum of dilution is maintained, and the danger of scouring of the shaft or plungers with gritty packing is avoided. The accompanying illustrations show how an automatic service may be arranged for intermittently running pumps of this description, that on the left showing the arrangement applicable to a pump using a clutch on driving shaft and that on the right being used with a tight and loose pulley drive.



SUPPLYING WATER TO PUMP GLANDS

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*309 Broadway New York

Solution of Grinding Problems

By SERGIO BAGNARA
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The use of screen classifications as a basis for the construction of curves that may be used for purposes of comparison is a system that may be of service. The comparison of diagrams and curves will assist in estimating the value of grinding machinery.

It is a matter of daily occurrence in milling practice that two or more curves of grinding have to be compared in order to get information, more or less useful, for the subsequent mill treatment of the pulps examined. The comparison consists often of the mere inspection of the two or more plots obtained and, unluckily much oftener, of two or more sets of figures referring to one or more of the sizes obtained. The information derived from this incomplete comparison gives by no means an idea of the absolute value of the curves.

In ball-mill grinding, especially when the curves are obtained from different types of machine, the information is still more incomplete and unreliable, since the different plots are referred to one another and not to a standard representing an ideal curve of crushing or intended to represent the most convenient sizing obtainable under well-defined circumstances.

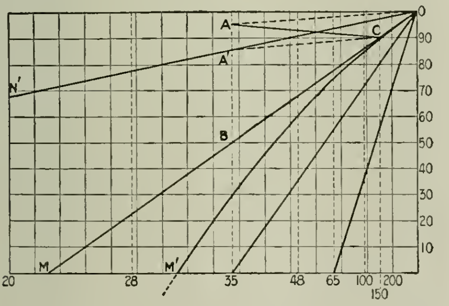


FIG. 1. EXPRESSING GRINDING CONDITIONS BY DIAGRAM

The question then arises: Is there any such curve, representing a sized pulp, that can be taken as the ideal curve, or the limit curve, or the curve of maximum efficiency?

Evidently, such a curve representing for each and every case a limit of grinding cannot be determined. The sizing of a pulp by grinding depends almost entirely on the ore and on the grinding device, the efficiency depends entirely on the milling operations after grinding, and both sizing and efficiency are intimately related to costs. It is, however, possible to determine the limit curve of grinding in each case with general methods that can easily be made to apply to any ore when the mineral-freeing value of the reduction is known.

The mathematical process for the determination of such a curve, as given here, refers to the disseminated lead ores of southeast Missouri, the grinding device considered being a well-known ball mill. The concentrating mill operates on three main classifications—the material between 9 and 2 mm. is treated by jigs, the coarse size between 2 mm. and 150-mesh is taken by tables, and all the minus 150-mesh is called slimes and sent to flotation, after being treated on slimes tables. It is the aim of the mill to make the least possible amount of slimes for both technological and economical reasons.

Assuming that the total extraction of the concentrating mill is to be brought to 90%, the ore must be ground in such a way as to have at least 90% of the lead as free-concentrating galena. By applying the laws of distribution of lead in these ores[1] it is easy to see that this condition is reached when all of it is ground to pass 100-mesh, or when the ore is perfectly sized between 65- and 200-mesh. By perfect sizing is meant classifying a pulp through a set of screens so as to leave on each one amounts proportional to the mesh opening of the screen. In other words, it is the size that is represented by a straight line in the cumulative direct plot of the ground pulp.

The perfect sizing from minus 65 is represented by the 0-65 line in Fig. 1. This line, however, does not satisfy the requirements of a line of good recovery, since it calls for 44.5% slimes (minus 150-mesh), nor does the 0-35 line, as it calls for over 20%, which is still objectionable.

From special crushing tests established, and described elsewhere, it appears that a theoretical minimum of 10% and a practical minimum of 12% slimes are obtainable on grinding our ores. According to the foregoing, a perfect sizing with 10% minus 150-mesh is the line *OM* cutting the 150 ordinate at the quota 90. The material represented by the line has evidently the disadvantage of being too coarse (50% minus 35-mesh), and since the amount of lead freed up to this size is only 65% of the total, additional grinding is necessary.

In order to make no alteration in the amount of slimes called for by this sizing—an amount that is an absolute minimum—the additional crushing has to be performed between the 35 and 150 ordinate only, and not beyond this ordinate. If we suppose that a fraction of the plus 35-mesh material has to be reduced, the diagram of additional grinding is evidently represented by the triangle *ACB*, point *C* being taken on the 150 ordinate and the *OM*. This additional grinding causes, theoretically, no variation of the amount of slimes, the triangle representing minimum grinding work permissible in the reduction of the fraction named.

Effect of Additional Grinding on Fines

Any additional grinding on coarse sizes will, however, affect the fines. In this case, by imposing the condition that the additional reduction shall be performed with the minimum expenditure of work, we may transform the diagram into another equivalent to it, extending the slimes line in such a way as to cause the minimum increase in the amount of slimes, since it is a diagram of minimum work. This transformation is indicated by the elementary geometrical construction indicated on the figure. Diagram $A'BC$ will therefore represent a diagram of additional reduction with a minimum expenditure of work and consequently with a minimum increase in the slimes.

Let us extend the OA' to N. From what has been said, the line of sizing answering our purposes will be seen to be OM after the reduction represented by the diagram NOM. To find the final curve, let us suppose that the line OM is a perfectly elastic and prismatic system and let us apply to OM the work of reduction, considering it as a force. The diagram NOM will then be the diagram of curvature of the line sought. The problem is here geometrically indicated. The general equation of the curvature of any line is represented in differential terms by the equation,

$$\frac{1}{r} = \pm \frac{\dfrac{d^2y}{dx^2}}{\left[y + \left(\dfrac{dy}{dx}\right)^2\right]^{\frac{3}{2}}} \qquad (1)$$

which, neglecting the term $\left(\frac{dy}{dx}\right)^2$ becomes

$$\frac{1}{r} = \pm \frac{d^2y}{dx^2} \qquad (2)$$

From the figure we have $r = k\,x$ and with the position (3) $k' = 1/k$ the (2) in absolute values becomes

$$k' \frac{1}{x} = \frac{d^2y}{dx^2}$$

which, after two integrations, gives

$$k'\,x\,(\log x - 1) = y \qquad (4)$$

where the logarithm is hyperbolic. This is the equation in finite terms of the limit curve. By means of convenient substitutions and ratings of variables it can be brought to the form

$$X\,Y = 1 \qquad (4')$$

which is the equation of an hyperbola of equal sides.

The curve (4) evidently touches the 0 point, since by making $y = 0$ it follows that $x = 0$. The value of k depends entirely on the fraction of plus 35-mesh to be reduced, and the fraction in itself is a function of the cost of making this additional grinding. The general expression of k is given by a consideration of triangles in the figure, and it is of the form,

$$k = \cot A - \cot B$$

which, after convenient substitutions, becomes

$$k = \frac{\sin(A - B)}{\sin A \sin B} \qquad (5)$$

an expression that can be calculated by logarithms.

From the data of the problem it is clear that the fraction of plus 35-mesh to be ground affects only the value of k. For each variation of this fraction k will assume a definite value, K, and the new curve corresponding to this value is homothetic to the limit curve just found, and the ration of homothety will be k/K.

In the case represented in the figure where we are supposed to grind nine-tenths of the plus 35-mesh material the (5) gives $k = 3.333\ .\ .\ .$ which, remembering the position made in (3) gives

$$k' = 0.3$$

The general equation in finite terms (4) therefore becomes

$$y = 0.3\,x\,(\log x - 1) \qquad (6)$$

and this curve was plotted in the figure. By making $y = 100$ the general expression (6) gives

$$333.3 = x\,(\log x - 1) \qquad (6')$$

which resolved by the method of successive interpolation brings the "all pass point of the cumulative direct plot close to the 28-mesh ordinate. The numerical characteristics of this curve are:

NUMERICAL VALUES OF THE CURVE

28-mesh all pass	
On 35-mesh	29.3
On 48-mesh	60.5
On 65-mesh	75.0
On 100-mesh	84.7
On 150-mesh	88.8
On 200-mesh	91.5
Through 200-mesh	8.5
Total	100.0

In plotting this curve it should be borne in mind that the value given to the independent variable x must be measured on the scale of the dependent variable y in order to obtain the correct ordinate.

That the curve found answers the conditions imposed for a curve of maximum efficiency is easily understood if we consider that:

It is the curve obtained after two subsequent reductions, both graded according to a line of perfect grinding.

The additional reduction made on the OM is one that produces a minimum amount of slimes by the conditions imposed.

The work of additional reduction is a minimum, which is one of the conditions.

The grinding represented by this curve frees more lead as free galena than the milling can recover. This is immediately recognized through the laws of distribution of lead in our ores.

It is plain, however, that this curve could not be a limit curve in all cases or under different milling conditions. It is possible, though, to determine another curve for the same process by simply changing the conditions of the problem. This statement is under the assumption that the cumulative direct plot of any sizing is a continuous function of the size. The assumption is permissible if we suppose that the set of screens on which the sizing is done is composed of an infinite number of screens or, in other words, that the grains of crushed product differ from one another by an infinitesimal amount, which is confirmed in practice.

In Fig. 2 is represented a cumulative logarithmic plot of the curve according to the general expression (6). By applying to it the laws of distribution of lead[1], it is possible to trace a graphic of the lead freed as galena in grinding according to this curve. This graphic is also shown on the diagram, and both analytically and directly it shows that the limit curve would free 94.5% of the total lead. Of this, a little less than 85% would be taken by tables and about 10% sent to flotation, but as the slimes tables recover, say, 50% of the lead fed, the amount really sent to flotation would be about 5% of the total in the feed; only 5.6% would still remain combined with the rock as middlings or chat.

In order to exemplify the advantage of referring to a limit curve when making a comparison of different crushings, two more curves have been traced on the diagram. One represents a pulp discharged by a Marcy mill and the other a pulp obtained in grinding similar material through a Marathon mill. Comparing these two curves with each other we can say that the Marcy grinds coarser on the coarse sizes and finer on the fine sizes than the Marathon, but which is the one that suits the milling exigencies best it is impossible to tell unless we refer both to the limit curve. By doing this, more features of each are revealed and an absolute value of the two curves obtained. In fact, it is easy to ascertain, for instance, that the tangent to the Marcy plot and the tangent to the limit curve on the 150-mesh ordinate are parallel. This means that the angle of contingency, and consequently the curvature, of both lines is identical at that point. This being also true in all the interval between 150 and 200, is shows that the Marcy mill has a minimum sliming capacity, this capacity being equal to that of the limit curve which stands to represent a minimum.

On the other hand, the sizing of the Marathon between 20- and 48-mesh runs in accordance with the sizing on the limit curve between 28 and 65. The two lines are congruent in the same vertical interval, and this means that a linear increase of reduction in the Marathon will give a pulp already sized according to the limit curve between 28 and 65.

The algebraic sum of the areas inclosed between each of the two curves and the limit curve—these areas being proportional to a work of grinding—is equal in each case. This means that the same amount of work is required in each case to bring the sizing to the limit curve. Conversely, because of the fact that the size of the feed was the same, it means that the Marcy requires a greater expenditure of work, or greater power consumption, than the Marathon in performing the same reduction.

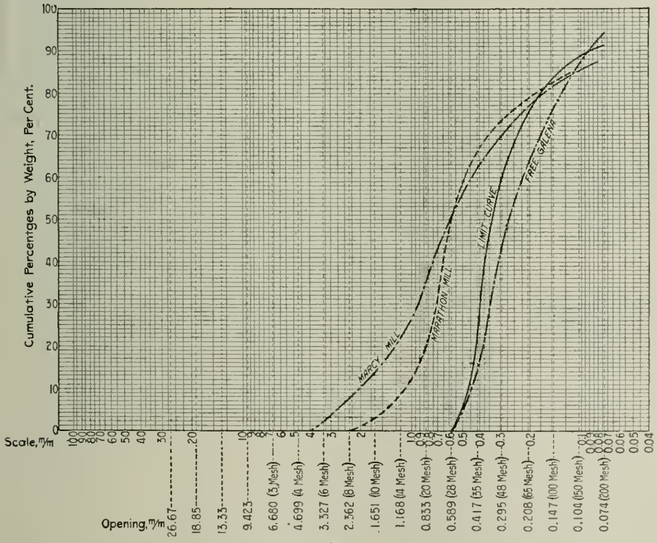


FIG. 2. CUMULATIVE LOGARITHMIC PLAT OF GRINDING CURVES

The use of the limit curve is of great advantage, and it should be determined by each mill. The minimum slimes possible to obtain under ideal conditions of grinding were ascertained according to the following considerations and with a very simple test designed to bring out typical conditions in grinding.

The slimes are due in crushing to two facts: First, the wearing action of the pieces either against one another or against the grinding device used; second, the separation of fine particles from the piece by blows that separate portions of the piece. If a piece of rock is crushed by hammering alone, the wearing action is eliminated and the amount of slimes obtained is a minimum.

A piece of rock was hammered on a steel plate in successive stages with the aim of obtaining a definite-sized product. At each stage both oversize and slimes (minus 150) were weighed and the slimes cumulated. Care was taken to hammer a piece at a time, and the results of different tests seem to agree fairly closely on 10 to 12% slimes for a grinding to pass 20-mesh. Of course this amount is entirely related to the amount of oversize obtained and of the reduction aimed at.

American Tube-Mill Pebbles

For a long time mill operators have been searching for a near-by source of pebbles for use in grinding mills, to take the place of those imported from Denmark, Norway, Sweden and France. The acute scarcity of the imported material during the last two years has led to increased activity in this search and has, apparently, produced some results. A rock formation about eight miles from Manhattan, Nev., is being exploited by Omer Maris. This rock is said to be a filled rhyolite of chalcedonous texture, and is extremely hard and tough. It occurs in layers 6 to 20 ft. thick, with occasional strata of unaltered rhyolite. The exploration has only reached a depth of about 30 feet. The rock is easily quarried and comes out in pieces without drilling, although occasional boulders, weighing a ton or more, have to be broken down by plastering or bulldozing. Usually the proper sizes are reached by breaking with hammers, and then given a vigorous tumbling treatment in a mill of the later type, whereby the pieces are brought to nearly spherical shape. They seem to reach this form more by a process of chipping than by wearing. The milling is done dry, only a little water being added to settle the dust. The pebbles produced resemble Norway flint and are said to wear about as well. Three mills in Manhattan and two in Tonopah are said to be using them and getting practically the same service out of them that was secured with the best imported pebbles. The material may prove to be of great importance at this time.

Mass Consolidated Mining Co.'s annual report for 1916 shows $94,556.03 spent in new construction, $730,811.94 in operating cost, and $194,634 in dividends. The income from 4,752,588 lb. of copper and 1812.5 oz. of silver, together with accrued interest, was $1,255,895.92. The balance of cash asset is given as $449,255.02 as at Dec. 31, 1916, compared with $213,361.07 at the end of the previous year. Labor cost has shown an increase of 18% over 1915 and supplies a corresponding increase.

Selective Lead-Zinc Flotation

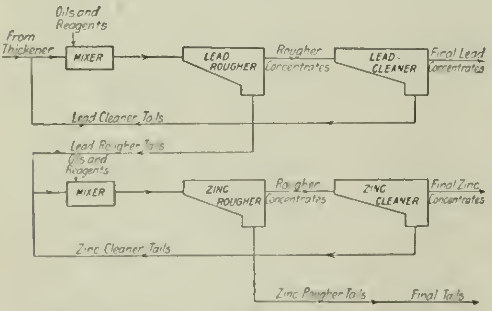
BY LUTHER L. KIRTLEY*

Experiment in solving the problem of recovering zinc and lead separately from the zinc-lead slimes led to the selection of oil flotation as the best method. Various oils were tried and various methods, the one ultimately selected combining in itself most of the advantages.

ABOUT a year ago, when I received the commission of working out a method for treating the slimes of a lead-zinc concentrator by flotation, I turned to the technical journals for suggestions. I was unable to get much help from them at that time and, indeed, but little has appeared during the last year. So I feel that perhaps a recounting of some of my troubles and their solution may be of assistance to others who are trying similar work.

SEPARATING LEAD AND ZINC CONCENTRATES FROM SLIMES

The problem was to take for heads, the slimes that would ordinarily be treated on slimes tables, or perhaps the tailings from such tables, and produce by flotation alone, without the aid of tables, lead concentrates low in zinc and zinc concentrates low in lead. The slimes would assay on the average 6% lead and 8% zinc. The maximum percentage of zinc in the lead concentrates that the lead smelter would allow was 15%, and the minimum percentage of zinc that the zinc smelter would accept in the zinc concentrates was 30%.



FLOW SHEET OF THE SELECTIVE PROCESS

In order to get high-grade zinc concentrates, it was thought necessary to remove practically all of the lead before attempting to float the zinc, a conclusion that was borne out by the experiments. This condition divided the problem into two natural parts: (1) To get lead concentrates low in zinc, with tailings as low in lead as possible, and (2) to get zinc concentrates high in zinc and with as low zinc tailings as possible.

From the descriptions of the work at the Missouri School of Mines, it appeared that a good oil for lead is hardwood creosote and that a good example of such an oil is Cleveland Cliffs No. 2. Experiments proved that this is a good oil for lead, but that it brings up considerable zinc too. In order to keep the zinc down, the conditions were varied, and it was found that in an alkaline solution the zinc content of the concentrates was fairly low and that sodium carbonate was the best reagent.

In all these tests the dilution of the sample was between 15% and 20% solids, and the temperature was the same as that of the mill water. The oil was added at the rate of 2 lb. per ton of dry slimes in each case.

RECORD OF TESTS USING HARDWOOD CREOSOTE

C.C. No. 2. No reagent	Pb	SiO_2	Zn	Extraction % Pb	Extraction % Zn
Head	5.0		7.6		
Concentrates	19.3	38.1	12.3	55.4	22.3
Tailings	2.6	....	7.2	....	
C.C. No. 2 Reagent—H_2SO4 2 lb. per ton					
Head	7.4		10.4	..	
Concentrates	20.0	32.0	13.8	71.1	37.5
Tailings	2.9	..	8.2		.
C.C. No. 2 Reagent—NaOH 2 lb. per ton					
Head	6.0		9.2		
Concentrates	17.4	37.0	11.5	63.5	29.5
Tailings	2.8		8.2	.	
C.C. No. 2. Reagent—Na_2CO_3 2 lb. per ton					
Head	6.0		7.5		
Concentrates	11.4	49.0	7.9	66.3	47.4
Tailings	3.1		7.0		

From this series of tests it was concluded to apply the conditions used in test No. 4 and to go ahead with the problem of bringing up the zinc. After quite a large number of tests I found that a fuel oil called Texana No. 7, or No. 8 seemed to film the blende with oil in a satisfactory manner and that Georgia pine turpentine No. 205 (which is a mixture of crude pine oil, crude wood turpentine and "heavy products") worked well as a frother. Pensacola pine turpentine No. 350 (which is a crude pinewood oil) and also General Naval Stores No. 17 (which is a crude hardwood oil) worked well as frothers, but as the sample of the Georgia product was in better shape than the others, I used it in most of the tests.

I soon found that the hard part of the work with zinc was to get low tailings and that increasing the amount of oil above 2 lb. per ton failed to solve the difficulty. Sulphuric acid not only failed to give low tailings, but also produced dirty concentrates. About this time J. M. Callow described some of his methods, and one of them was the use of small amounts of copper sulphate to secure low zinc tailings. I found that by using it at the rate of ½ lb. per ton, I made satisfactory tailings. Copper sulphate was also tried in the lead run and found to be quite a help in securing low lead tailings if used in amounts under ¼ lb. per ton.

In all these tests the iron content of the concentrates was about 8%. The different oils seemed to bring up about the same amount of iron under all the conditions. Sodium sulphide, when present in amounts over 5 lb. per ton brought up the iron at a lively rate, but when present in amounts of about 1 lb. per ton, served to bring up additional zinc. This action is especially noticeable if the sulphide is added after most of the concentrates have come over and the effect of the oil has begun to diminish. These last concentrates have considerably less silica, strangely enough, and are frequently high in grade.

In these tests the conditions were the same as those in the lead tests. The mixture of oils was added at the rate of 2 lb. per ton. The proportion of the two oils varied between 50-50 and 80-20%, with the fuel oil always in excess.

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In making the cleaning tests to raise the grade of the concentrates, it was necessary to add some sodium carbonate to the lead concentrates, but the addition of copper sulphate did more harm than good. Without the copper sulphate the zinc content of the cleaner concentrates was about the same as that of the rougher concentrates, but with it the zinc seemed to come up at the same rate as the lead. In cleaning the zinc concentrates the addition of reagents seemed to be of no help. In all cleaning tests the addition of oil was quite unnecessary.

In making the tests, both the Minerals Separation type and the Callow type of machine was used. The latter seemed to give lower tailings than the Minerals Separation type, and concentrates that were broken down easily and easily cleaned as well, although the silica content was higher than that of the Minnerals Separation machine product. The selective action of the oils and reagents seemed to be more pronounced in the Callow type, especially in lead tests.

FLOTATION TESTS USING FUEL OIL

	Pb	SiO_2	Zn	Extraction % Pb	Extraction % Zn
Texana No. 8, Georgia No. 205.	Reagent—Na_2S 2 lb. per ton				
Head	2.4		6.0	..	
Concentrates	11.8	24.0	26.4	....	72.1
Tailings	0.3		2.0	....	
Texana No. 8, Georgia No. 205.	Reagent—$CuSO_4$ ½ lb. per ton				
Head	0.8		4.9	..	
Concentrates	11.8	32.0	20.9	.	71.0
Tailings	0.2		1.7	...	
Texana No. 8, Georgia No. 205.	Reagent—$CuSO_4$ ½ lb. per ton, Na_2S 2 lb. per ton				
Head	3.0		6.8		
Concentrates	12.9	24.0	24.0		81.6
Tailings	0.2		1.7		

At one time I was short of tubs in which to catch the slimes samples, and in lieu of anything better at hand I used tubs made by cutting an old oil barrel in half. There was enough oil left in the wood of the barrel to introduce some into the sample, and it practically destroyed the selective action. After that, I was careful to use only the galvanized iron tubs for the samples.

During the winter months the oils became cold and stiff and hard to handle. To correct this difficulty I made a little iron shelf on a steam radiator upon which I could place the samples of oil and get them fluid again. Soon I formed the habit of leaving the oils on the hot plate for longer and longer periods, and finally for perhaps a week at a time. About this time the results were not satisfactory, and I wondered if the constant cooking had removed some of the volatile constituents of the oils. Fresh samples of oil showed that this was exactly what had happened, for with the fresh oils the results were considerably better.

As there was but one machine of each type, I had to use the same machine for both the lead and the zinc runs. The lead content of the zinc concentrates seemed to be the same in cases where the lead tailings were very low as where the lead tailings were not so good. Of course the machine was being cleaned out each time between the lead and the zinc runs, but it was only after fairly flushing out with a quantity of water that the results became more consistent.

The samples in these tests weighed between 15 lb. and 20 lb., which gave products too large to dry and weigh direct. In order to figure the extractions, I needed a formula involving four variables, corresponding to (1) heads, (2) lead concentrates, (3) zinc concentrates, (4) tailings. Inasmuch as such an expression seemed unprocurable, I used Gahl's formula,

$$E = \frac{c(f-t)}{f(c-t)}$$

as described in the *Journal* of Apr. 1, 1916. To adapt this formula to the conditions, I took a sample of the pulp after the lead concentrates had come off, which was called the lead tailings, and enabled me to compute the extraction of the lead. Then by renaming the same sample "zinc heads" and taking a sample after the zinc concentrates had come off, which was zinc tailings, it was possible to figure the zinc extraction.

In order to determine the weight of dry slime in the wet sample I used the formula,

$$X = \frac{Sp.Gr.}{Sp.Gr.-1}\,W-F$$

which is the same as

$$W = \frac{Sp.Gr.-1}{Sp.Gr.} + F$$

where F is the weight of water in a given flask, W is the weight of the slimes sample in the same flask, and $Sp.Gr.$ is the specific gravity of the dry slimes.

The flask used was a 5-lb. acid bottle, which served two purposes—it gave a sample for assay and also gave the weight of the dry slimes in the bottle. By measuring the volume of the flotation machine with reference to that of the acid bottle, it was easy to determine the weight of slime in the machine.

The final results, showing the effect of cleaning tests, as noted in the table, are actual results and are averages of seven roughing tests the products of which were combined to make one cleaning test.

RESULTS OF CLEANING TESTS

	Pb	SiO_2	Zn
Average head assay	7.0		7.8
Average rougher lead concentrates	23.8	32.5	12.5
Average rougher zinc concentrates	14.4	23.9	24.3
Average rougher zinc tailings	0.7		2.8
Cleaner lead concentrates	35.8	21.4	12.4
Cleaner zinc concentrates	16.2	14.2	29.3
Extractions:			
Rougher zinc tailings	6.8%		23.8%
Cleaner lead concentrates	58.3%		18.1%
Cleaner zinc concentrates	27.1%		43.7%

In the foregoing examples, it will be noticed that the grade of the zinc concentrates has not been raised much. The assay of the cleaner zinc concentrates is the average from several samples taken during the cleaner test, the first of which was about 35% and the last about 27% Zn. By making the zinc cleaner test shorter, the grade of the product can be raised to 33% or 35% without any bad effects.

The effect of circulating the cleaner tailings back to the rougher cell seems to be beneficial rather than harmful. By doing this a thoroughly emulsified oil is introduced, which not only helps to get good results, but also cuts down the consumption of fresh oil.

As may be seen in the flow-sheet diagram, there are two separate circuits. This is necessary to the success of the scheme, for if the rougher zinc tailings were circulated back to the head of the lead machine, they would introduce into that machine oils that would bring up a large percentage of zinc and thus upset the selective action. Not only would the wrong oils be introduced, but also wrong reagents, and thus wrong conditions would obtain, so that probably the resulting concentrates would contain as much zinc as lead, if not more.

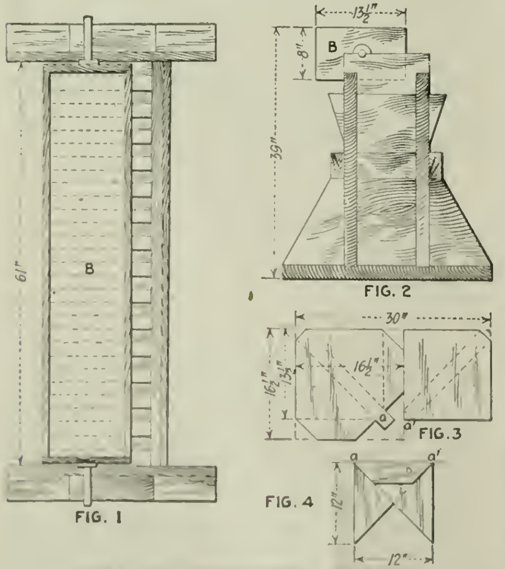
The mixer between the lead and zinc machines is necessary, since the heavy fuel oil used as the collector for the zinc requires thorough mixing, even more than the oil for the lead.

From the results secured it can be seen that it is possible to produce by flotation alone salable products from lead and zinc slimes. That such a system would be delicate goes without saying, for even in plants where simple systems are in operation, requiring little circulation, conditions vary a great deal at times and occasionally entirely destroy the flotation action. The results cited are not selected in any sense, but are the actual averages of results secured from samples taken from the mill under all operating conditions, and therefore I feel confident that such a system, under careful and close supervision, would prove a commercial success.

Ore Sampling at a Custom Mill

By Jackson A. Pearce*

Buying ore for a custom mill in a superannuated district is not an enviable avocation. This is especially true where decades of imposition on the part of ore buyers have developed a suspicious public. The Argo mill is one of several operating exclusively on custom ore.



SAMPLING ARRANGEMENTS PROVIDED

To allay the suspicion so deeply rooted in the district, we have endeavored to maintain a sampler free from the possibility of manipulating to our advantage.

The prevalent Western custom of sampling ore is to crush and pile the entire lot and shovel it over, setting aside every tenth shovel for coning and quartering. The possibility of error, intentional or otherwise, in this system is evident to one familiar with it. Instead of removing a tenth by shovel, we remove a fourth from a continuous stream of ore by means of a Snyder sampler. This operation is twice repeated automatically and continuously, the ore being crushed finer in each operation. A final sample of from 500 to 4000 lb. results. It has been customary with us to reduce this sample by the cone-and-quarter method. This method is open to serious error, as has been pointed out by the Bureau of Mines, and further, it is possible for an expert sampler to juggle the sampling, as has been pointed out by most of the shippers. To eliminate this objectionable feature, we have installed a cutter of the Jones, or Brunton, type. There is nothing particularly new in it except that it is larger than usual. This makes a sampler flow sheet as nearly free from manipulation as possible. It has gained the confidence of the shipper to an extent greater than anticipated. Whereas, formerly about 10% of the lots were resampled, only one has been resampled in the last 250 lots.

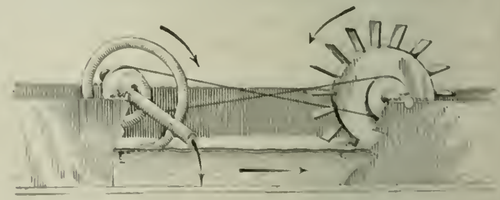
Fig. 1 is a plan of the cutter and Fig. 2 an end section. A box *B*, with a capacity of 200 to 250 lb., is filled, leveled and emptied upon the cutter. The operation is repeated until the sample is small enough to be handled on smaller cutters.

The sampler was made by the men at the plant. No. 18 iron was found suitable for the cutting arrangement. Fig. 3 shows the method of cutting a piece of 30-in. sheet iron. If cut along the solid lines and bent along the broken lines, the two resulting pieces may be bolted or riveted together, as shown in Fig. 4. Projections, *a* and *a'*, fasten it rigidly to the framework.

An Automatic Sampler

By A. W. Allen*

The apparatus illustrated herewith is well suited for sampling thin slime pulp or solution and can be adjusted in a way permitting a representative sample to be taken of any particular volume. The sample is delivered at a point above the level of the launder through a pipe bent in the manner shown, which also acts as a shaft supporting the sampler. The distance between sampler and waterwheel should be adjustable.



AUTOMATIC PULP SAMPLER

Shattuck Arizona Copper Co., of Bisbee, Ariz., reports that during 1916, 183,538 tons of ore was mined and 183,968 tons smelted for the total recovery of 18,161,763 lb. Cu, 4721 oz. Au, 314,918 oz. Ag and 3,413,445 lb. Pb, an average recovery of 5.384% Cu, 0.028 oz. Au and 1.867 oz. Ag per ton of copper ore, and 16.85% Pb, 0.165 oz. Au and 4.759 oz. Ag per ton of lead ore treated, the copper sold amounting to 17,308,670 lb. averaging 23.18c. per lb. Net profits for the year were $3,074,012, and four regular and four extra dividends amounting to $1,662,500 were paid.

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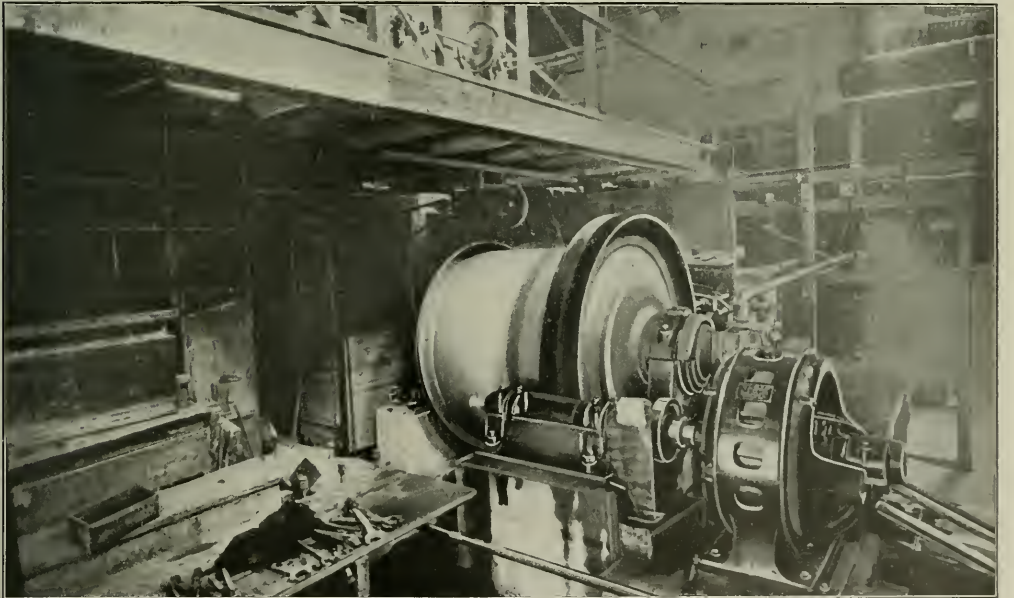
The Tom Reed Mill, Oatman, Ariz.

By H. P. FLINT
Mill Superintendent for the Tom Reed Gold Mines Co.

A description of the new cyanide mill of the Tom Reed Gold Mines Co., Oatman, Ariz., built to double the capacity of the one formerly in use. Ball-mill crushing is practiced, and agitation of slimes is by Dorr agitators. The mill crew has been reduced from five on a shift to two.

RESULTS of investigations made last fall by the board of directors of the Tom Reed Gold Mines Co. showed them that their mill and cyanide plant was too small and inefficient to treat profitably the grade of ore developed in the mine. In order to show satisfactory earnings on this ore it was deemed necessary to increase not only the efficiency of the mill, but also the tonnage treated. The management was then ordered not only to submit plans and estimates to double the mill capacity, using the old mill site, but to utilize as much of the old equipment as possible. Plans and estimates were submitted and accepted. They were authorized and ordered by the board of directors to be installed immediately. This new installation was designed and constructed by E. M. Rabb, manager of the company's property, and H. P. Flint, mill superintendent. The construction program was carried out and the new mill started operating without loss of time or any interference with operations of the old mill. Five months was consumed in the construction of the mill.



A PARTIAL VIEW OF THE INTERIOR OF THE TOM REED MILL, AT OATMAN, ARIZ.

The ore is delivered from the mine bin to an Austin No. 2 gyratory and a 15 x 22-in. Dodge crusher, breaking to a maximum of 2½-in. The crushed ore is discharged upon an inclined-belt conveyor that elevates it to the mill bin. This bin was enlarged by adding 8 ft. to the height of the old bin and extending it in length 8 ft. and also altering the last 14 ft. of the old bin from a 45° incline to a flat bottom.

A 16 x 16-in. steel chute was set in the bottom of this bin to deliver the ore to a 24-in. x 5-ft. Stephens-Adamson apron feeder. This feeder is driven and controlled through a No. 1 Reeves variable-speed transmission machine, having a range of adjustment of two to one. This machine is giving a very satisfactory control of feed.

The apron feeder delivers the ore to a combination scoop feeder (42-in. radius) of an Allis-Chalmers 6 x 5-ft. ball granulator, direct-driven by a 100-hp. slip-ring motor through Wuest herringbone gear and pinion. The coupling is of the bushing type. This mill is used as the primary grinder, with 5-in. chrome-steel balls, and is in closed circuit with one Dorr duplex classifier. The mill is lined with step-type manganese-steel lining.

The pulp overflow from the primary classifier flows by gravity to two pairs of similar classifiers on the floor below, each pair of which is in closed circuit with an Allis-Chalmers 5 x 6-ft. ball granulator used for finishing. Each of these mills is driven by a 75-hp. slip-ring motor through a Wuest herringbone gear and pinion and a bushing-type coupling. The ball feed to these mills is 1½-in. chrome steel; the liners are of the step type and are also of chrome steel. These two mills are provided with 42-in., radius, combination scoop feeders.

The primary classifier, the Reeves machine and apron feeder are driven by a 5-hp. motor; the few secondary classifiers are driven by another 5-hp. motor.

All the switches and starting equipment are placed together on a central switchboard within easy reach of the operator and commanding a view of all the machinery. The starters for the three ball granulators are provided with ammeters to facilitate load control on the mills.

The finished product from the two pairs of secondary classifiers flows by gravity to an 11.5 x 40-ft. redwood tank equipped with Dorr thickener, machinery driven by a 3-hp. motor provided with an ammeter, which normally registers 1.7 amperes. A minimum of 85% through 200-mesh screen is required and obtained in the finished product.

THE THICKENERS AND AGITATORS

From this primary thickener the pulp, at a specific gravity of 1.48 to 1.50, is transferred by a 4-in. air lift to the first of a series of four 11.5 x 40-ft. redwood tanks equipped with Dorr agitating machinery. These tanks are connected by 4-in. pipes placed on a 45° slope from the preceeding to the following tank. These agitators are driven by individual 3-hp. motors with ammeters on each to enable the attendant to note any overload, and normally pull 2.4 to 2.5 amperes each.

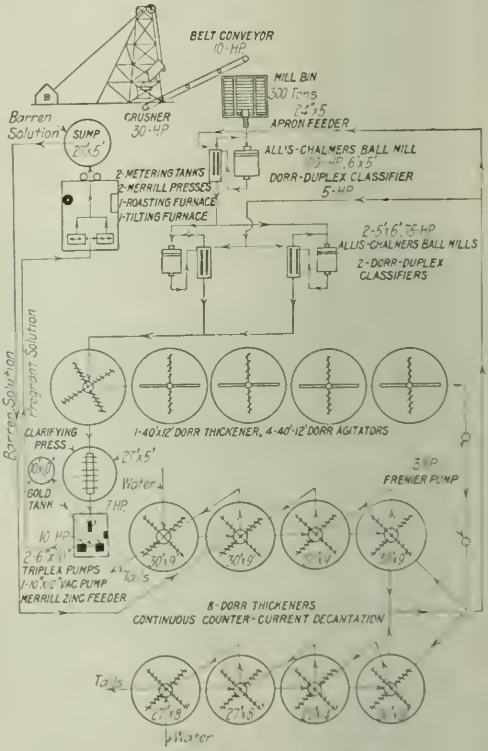
The four agitators replace four 10 x 38-ft. Pachuca or Brown agitators and give approximately twice the period of contact under double the duty required of the Pachucas, and show by results obtained 50% more efficiency when handling a sandy pulp.

From the last Dorr agitator the pulp is elevated by a 4-in. air lift to the lower of two 10 x 54-in. Frenier pumps, each driven by a 2-hp. motor geared to the pump. The lower pump delivers to the upper and this in turn to a distributing box. From this distributing box the pulp is divided between the head tanks of two series of four 9 x 30-ft. steel tanks equipped with Dorr thickener machinery operating on the counter-current decantation system. Each thickener is driven by a 3-hp. motor provided with an ammeter to indicate the load. The elevation of the pulp to the decantation tanks is necessitated by the fact that these tanks were part of the old installation and are and always have been above the grinding machinery.

The pulp discharge from each of the decantation thickeners is elevated to mixing boxes, where it meets the overflow solution from the second succeeding thickener and is discharged into the first succeeding thickener, and so on throughout the series. These decantation thickeners are being equipped with distributing launders made of 3-in. pipe, perforated at regular intervals along the bottoms and slotted on top to facilitate cleaning, it having been found by experiment that this does not interfere with the clarifying action and, further, gives an almost perfect mixture of solution throughout the tank. The overflow and discharge solutions show practically the same values for any given thickener, provided extraction is complete in the agitators. This is the case with the new installation.

The residues discharged from the last of each series of decantation thickeners pass over an automatic sampler and into a system of distributing pipes. These pipes lead out over the various sections of the tailings pond to facilitate the even distribution of tailings on each section of the pond in layers of proper thickness for "farming." The scrapings from these ponds are hauled by a Jeffery "quad" truck and delivered to the ore bin for re-treatment. The recovery from these scrapings is offset against the tailings loss each year.

The overflow solution from the head tanks of the two decantation series flows direct to the ball mills and classifiers, whence it passes to the primary thickener. The overflowing pregnant solution from the primary thickener passes to a 5 x 27-ft. steel sump tank in which are suspended forty-four 3 x 9-ft. filter leaves connected to the suction of a 12 x 10-in. Goulds vacuum pump. This pump discharges into a 10 x 10-ft. redwood sump that is connected to the suction of two 6½ x 10-in. Rumsey triplex pumps. These pumps are direct-driven by a 10-hp. motor each, one of which is always in reserve.



FLOW SHEET OF THE TOM REED MILL

PRECIPITATION BY ZINC DUST

Zinc dust is here added to the clarified solution by a Merrill zinc feeder and emulsifier through a 4-in. standpipe connected to the common suction of the pumps. These pumps lift the solution through two Merrill 300-ton precipitating presses situated in the refinery 45 ft. above the pumps. The amount of solution required by the emulsifier is drawn from the discharge of the precipitating pumps between the pumps and a check valve in the discharge line. The feeder and emulsifier are driven from the jackshaft of the pump that happens to be in commission. This arrangement relieves the attendant of the necessity of opening or closing valves or stopping or starting any separate machinery when the precipitating pump is stopped or started.

The rearrangement of the plant has permitted the discarding of two battery-solution pumps elevating 1000 tons of solution 45 ft; two 8 x 52-in. Frenier pumps which operated in closed circuit with the old tube mills and classifiers; one 4-in. Butters and two 2-in. Hansen centrifugal pumps which elevated 1200 tons of solution and 150 tons of crushed ore through 32-ft. vertical lift; one 2½-in. Hansen centrifugal pump, used intermittently to clean out the Pachuca agitators; one 6½ x 10-in. Rumsey triplex pump, used to return precipitated solution to the barren solution tank 100 ft. above the pump; three other minor pumps and one small Goulds vacuum pump.

From the Merrill zinc presses the precipitated solution flows by gravity to two 6 x 6-ft. alternating measuring tanks. The solution flows through a tilting launder operated by two floats. This launder in turn opens one and closes the other of the discharge valves of these tanks. The rise and fall of the solution in each tank is registered by Bristol water-level recording gages.

The solution discharges from these measuring tanks into a barren-solution 5 x 27-ft. steel tank. From this sump the barren solution is piped to the third tank in each decantation series. The water necessary to replace moisture discharged with the tailings is added to the fourth tank of each series through two 1-in. water meters. Water for the mill is obtained from the mine.

The refinery is placed at the top of the plant to eliminate duplication of pumping. It is housed in a corrugated-iron building 22 x 30 ft., having 10-ft. walls and a ventilator the full length of the building on the gable. The two precipitating presses are ranged along one side with the spigots toward the wall, while on the other side are two roasting muffles and a Steele-Harvey, No. 150, tilting furnace.

The mill is at present operated by a regular crew of two men on a shift as against a regular crew of five men formerly employed.

To Find the Length of a Leather Belt by Weighing*

Put the belt on a pair of scales, get the correct weight, measure the thickness and width, and then lay the ruler across this chart twice and column *E* will tell the length in feet in a jiffy. The belt need not be rolled up neatly; it can be a jumbled up mess, as belts sometimes are, yet the scales will not lie. There is nothing miraculous about this method. It is based on the fact that leather belting weighs 0.035 lb. per cubic inch. So, knowing the width and thickness one can solve "backward" for the length. This chart, however, does away with the figuring.

For example, What is the length of a belt whose thickness is ¼ in., whose weight is 42 lb., and whose width is 10 inches?

Connect the ¼ (column *A*) with the 42 (column *C*) and extend the line to intersect column *D* as indicated by the dotted lines. Then run a line through that intersection and the 10 (column *B*), and the intersection with column *E* gives the answer as 40 ft. as the length of the belting in the rod.

When measuring the thickness of a belt, it is well to use considerable care, since a fractional part of an inch on this chart will make a great difference in the answer, as you may readily observe. If the belt is rolled up, measure the total thickness of ten layers. It is then easy to divide by 10. For example, if you find the total thickness of ten layers to be 2⅜ in., you know that to equal 2.375 in. Dividing by 10, the thickness of the belt is therefore 0.2375 in. You could not do much better with a pair of micrometer calipers even if it were considered desirable to do so.

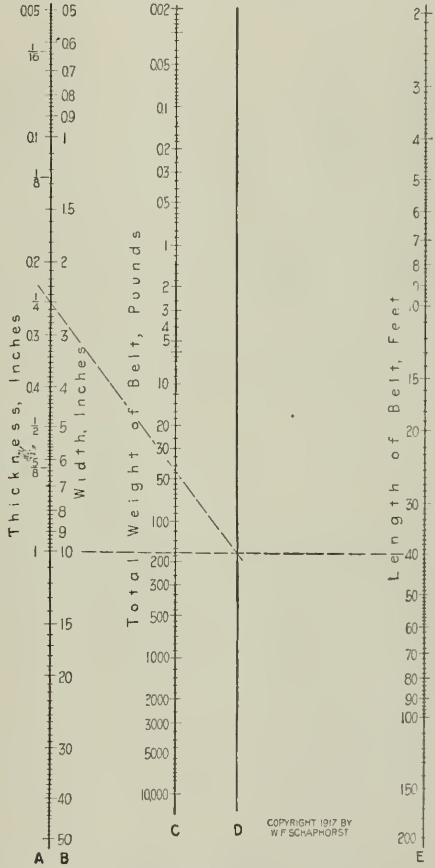


CHART TO FIND LENGTH OF LEATHER BELT WHEN WEIGHT IS KNOWN

The range of this chart is great enough to include all ordinary and many extraordinary belts. It is of service in a great number of instances where it would be exceedingly inconvenient to unroll the whole package of belting and put a tape line on it. Besides, no great amount of room is required to perform the operation.

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Concentration at Humboldt, Arizona

By GEORGE M. COLVOCORESSES
General Manager, Consolidated Arizona Smelting Co., Humboldt, Ariz.

Treatment at the Consolidated Arizona Smelting Co.'s plant is complicated by the variety of the ore, its hardness and the difference in various grades. Concentration, oil flotation and smelting are all practiced.

ALTHOUGH the Consolidated Arizona Smelting Co. of Humboldt, Yavapai County, Ariz., has conducted concentration of ores on a comparatively small scale, there are some features of this work that may be of general interest, and it is the purpose of this article to treat especially of these features rather than of the general operations of ore concentration.

The concentrating ore comes from the two mines operated by the company—the Blue Bell and De Soto mines—and consists essentially of an intimate mixture of chalcopyrite and iron pyrites in a gangue of quartz and sericite, chlorite and hornblende schists (Yavapai schist). The average composition of the concentrating ore from the two mines is approximately as follows:

AVERAGE COMPOSITION OF CONCENTRATING ORES

	Bluebell	Desoto
Au	0.035 oz.	0.03 oz.
Ag	1.40 oz.	1.30 oz.
Cu	3.20%	3.20%
Fe	15.00%	9.00%
S	17.00%	10.00%
CaO	1.00%	2.00%
MgO	1.00%	1.50%
Al_2O_3	4.00%	4.50%
SiO_2	57.00%	69.00%

The concentrator building was erected in 1905, intended at that time to treat only ore from the De Soto mine, which (as will be noted) is more siliceous, but the operations in 1905 and 1906 were not at all successful and only about 50% of the copper contents were recovered, the mill being closed down after treating a few thousand tons of material. The concentrator was started again in 1913, at which time the Blue Bell mine only was producing and 68% of the copper contents were recovered in the concentrator. Flotation was installed in 1914, and the De Soto mine was reopened in 1915. The main results of the concentrator operations during the last four years are given in the table following:

RESULTS OF CONCENTRATOR OPERATIONS

Year	1913	1914	1915	1916
Tons of ore treated	30,635*	51,906	81,544	80,304
Average Au contents of ore treated, oz. per ton	0.08	0.0355	0.034	0.036
Average Ag contents of ore treated, oz. per ton	1.66	1.233	1.05	1.07
Average Cu contents of ore treated, %	3.70	3.504	2.83	3.19
Tons of Con. produced	10,462	12,281	19,877	24,514
Recovery of Au in conc., %	51.28	55.55	62.50	80.30
Recovery of Ag in conc., %	49.94	59.15	70.50	79.9
Recovery of Cu in conc., %	67.59	78.12	88.60	92.50
Ratio of concentration	2.93:1	4.29:1	4.1:1	3.28:1

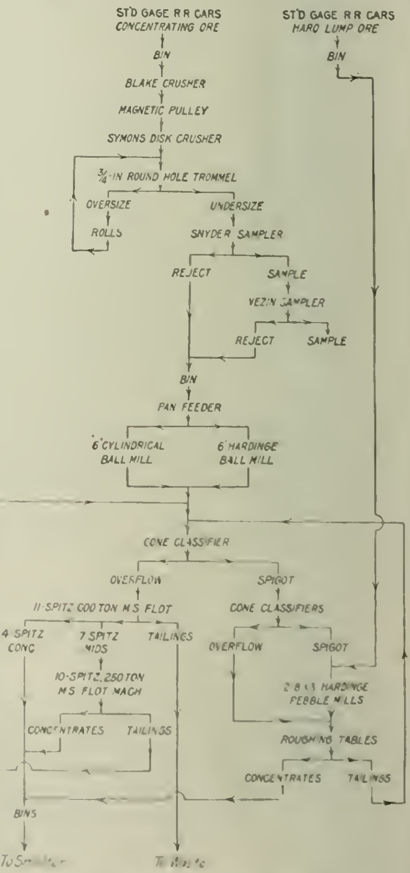
* Includes 1,603 tons of [illegible] ore with high gold values.

During 1915 and 1916 a certain amount of tailings from the old operations of the concentrator, averaging 1.75% copper, were treated and this reduced the average grade of mill heads and also tended to reduce the recovery of metals since the copper in the tailings is more or less oxidized and does not float as readily as the fresh ore from the mines.

During the latter part of 1916 and the beginning of 1917, new equipment was placed in the concentrator, and at present approximately 400 tons of ore is being treated daily with the expectation of treating between 500 and 600 tons in the near future as adjustments are made to the crushing equipment. The flow sheet of the concentrator has been altered and modified several times during the last four years and at present is represented by the accompanying diagram.

Some of the points that may be of special interest in connection with our concentrating operations are treated under the following headings.

Although for certain ores it is undoubtedly advantageous to take out as much mineral as possible in the form of a coarse product, an attempt to carry out this program has not been satisfactory at Humboldt. The minerals in the ore are intimately mixed with the gangue, and experience has proved that there is no thorough separation of the minerals and gangue until very fine grinding has taken place and until the particles of



FLOW SHEET OF THE CONSOLIDATED ARIZONA SMELTING CO.'S MILL ore have been reduced to pass 65-mesh or, better, to pass even 100-mesh. During 1913 and 1914 we operated jigs, the feed having been crushed to pass ½ in., but the jig concentrates were extremely low in grade and the jigs served mainly to remove the coarse pieces of rock as well as ore and, naturally, took out more iron pyrites than copper pyrites. It soon became apparent that the jigs could be eliminated altogether with advantage. After the jigs were removed, all the feed was crushed to pass 10-mesh and a table product was made, and at present the table feed will practically all pass 20-mesh.

As the concentrator is now arranged, the discharge from the ball mills is classified and the overflow goes direct to the flotation machine, while the coarse material is sent to the two 8-ft. Hardinge pebble mills. The discharge from the pebble mills goes over the roughing tables, and the tails from the tables are returned to the classifier in closed circuit. The roughing table concentrates contain about 4.50% copper, 15% insoluble and 38% iron. This product constitutes about 60% by weight of the mill concentrates, but contains only about 30% of the copper recovered, so that even at this stage we still recover a far larger proportion of iron than copper.

The average flotation concentrates contain about 15% copper, 20% of insoluble and 25% iron, and the mixture of the flotation concentrates and the table concentrates gives general mill concentrates averaging in the neighborhood of 9% copper, 16% insoluble and 30% iron.

The typical grading and assay of feed of the flotation machines and tails therefrom are shown in the accompanying table

GRADING AND ASSAY OF FLOTATION FEED AND TAILINGS

	Feed			Tailings		
Screen Size	Wt. % Solids	Assay % Cu	Wt. % Cu	Wt. % Solids	Assay % Cu	Wt % Cu
On 65-mesh	7.5	1.18	3.4	7.2	0.56	12.7
100-mesh	11.5	1.62	7.1	12.5	0.38	13.7
200-mesh.	20.4	2.33	18.0	22.2	0.22	13.5
Through 200-mesh.......	60.6	3.08	71.5	58.1	0.39	60.1
Total	100.0	2.05	100.0	100.0	0.39	100.0

Now, since the subsequent handling, roasting and smelting of concentrates are expensive, it is our aim to make as high copper concentrates as possible, and for this purpose the selective action of the flotation machine is very valuable as showing a preference for copper over iron. On the other hand, the gold and silver values in our ores generally follow the iron rather than the copper, and hence we do not desire to lose the iron if in so doing an unduly high loss in precious metals is sustained, and, moreover, up to the present time we have always found that a better recovery is made by the flotation plant if the heavy iron sulphides are removed from the ore before it is treated in the flotation machine.

These factors necessitate careful calculation and the accumulation of a considerable amount of data on which to base such calculations, and just at present we are not prepared to state definitely whether it will pay to continue, as at present, to make roughing-table concentrates and then to follow this with the flotation machine, or whether ultimately we shall find it to our advantage to float our minerals first and afterward table the tailings for such coarse mineral particles as may be contained, as is at present the practice at Inspiration. The calculations are complicated by the metallurgical conditions at the smeltery, where, up to the present time, we have always had an excess of silica to offset which we have been obliged to purchase basic flux (either limestone or basic copper ore), and in the custom material that we have purchased, we pay four cents per unit for the iron and lime contained and charge the shipper for all silica contained. It is therefore obviously to our advantage to retain the iron in our concentrates, provided that by so doing we do not make too low-grade concentrates on which the smelting costs would offset the gain in fluxing value.

Crushing and Grinding the Ore

Crushing and grinding has presented several difficulties, owing to the nature of the ore, which is exceptionally hard and tough. In starting out to enlarge the capacity of the concentrator, we used a jaw-crusher to reduce the ore to about a 3-in. ring and followed this with a Symons disk crusher which was intended to deliver a product passing a 1½-in. ring, and the product to be delivered to a 6-ft. cylindrical ball mill and a 6-ft. Hardinge ball mill which were intended to reduce practically all the feed to pass 8-mesh, the same to be further reduced by Hardinge pebble mills in closed circuit.

The ball mills of both types proved entirely unequal to the task allotted to them, not through any fault of their own, but simply because we were demanding something that proved impossible, and even the impact of a 5-in. steel ball failed to crack the larger pieces of ore, many of which went through the mills and came out as round unbroken pebbles the size of marbles. To remedy this fault we put a 1-in. trommel after the Symons disk crusher and returned the oversize, thus running the Symons machine in closed circuit. This practice considerably increased the tonnage that the ball mills would handle, but resulted in unduly heavy wear on the Symons disk crusher, and eventually we decided to install rolls to handle the oversize from the trommel and at the same time reduce the screen of the trommel to ¾-in. as used at the present time. The feed to the ball mills will now all pass ¾-in., and on this basis the ball mills are doing very good work and are crushing twice as much feed per day as could be passed through them when the 1-in. screen was in use, and it is our intention to install heavier rolls later and to reduce the feed to the ball mills to pass ½ in., which will make a better arrangement.

The extreme hardness of our ore may be shown by another illustration, but in this second case we have been able to utilize this hardness to good advantage. The fine-grinding of the ore in 8-ft. Hardinge pebble mills was previously, for a short time, done with flint pebbles and the cost of the pebbles for grinding the very hard ore amounted to upward of 15c. per ton and would have been considerably more at the present higher price of pebbles. Gradually we substituted for the pebbles our own ore from the Blue Bell mine, using blocks of ore about 4 or 5 in. in diameter, and choosing this material from the stopes in which the ore was hardest and heaviest. For a long time past no pebbles at all have been used, but the lump ore is fed into the Hardinge mills through the discharge end and the average consumption is slightly less than 9 tons of this ore per day, or about one-fiftieth of the feed to the mill.

The ore blocks as fed into the mills cost about $2 per ton more than the crushed ore as delivered in the regular manner, but the mineral contained is, of course, added to the concentrates as these grind up and amply repay this extra charge, and therefore the net saving in using block ore instead of flint pebbles may be considered as 15c. per ton of ore concentrated.

Generally speaking, the commercial minerals in our ore float in an entirely satisfactory manner and when clean sulphide ore only is sent to the mills, an excellent recovery is obtained, sometimes as high as 95 or 96% of the values, including the recovery made by the roughing tables. Various mixtures of oil have been tried out during 1916; the average mixture used had the composition shown in the table

COMPOSITION OF FLOTATION OILS

67 7%	Standard Oil Co 's Stove Oil 27 plus
25 7	Pensacola Tar and Turp. Co 's No. 200
6 6%	other oils
100 0%	

and on the average 1.387 lb. of oil per ton of ore was employed, the cost representing just about three cents per ton of ore. At the present time we are using the mixture of oil shown in the accompanying table,

FLOTATION OILS NOW USED

70 4%	Standard Oil Co.'s Stove Oil 27 plus
24 9%	Pensacola Tar and Turp. Co 's No. 200
4 7%	Standard Oil Co.'s Calol fuel oil 24 plus
100 0%	

and the amount is about 1.31 lb. per ton of ore and the cost about 2.5c. per ton.

Operating on the hard ore mentioned with a comparatively small tonnage and a mill that was in the first case poorly designed and that has been remodeled piecemeal, the working costs are naturally rather high; the best yearly record was made in 1915, when the total cost of milling was $1.06 per ton exclusive of flotation royalty. The costs in 1916 were increased by the higher prices of material and particularly by the higher cost of labor, and the cost in that year was $1.36 per ton, excluding flotation royalty. A division of the working costs for 1916 is, excluding flotation royalty: Crushing, $0.391; grinding, $0.471; tabling, $0.262; flotation, $0.240.

IMPROVEMENTS IN METALLURGICAL TREATMENT

During recent years the improvements in concentration practice, and more particularly the advent of flotation, have worked a great change in the smelting conditions and practice. Flotation has not only made possible the profitable treatment of many ores that could not be successfully handled by gravity, but as an adjunct to gravity concentration has greatly improved the recovery of metal and the grade of concentrates produced, and to meet this situation the nature of smelting equipment has been radically altered, the blast furnace being more and more replaced by roasters and reverberatories. There are, of course, certain classes of ore that consist essentially of massive iron and copper sulphides, which naturally are treated in the blast furnace and for which no other means of treatment would be at all satisfactory; and conversely, such ores as are found in the porphyry coppers and in other mines with comparatively low-grade copper and high silica content can be treated only by concentration and subsequent smelting of the concentrates.

At Humboldt, however, much of our ore falls in what might be termed the "twilight zone" between concentration and direct smelting, and the decision as to whether certain portions of the ore produced should be concentrated or directly smelted in the blast furnace is a matter that can be decided only after careful calculation and the collection of a considerable amount of both milling and smelting data.

The smeltery at Humboldt is equipped with both blast-furnace and roasting and reverberatory plants, and very careful records as to the recovery and costs in both these departments must be utilized in deciding the best manner of treatment for portions of the orebodies that are neither very basic nor very siliceous. The very siliceous ore, coming largely from the De Soto mine and containing upward of 65% insoluble is, of course, a straight concentrating problem, and likewise the most basic ore at the Blue Bell, higher in gold and silver and containing in the neighborhood of 4% copper, 35% insoluble and over 20 units of iron and lime, constitutes an excellent blast-furnace charge. Between these two extremes the bulk of the production of the mine varies, and varying conditions, costs and recoveries in gold, silver and copper at the mill and smeltery determine just where the line between milling and smelting ore is to be drawn.

At present we find it to our advantage to concentrate all ore containing less than $2 in gold and silver and less than 3½% copper, where the insoluble exceeds 40%, which means that the iron will not exceed 16 or 17%. On the other hand, with the ore that is higher in gold, silver and copper than the foregoing and which (as usually follows) contains less insoluble and more iron, direct smelting is more profitable than concentrating.

As the development of our concentration proceeds and lower working costs are attained with better recoveries also, the balance should swing in favor of concentration, but on the other hand, as conditions and equipment at the smeltery are improved at the same time, factors in favor of direct smelting will be introduced, and the only way in which this question can be intelligently decided is by continually refiguring the calculations with the varying factors obtained from the latest cost and metallurgical records.

Enlarging a Pulley

Frequently it is necessary to increase the size of a wooden pulley by a fraction of an inch; up to ¼ in. may, in many cases, be successfully accomplished by applying layers of common newspaper, each layer being given a good heavy coat of shellac. Don't try to pull the wet paper tight—you can't do it. Lay it on smooth and trust the shellac to do the rest.

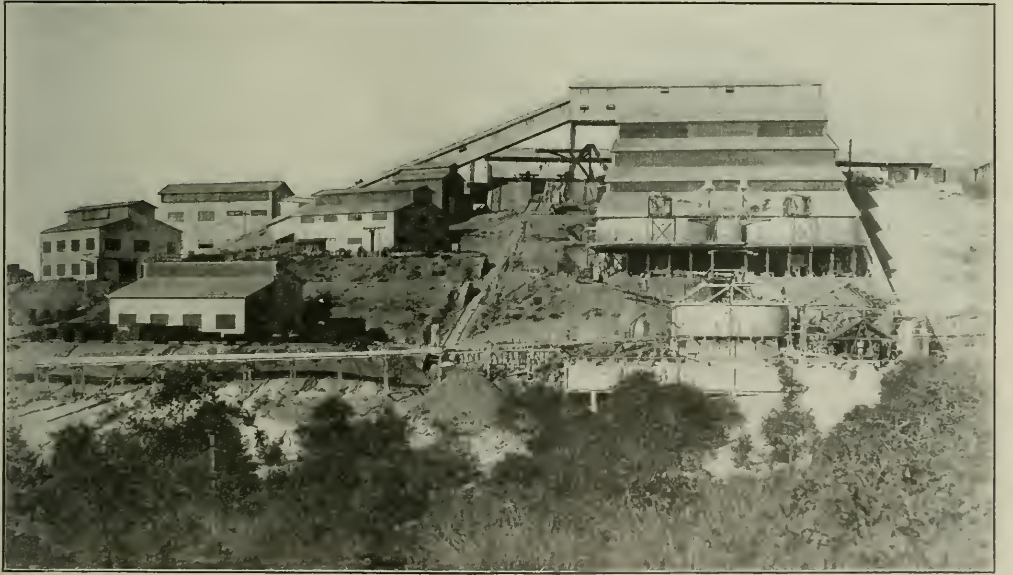
CADMIUM PRECIPITATION—In a recent issue of the "Chemist-Analyst" Andrew J. Whittstat suggests as a means of hastening the precipitation of cadmium as sulphide in spelter analysis that sulphureted hydrogen be passed into the solution from five to ten minutes, then make slightly ammoniacal with ammonium hydrate (thus precipitating both Cd and Zn) and acidify with dilute sulphuric acid, after which pass the gas in for about an hour to precipitate.

The Burro Mountain Concentrator

BY F. C. BLICKENSDERFER
Metallurgist, Burro Mountain Branch, Phelps Dodge Corporation

The Burro Mountain concentrator of the Phelps Dodge Corporation was started in April, 1916. It includes many new forms of machinery and some new ideas in concentration. The new features include fine reduction of ore in a dry state, installation of Butchart tables, Marathon mills and Rork flotation machines, Senn concentrators and the use of individual motors on most of the machines.

THE concentrator of Phelps Dodge Corporation, Burro Mountain Branch, is at Tyrone, N. M., on the El Paso & Southwestern System, about 20 miles west of Santa Rita and Hurley, and 15 miles south of Silver City. The concentrator consists of two 700-ton units and was designed to treat the low-grade Chemung and Burro Mountain ores of this company, according to the results from test-mill experiments obtained during 1914 and 1915. One section of the plant was put into operation in April, 1916, and the second section in May of the same year.



THE BURRO MOUNTAIN MILL OF THE PHELPS DODGE CORPORATION, TYRONE, N. M.

The ore is hauled from the Burro Mountain mines by standard-gage trains in side-dump all-steel cars of 30 and 50 tons' capacity. The total distance of haulage is about three miles, one-half of which is comparatively level and the other half on a steep grade. A Fairbanks track scale is placed near the mill for the purpose of weighing out concentrates and weighing in ore for scale tests, thus providing for convenient weighing at the point where it is required.

The ore cars are pushed to a track that extends the full length of the coarse-ore bins. These bins are 300 ft. long, 16 ft. 4 in. wide and 15 ft. 9 in. from the center of rail to the bottom. They are of concrete and steel throughout. The cross-sectional area of the bins is that of a rectangle with a V-shaped bottom. The sides of the V-shaped portion slope 45° and are reinforced with 10-lb. steel rails extending to the upper surface.

The ore is discharged through 35 pockets fitted with iron jaw gates operated by a rack and pinion. These pockets are spaced 8 ft. 4 in. between centers and permit of nearly all the ore being drawn without the aid of shoveling.

A feeder car that is capable of traveling the whole length of the coarse-ore bins serves any one of the 35 pockets. The car is driven backward or forward by means of a reversible gear wheel attached to the motor mounted on the feeder car. The car contains a slowly moving steel apron beneath the jaw gates to receive the falling ore, and the apron transfers it a distance of 8 ft. and discharges it upon a 30-in. conveyor belt, traveling 182 ft. per min. Before reaching the end of this belt, any wood that is visible in the ore is removed. The head pulley is magnetic to remove "tramp" steel.

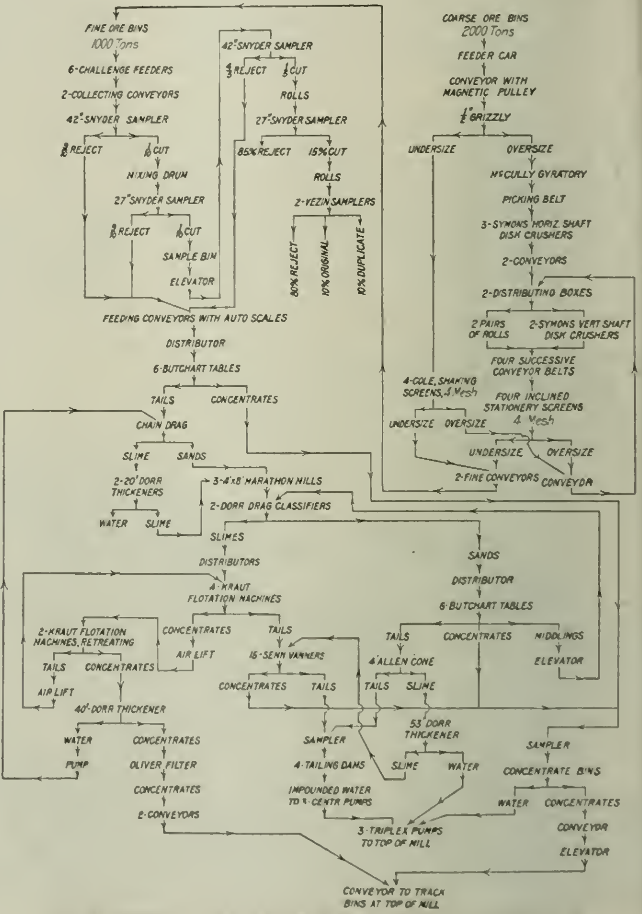
The ore discharges upon a bar grizzly, spaced ½ in. in the clear, the undersize going to the fine screens and the oversize to a No. 8 Telsmith gyratory crusher set to deliver a 3½-in. maximum product.

The gyratory product goes to a 48-in. picking belt traveling 60 ft. per min., over which is hung a powerful magnet to remove any "tramp" steel that has escaped the magnetic pulley. Pieces of wood are removed by hand, and any large, flat pieces of ore that have fallen through the gyratory are broken up with a small sledge.

The ore is then discharged to three 48-in. Symons disk crushers set to produce a maximum size of one inch. Two 18-in. conveyor belts, traveling 266 ft. per min., carry the 48-in. crusher product upward to a distributing box, whence it goes to two 54 x 24-in. Allis-Chalmers rolls and two 48-in. Symons fine-reduction disk crushers. The rolls and fine disk crushers are set to crush to a ¾-in. product. A 24-in. conveyor belt with a velocity of 258 ft. per min. collects the products from the two rolls and the two fine Symons machines and discharges to a series of three conveyor belts of similar size and velocity set at right angles, the final conveyor discharging upon stationary screens of 4-mesh opening. The screen oversize is received by an 18-in. conveyor traveling 277 ft. per min., which carries it back to be equally distributed between the two pairs of rolls and two fine disk crushers. There is a third and final magnet over this belt to insure complete removal of all "tramp" steel. The undersize from the gyratory grizzly is sent to Cole zigzag screens with 4-mesh openings, the oversize joining the oversize of the stationary screens, which returns to the rolls and fine disk crushers. Hence, the total mill feed has been reduced to pass a 4-mesh screen by dry-crushing alone, and in accomplishing this it is necessary to grind in closed circuit. The total undersize of the screens is collected by a 24-in. belt traveling 266 ft. per min., thence the ore is discharged to another 24-in. belt at 283 ft. per min., and at an inclination of about 20°, which belt leads to the top of the fine-ore bins. Here the ore is discharged upon a 24-in. distributing belt containing a tripper car which discharges the ore into the fine-ore bins. The tripper car is not of continuous reverse motion, but is capable of being moved forward or backward by means of a gear and clutch operated by one of the conveyor-belt pulleys. The fine-ore bins are 110 ft. long for both units, 25 ft. wide and 19 ft. deep; they are constructed of steel throughout and hold 2000 tons. The bins are partitioned off into four equal sections holding 500 tons each.

Three Challenge disk feeders are on the bottom of each 500-ton section to deliver the ore at a uniform rate. The ore is received by two 18-in. conveyors per unit, which discharge into the same hopper at the center of the unit. The hopper receiving the ore at this point contains a 42-in. Snyder sampler.

The Snyder sampler at the sample mill consists of a concave disk with two radial slots diametrically oppositely placed, with the ore stream impinging on the concave side. As the slots pass through the ore stream, a portion (10%) is deflected. The sample cut out is mixed in a revolving drum and discharged upon a second Snyder sampler, where 10% is cut out, the reject going to join the reject of the first cutting operation. The sample at this stage is 1% of the original ore stream and is collected in steel sample bins, over a period of 8 hours, when it is passed through the sample mill. An elevator carries the sample to the top of the sample mill, where a Snyder sampler cuts out 20%. This portion is crushed to 3/16 in., the product passing to another Snyder sampler, which cuts out 15%. This portion is crushed to ⅛ in., the product going to a 28-in. Duplex Vezin sampler, which cuts 10% and 10%, forming duplicate samples.

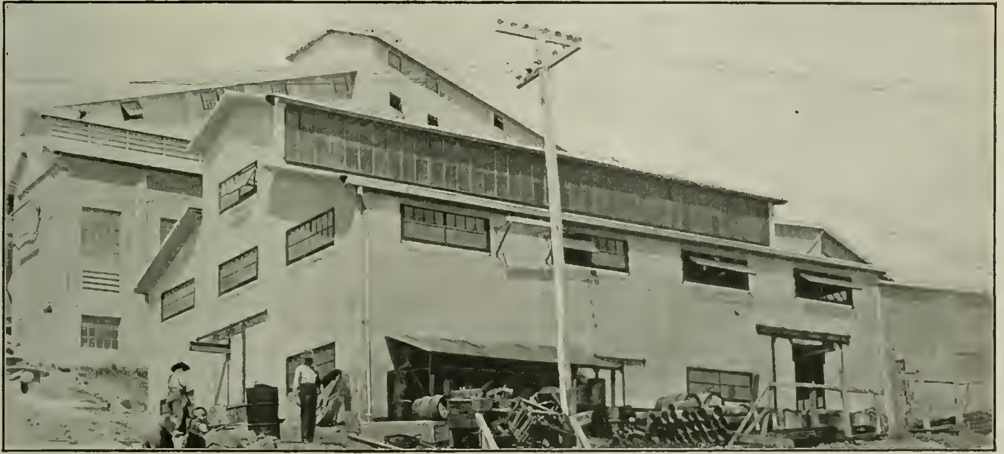


FLOW SHEET OF THE BURRO MOUNTAIN MILL, TYRONE, N. M.

The reject from the different samplers are collected in a bin at the bottom of the elevator, and when the sample has been run through, the reject is elevated in the sample-mill elevator and discharged upon the feeder collecting belts. There is a man elevator from bottom to top of the sample mill, with steel-rod steps, spaced 6½c., and with a velocity of 70 ft. per minute.

The total ore stream is carried by conveyor over a Blake-Denison automatic recording and weighing machine, to a distributing box. These scales have been tested against the railroad track scales (tested by a test car), and they were found to be 0.47% low in the weighing of 21,000 tons of ore. The automatic scales are delicate instruments, but with careful adjustment have given splendid results.

The ore is of two distinct classes. The east orebody (also called No. 1 division) is composed of a quartz porphyry and quartz monzonite porphyry, with an average grade of copper of 1.90%, of which 0.20% is copper in the form of oxide and carbonate, and the remainder chalcocite. The Chemung (also called No. 3 division) is composed of granite, felsite and small amounts of quartz porphyry, with an average grade of 1.90% copper, of which 0.09% is in the form of oxide and carbonate, the remainder chalcocite. Both ores contain small amounts of water-soluble copper compounds, requiring the addition of lime for protection of iron parts.



SUPPLY HOUSE OF THE BURRO MOUNTAIN MILL, TYRONE, N. M.

The first step in concentration is effected by six Butchart tables per unit. These tables are fed from a distributing box composed of a revolving drum with a sloping bottom in which there is an opening at the apex in the periphery. The opening revolves uniformly over six equally partitioned segments of a circle, and as water is added in the revolving drum, an equal distribution of feed takes place. The percentage of solids in the table feed ranges from 35 to 40. Each table treats about 150 dry tons of feed per 24 hours, with an initial tonnage of 700 per unit, since one table is usually shut down for reriffling or repairs. The table concentrates are discharged directly to the main concentrate launderer, the tailings containing 30 to 35% solids, going to a chain drag.

Before the tailings from the roughing tables are subjected to finer grinding, the excess slime and water is removed in the overflow of the chain drag, the coarse sand at the same time being dragged clear. The overflow goes to two 20 x 8-ft. Dorr thickeners, whose overflow of clear water is used for wash water on lower levels, and whose thickened discharge partly combines with the drag sand to form the feed for three Marathon mills. The remainder of the Dorr-thickener underflow bypasses the Marathon mills and enters the Dorr drag classifiers. The Marathon mill used in this plant is 4 ft. in diameter and 8 ft. long. It is driven by a direct-connected 50-hp. motor, transmission taking place in two stages of common gear reduction. It has been found that with rigid shafts the gears are easily stripped, so that the motor shaft contains a flexible coupling, and the shaft carrying the second reduction is also fitted with a flexible coupling. One of the mills has been driven by a flexible chain from the motor shaft to the first shaft of the Marathon drive gear, and so far it has proved successful. Experiments covering a period of three months have established the following facts: The best speed is 28 r.p.m.; size of new rod best suited for this class of work, 1¼ in.; horsepower required for driving the loaded mill, connected as noted, 48; weight of charge of rods at initial filling of mill, 16,000 lb.; and height of rods in mill, 22 inches.

The tonnage of each mill on section A, treating an ore that is medium hard, is 300 tons per 24 hours, and the tonnage of each mill on section B, treating a much harder ore than A, is 225 tons per 24 hour. The quality of the product is +35-mesh 10%, and —200-mesh 33%. This product seems best adapted to a subsequent separation of sands for tabling and slimes for flotation treatment. The percentage of solids in the Marathon mill feed is about 60 (nearly 2 : 1); pounds of rods consumed per ton of feed crushed, 1.70; pounds of liners consumed per ton of feed crushed, 0.17; and kilowatt-hours consumed per ton of feed crushed, 2.697.

These mills are operating satisfactorily, and it is intended to experiment further with them. A 20-ton crane serves the entire Marathon mill floor.

The fine-grinding product contains about 60% solids as it is discharged from the Marathon mills. The scheme of concentration requires a separation of sand and slime at this point, and two duplex Dorr drag classifiers have been selected to perform the operation. The drag classifiers are 18 ft. long by 5½ ft. wide, have a slope of

2½ in. to the foot, and the drive pulley revolves 100 r.p.m. Water is added to the Marathon-mill product as it enters the Dorr classifiers, while sprays and a water-box supply water at the head end of the machines to aid in washing the slime from sand. The sand removed by the classifiers contains about 5% of —200-mesh, while the slime overflowing the tail end contains about 15% on 100-mesh, and 20% solids (1 : 4). The percentage of solids at this point is carefully controlled on account of the flotation step following.

Fine-Sand Concentration

The Dorr classifier sands comprise about one-half of the Marathon-mill product, the drag slimes about one-half, or a separation into equal parts. The sand is delivered to a stationary distributor, from which six Butchart tables receive and treat the uniformly divided feed. These tables are of the same type as the roughing tables, except that their riffling is suited to the treatment of fine sands.

The proportion of solids of the table feed is 35 to 40%. Three products are formed—final sand tailings, middlings and finished concentrates, the middlings being elevated and returned to the Dorr classifiers, the concentrates entering the main concentrates launderer, while the tailings, containing about 20% solids, are sent to Allen cones for dewatering.

The Allen cone consists of a conical steel tank 4 ft. in diameter by 5 ft. deep. The discharge is regulated automatically. Feed is introduced to the cone through a vertical pipe extending below the plane of the top of the cone. Surrounding this feed pipe is a ring-shaped metal float, which is itself surrounded by a circular shield extending about 18 in. below the water level of the cone when full. The feed pipe and the shield act as guides for the float. The latter is connected by a system of levers to a hinged ball-valve on the bottom of the cone, and when the float moves, its motion is communicated to the valve. When the water and the feed enter the cone, the surface of the water is low and the float hangs to its lowest position, drawing the bottom valve shut. As the cone fills (in this case, with water and sand) the sand settles to the bottom and fills the tank, at the same time keeping water and slime floating above itself. When the sand has banked high enough to obstruct the entrance of feed between the bottom of the shield and the banked sand, the water level in the shield rises and forces the float up. This motion serves to open the valve and let some sand escape, when the normal condition is established.

When properly set, the cone is automatic in its action and requires but little attention.

The sand product contains 75% solids and 2% —200-mesh material. The cone overflow contains about 4% solids, most of which passes a 200-mesh. The cone is at once a good deslimer and dewaterer.

The overflow of the cones is pumped by a centrifugal pump to the lower Dorr thickeners and subsequently treated on Senn vanners. The cone sand is sampled automatically and then discharged to the tailings launder.

The overflow from the Dorr drag classifier goes directly to the flotation machines of the Rork type. Each Rork machine is driven by a 15-hp. motor, connected by a flexible chain drive at a reduction of 109 to 17.

Most of the oil is sprayed by steam jets into the Marathon mills, only a very small amount of light oil being added to the machines themselves. The Kraut & Kohlberg disk oil feeder is used to supply the oil. The oil storage is located in two 14,000-gal. horizontal tanks, beneath the roughing-table floor.

The flotation process has not been a pronounced success. It has been definitely determined that insufficient agitation is the primary cause of such difficulties. Recently the tailings from one Rork machine have been re-treated in another Rork machine, and very good results have been obtained. This has been applied only to section A ore (Division 3 of Burro Mountain mines). The B section ore (Chemung) is of a different character and requires about 8 lb. per ton of commercial H_2SO_4. Without acid the results obtained are poor.

The data shown in the table have been established by actual experiment.

FLOTATION DATA AT BURRO MOUNTAIN MILL

Tons dry feed treated by each primary cell	75
Percentage of solids in feed	20
Pounds oil per ton of feed treated by flotation	2.75
With an additional 8 lb. of acid for section B.	
Horsepower per ton of feed treated	0.20
Size of motor	15 hp.

Life of drum, about 6 weeks; if there are considerable amounts of sand in the feed, the drum will be cut out in 5 weeks or less.
Flotation process will not work in a neutral solution.
Section A ore is indifferent to acid, but section B ore demands it.

This type of flotation machine has the advantages of mechanical agitation, but at the same time it does not escape the drawback of a large amount of repairs and high power required.

Concentrates-Filtering Plant

The flotation concentrates go to a 40-ft. Dorr thickener, which reduces the percentage of solids from 6% to 35% with a clear-water overflow. A small amount of vanner concentrates is added to the flotation concentrates to give them porosity. The Dorr-thickener overflow is pumped back to the top of the mill and added as initial water to the roughing table feed in order that any light oils may be utilized again.

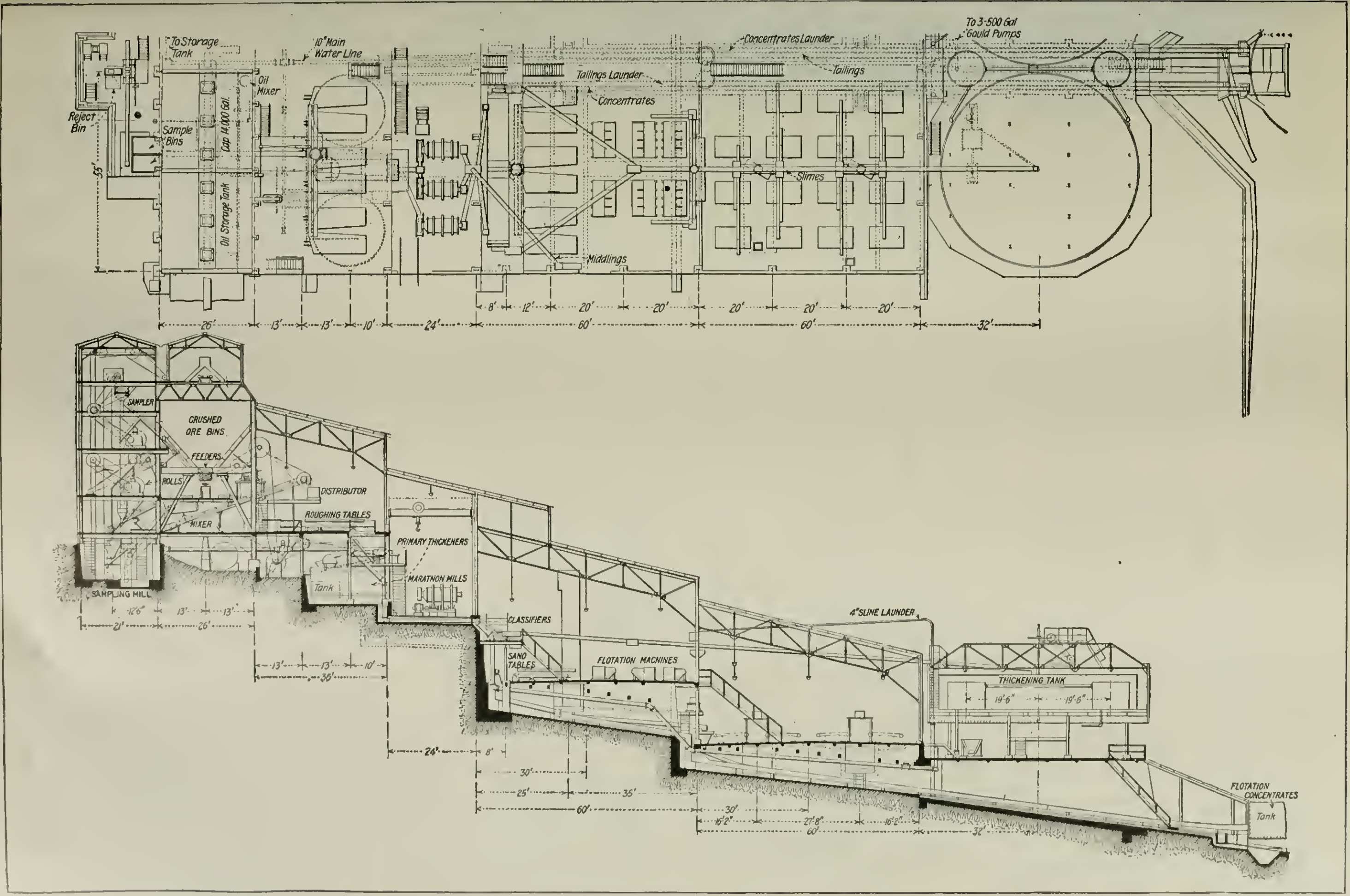
The thickener discharge is sent intermittently to a 14 x 14-ft. Oliver filter, which handles about 36 tons of flotation concentrates in 8 hours, with a range of solids in the cake of 20 to 30%, depending entirely on the amount of insolubles and alumina contained in the concentrates. The filter is operated only during the day shift.

A No. 3 Nash vacuum pump, operated by a 20-hp. motor, furnishes a vacuum of 21 in. on the drum of the filter. A filter canvas has a life of about six months.

The dried concentrates are collected on a small conveyor and elevated to another conveyor at right angles, thence discharged to the concentrates conveyor leading to the concentrates track bin at the top of the mill.

The tailings from the flotation machines are sampled and discharged to a distributor, which furnishes an even feed to 15 Senn pan-motion concentrators per unit. This type of vanner has both the side and end motion, the resultant action of which produces a natural circular pan motion. Each machine is 8 ft. long by 6 ft. wide, has a shaft speed of 150 r.p.m. and an adjustable cone speed for the belt travel. A 1-hp. motor is directly connected to each machine through ordinary gears with a reduction of 113 to 15.

The solids in the feed of the vanners are about 19%, and the dry tonnage per machine per 24 hours is 30.

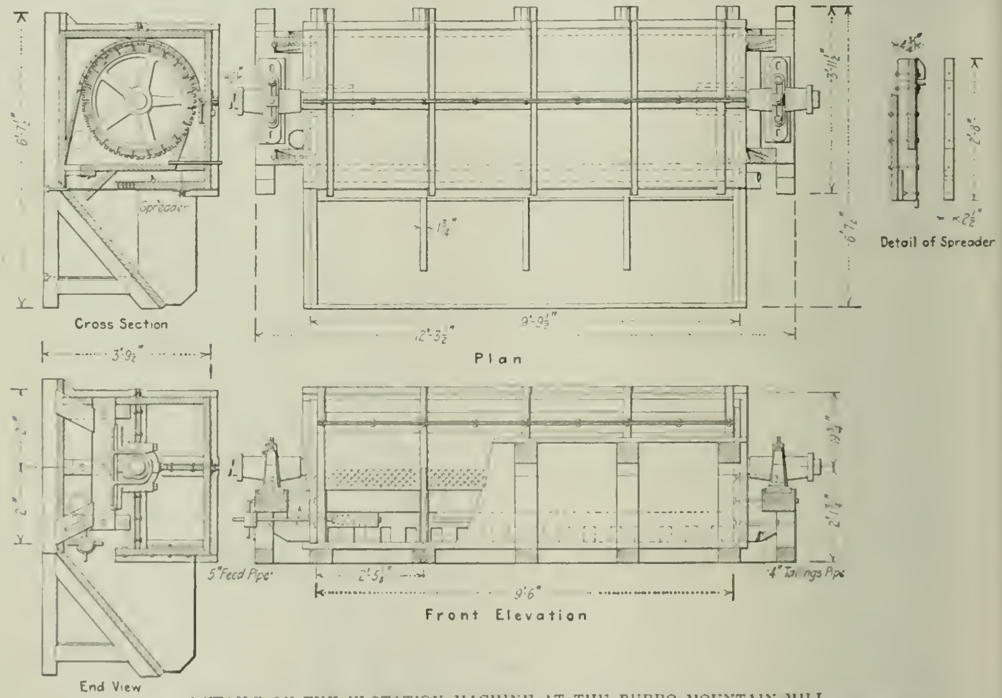


GENERAL PLAN AND SECTION OF THE BURRO MOUNTAIN CONCENTRATOR AT TYRONE, N. M.

The Senn vanner is able to take this unclassified feed of fine sand and slime and remove practically all the free mineral above 200-mesh, and makes a very good saving of the —200-mesh mineral that has escaped flotation.

The vanners make two products, the concentrates and tailings. The vanner tailings are sampled and discharged to the tailings launderer.

The coarse concentrates are conducted to six rectangular concrete bins at the bottom of the mill. They contain a porous bottom, formerly intended for vacuum drying, but it was found that a sufficiently low moisture content could be secured by allowing the concentrates to drain naturally for four or five days. The sluicing water overflows the tanks in the operation of filling and is pumped to the top of the mill from a small sump by two Gould triplex electrically driven direct-connected pumps and one 4-in. centrifugal pump.



DETAILS OF THE FLOTATION MACHINE AT THE BURRO MOUNTAIN MILL

The dried concentrates are discharged through four round holes in the bottom of the tank to a 24-in. conveyor running the length of the bins. While the process of filling is going on, the holes are closed by four plugs, extending to the top of the tank. The plugs are pulled by a chain block mounted on a crane, which travels above the tanks on a track supported on their walls.

The conveyor belt beneath the tank leads to an elevator which discharges to the 18-in. conveyor leading to the track bin at the top of the mill. The track bin is at such an elevation that the concentrates are loaded into cars by means of a chute, for shipment to the Douglas Branch smeltery at Douglas, Ariz.

The tailings from sections A and B unite and are led away in a launder with a 3% grade to four tailings dams in a small valley near the mill. The tailings contain about 25% solids and are impounded in the usual way by launder and trestle. The water that accumulates behind the dams is pumped back for further use by three centrifugal pumps.

The water supply is obtained from the mines of Phelps Dodge Corporation, Burro Mountain Branch, and is pumped a distance of three miles. A reservoir of 1,000,000 gal. capacity at an elevation of 25 ft. above the bottom of the mill tank stores the water and delivers it as required, part by means of a float-controlled valve and part directly.

The water system of the concentrator consists of a 16,500-gal. tank at the top of the mill, which furnishes water to the roughing tables. A line direct from the reservoir supplies the classifiers and flotation sprays.

Two auxiliary tanks are placed slightly below the level of the upper Dorr thickeners, receiving their overflow of clear water. These tanks supply wash water for the fine-sand tables and the head end of the classifiers. The auxiliary tanks keep a constant level by means of a float-controlled valve, supplying water from the top tank.

The clear water overflowing the concentrate bins is collected in sumps and pumped to a small tank on a level slightly below that of the two slime tanks, whose clear overflow is also received. This tank supplies water to the Senn vanners, the excess water flowing into another tank which is connected up with three Gould triplex pumps. Whenever this tank is filled with surplus water, a float-controlled switch starts the Gould pumps and the water is pumped to the upper mill tank. When the water level in the tank falls, the float-controlled switch stops the pumps. The quantity of water consumed per ton of ore milled is, on an average, 800 gal.

No attempt is made to economize on water by return pumping from the tailings dams, this being resorted to only when the supply of mine water runs low.

Drinking water is obtained from wells at the Fortuna pump station and is pumped to the concentrator, a distance of about three miles. A fresh-water tank and line, situated conveniently, furnish the mill with drinking and bath water.

Electric power is used exclusively and is obtained from the central power house of Phelps Dodge Corporation, Burro Mountain Branch, three miles away. The current is alternating and is received at 6600 volts in the transformer house through a choke-coil lightning arrester, an oil switch, then through three single-phase 300-kv.-a. transformers. The voltage is reduced to 440 and 220, the former for power and the latter for lighting.

ASSAYING AND SAMPLING

The sampling has been made as nearly automatic as possible. The Flood automatic sampler, with modifications, is the type installed. The vertical shaft of the original machine has been lengthened to protect the bearing from splash, and the cutters have been constructed of sheet copper with radial slots, instead of the parallel-sided slots as furnished by the manufacturers.

Each unit is equipped with the samplers set at the following points: Roughing table, concentrates and tailings; sand table, heads, tailings and concentrates; flotation, heads, tailings and concentrates; vanner, heads (which is flotation tails), tailings and concentrates; unit tailings and concentrates and a general tailings sampler, which, by the way, is the old familiar type of tilting water box. By this arrangement each group of machines is sampled daily and an accurate check of each separate step in the process of concentration is maintained.

All samples are transferred to a bucking room, on the roughing-table floor, which is fitted with a steam dryer, two Braun planetary disk pulverizers, one vertical disk grinder and a "coffee mill." Composites of the more important samples are made over 10-day periods and screen analyses made by a Tyler Ro-Tap testing sieve shaker. As an index to the accuracy of weights and assays, the saving of the concentrator since Jan. 1, 1917, figured on a basis of copper in ore and concentrates only, checks the saving of "assays only" within 0.2%.

The assay office is modern and up-to-date in every detail. The furnace room contains an electric still with a capacity of 3 gal. of distilled water per hour. In the center of the room is a Case gasoline-fired assay furnace, containing a 15 x 9 x 4½-in. muffle. This is employed in all gold and silver assays. The balance room contains 7 balances: 1 Thomson button balance, 1 Ainsworth analytical balance and 5 Thomson analytical balances.

The laboratory room is equipped with an electric muffle furnace 5 x 4 x 12 in., and is adjustable through a range of seven different temperatures. All daily fusions are made in this furnace. The same room is fitted with a hood containing three electric hot plates 18 x 24 in., with three heats, low, medium and high.

The electrolytic stand for the precipitation of copper assays contains twelve 4-volt vertical motors. Hot water is supplied this room by two 10-gal. electric water heaters.

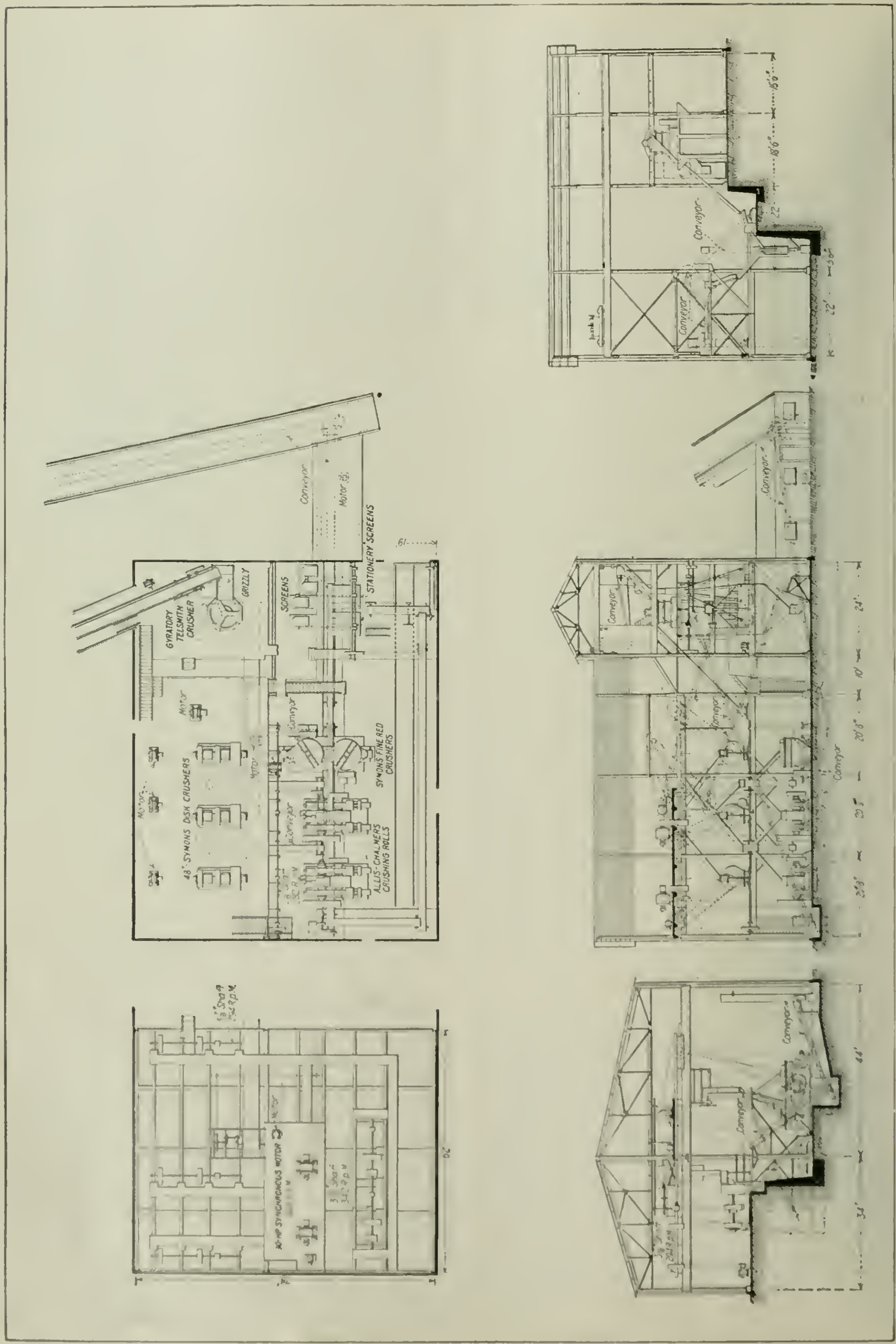
Determination of copper in mill heads and tailings: Weigh 1 gram ore, treat with 10 c.c. HNO_3 and 3 c.c. H_2SO_4. Run down the dense white fumes on hot plate, cool, add 5 c.c. HNO_3, add 25 c.c. water and bring to boiling. Fill up with water to 125 c.c. and cool in running water. Electrolize in Herman rotating anode cabinet with 1.8 to 2.4 amp. at 4 volts until H_2S on 2 minutes' standing with 2 to 3 drops solution fails to produce dark color.

Permanganate method for daily mill concentrates samples: Weigh out 5 grams concentrates, add 10 c.c. HNO_3 and 5 c.c. HCl. As soon as fumes cease, add 10 c.c. of a 4:6 solution of H_2SO_4 and run nearly to dryness. Add 40 c.c. water and bring to boiling. Make the boiling solution slightly amoniacal and exactly neutralize with concentrated HCl, when exactly 3 c.c. HCl is added in excess. The solution is now placed on a hot plate, and 10 c.c. of a 10% solution of sodium sulphite is added to reduce all iron and copper, indicated by a paling of the solution. To the reduced solution 10 c.c. of a 10% solution of potassium sulphocyanate is added and the solution just brought to a boil. The precipitate is allowed to settle and is filtered, the tip of the breaker being previously coated with vaseline and the paper being kept but half full, owing to the creepiness of the precipitate. Wash three times with moderately warm water, twice ⅔ of the filter-paper height and once the entire paper, the stems of the funnels being washed. The original beaker sides are now washed with a nearly boiling 7½% solution of sodium hydrate, and the beaker placed under the funnel. The precipitate is washed once with the sodium hydrate and then three times with boiling water. The sides of the beaker are washed down with boiling water. Add 30 c.c. of (1:2) H_2SO_4 and water and titrate with standard $KMnO_4$, 1 c.c. = 0.01 gram Fe. Low's modified table is used to calculate results. Potassium permanganate is standardized by both iron wire and ferrous ammonium sulphate; 1.4 grams ferrous ammonium sulphate is weighed out, dissolved in 100 c.c. 1:5 H_2SO_4 and titrated; 0.2 gram iron wire, rust free and polished, weighed into an Erlenmeyer flask with Bunsen valve dissolved in 100 c.c. 1:5 H_2SO_4, cooled and titrated.

Insoluble in concentrates: Weigh out 5 grams, add 5 c.c. HNO_3, take to absolute dryness at low heat; take up in 10 c.c. HCl and 1 gram potassium chlorate, run to complete dryness in low heat, finishing on high heat; cool, take up in HCl; filter, wash thoroughly with boiling water, dry, ignite and weigh.

Method for oxide copper in heads and tailings: Weigh out 1 gram of sample, add 25 c.c., 10% of H_2SO_4 (by weight), bring to a boiling point. Boil for 2 min., filter, wash and electrolyze at 1 ampere.

Iodide method for copper: Weigh out 5 grams of concentrate sample, place in 7-oz. beaker, moisten and cover; add 5 c.c. concentrated HCl, then several cubic centimeters pure bromine, then 5 c.c. HNO_3. Run down on a hot plate for a few moments, taking care to avoid running to dryness. Remove from hot plate and allow it to cool a moment. Add 5 c.c. concentrated H_2SO_4 and bake to strong fumes. Remove, cool and add 30 c.c. water and a drop of HCl to precipitate any silver present. Put on plate and allow to boil gently 10 min. to dissolve all basic sulphates. Filter into 8-oz. beakers through quick 11 cm. papers, wash thoroughly 5 or 6



CRUSHING ARRANGEMENT AT THE BURRO MOUNTAIN CONCENTRATOR, TYRONE, N. M.

times with very hot water. To filtrate, add 15 c.c. hypo solution (commercial grade, filtered). Make up with water to about 150 c.c., cover and place on hot plate and boil until precipitated sulphides have turned dark and solution is clear and colorless. Filter through quick, 11-cm. papers and wash 5 times with hot water. A few cubic centimeters of Na_2S solution are added to filtrate to make sure of total precipitation of copper or test for any AS, Sb or Bi present. The filter with the copper sulphide is placed in a porcelain crucible and ignited at a low red heat. To the beakers from which the copper sulphides were filtered, add 5 c.c. of chlorate mixture ($KClO_3$ dissolved in HNO_3) and wash out of porcelain crucibles into corresponding beakers the ignited sulphides. Run down to dryness over gentle heat and bake off all smell of acids or chlorine. Up to this point the electrolytic method is exactly the same in procedure as the iodide method. Continuing with iodide method, cool and add a few drops of HNO_2 from dropper, sufficient to dissolve Cu. Wash down sides of beaker with fine stream of hot water and add enough more water to make up to about 40 c.c. Add NH_4OH until solution is clear blue. Boil to expel excess ammonia and until dark precipitate of oxide of copper has formed, then add 5 c.c. strong acetic acid and boil a few minutes. Remove and wash off cover and sides of beaker and cool. Assays are then ready for titration. A standard solution of sodium thiosulphate of 20 to 30 grams per liter is used, which will read direct percentages of copper on ½ gram and give a factor very close to 1. The solution is standardized with pure copper foil daily. Starch solution is made up frequently from soluble starch powder. The KI solution has a strength of 1 lb. to 2 liters and on an average 8 c.c. will be required per assay, the equivalent of 1.8 grams of the salt. All solutions are made in quantity proportionate to their use.

Continuing now with the electrolytic method at the last point of similarity to the iodide method: Add 1 c.c. nitric acid, 4 c.c. H_2SO_4 and 15 c.c. of ammonium-nitrate solution (3 kg. to 10 liters of water), dilute to 125 c.c., boil and electrolyze with $^6/_{10}$ amp. for about 30 minutes.

The concentrates shipped to the smeltery are assayed by the iodide method and checked by the electrolytic method.

GENERAL LOCAL CONDITIONS

The concentrator is built on a slope that furnishes plenty of fall for gravity concentration. All structures are built of concrete and steel, and the floors and retaining walls of the concentrator are of concrete of appropriate consistency.

There is a carpenter shop, a machine shop and a supply house. All necessary woodwork and machine work is taken care of and a complete stock of mill supplies is kept on hand. An incline hoist extends from the bottom of the concentrator to the track switch at the top. Branch switches extend to the platform of the incline-hoist car from the Senn-vanner floor, sand-table and flotation floor, and the Marathon mill floor on one side and the carpenter shop, machine shop and supply house on the other. The machine-shop switch extends into the crushing plant. A 15-ton hand derrick at the top of the incline serves the hoist from the track switch, thus providing a safeguard on estimations that prevents the occurrence of errors.

The results, summarized since operation, are shown.

RESULTS OF BURRO MOUNTAIN MILL OPERATION

Copper in feed	1.90%
Oxide copper in feed	0.15
Ration of concentration	10:1
Extraction total	72%
Sulphides	77%
Fresh water per ton	800 gal.
Power consumed per ton	9.0 kw-hr.

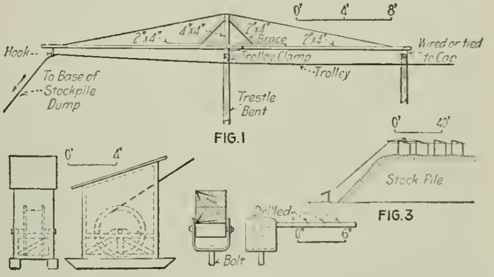
In view of the fact that the flow sheet has been constructed with entirely new types of machinery, this concentrator may be considered a new departure.

Extension Support for Stockpile Trolley

By D. E. Charlton*

Where motors are used in stockpile operations, several methods are in use for extending the trolley beyond the end of the dump. The accompanying sketches show one which is being made use of on the Missabe Range.

It consists of a beam (Fig. 1) fastened to a strap hinge and placed in a U-piece. The U-piece is bolted to the crosspiece of the last bent. (Fig. 2 shows hinge and U-piece in detail.) The beam is 2 x 4 in. and 31 ft. long and is reinforced at the middle by another 2 x 4 in., 10 ft. long. At the center is a 4 x 4-in. upright, 2½ ft. long and braced; ⅜-in. square iron braces extend from the top of the upright to within about 1½ ft. of either end of the beam. The beam being placed in position, one end is tied or wired to the cap or crosspiece of the bent next to the last one, and the other swings out over the dump. A hook is placed on the far end so that the trolley is carried from the last clamp through the hook and from there to the base of the dump, where the remainder of the wire is kept on the original reel (Fig. 3). Fig. 4 shows the arrangement of a shed which is placed at the base of the stockpile and contains the reel. The framework is covered with 1-in. boards and the whole mounted on skids. Doors may be provided at the front and back ends, although these are not necessary. The reel is mounted on a 3-in. pipe which is supported on the framework provided. An iron rod, placed through holes in the reel and resting on the framework, serves as a stop to prevent the reel from unwinding. As the stockpile is extended, the shed may be moved out and the reel unwound as needed, thus doing away with any splicing of the trolley. Also, with the continuance of the dump, new bents will be placed on top and the beam-support will be moved to the last bent each time.



TROLLEY EXTENSION SUPPORT FOR STOCKPILE

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*P. O. Box 2, Virginia, Minn.

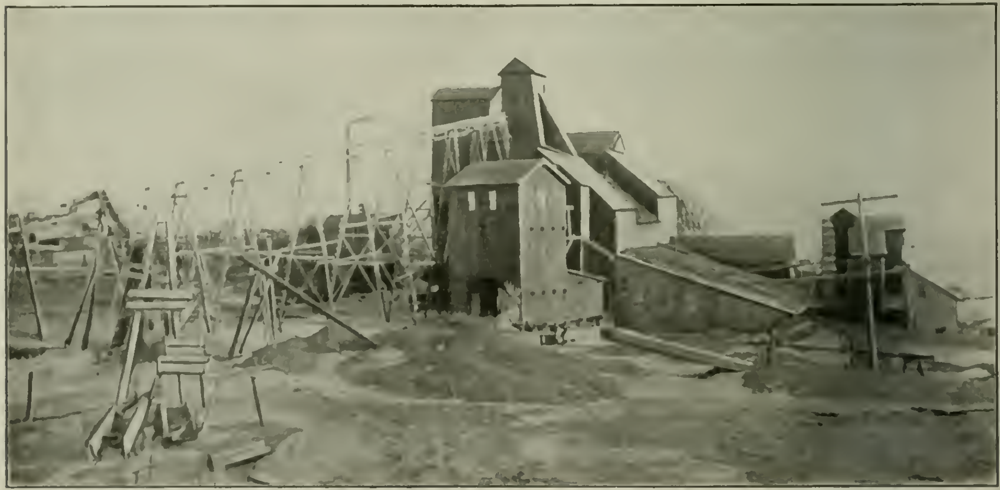
Milling Wisconsin Lead-Zinc Ores*

By WALTER SCHULTZ
Metallurgical Engineer, Wisconsin Zinc Co., Platteville, Wis.

The Wisconsin ores are complex and contain sphalerite, marcasite and galena closely associated. Separation is principally by gravity methods, utilizing jigs. The equipment of a typical mill is outlined.

Most of the ores milled in the southwestern Wisconsin district are of somewhat complex nature, for sphalerite, marcasite and galena occur intermingled and more or less closely associated. When the ore occurs in sheets it is free milling, but when it occurs disseminated in the country rock it is refractory. The country rock is dolomitic limestone, and as hoisted, the mill dirt assays up to 15% metallic zinc. An average value of heads in one of the large producers of the district is about 5% zinc. The average assay value of concentrates shows the wide range from 15 to 60% zinc.

The ore as hoisted in most of the properties is sent to a grizzly where it is hand-sorted and the large pieces of gangue, containing little zinc, are culled out and sent to waste. The amount of this gangue removed varies greatly, depending on the nature of the ore mined. A rough average is from 10 to 25% of the total hoisted. Since labor now is scarce and high-priced, some of the newer mills are treating all the dirt hoisted.



THE CHAMPION MILL AT BENTON, IN THE WISCONSIN ZINC-LEAD DISTRICT

The separation of the concentrates is based upon the relative specific gravities of the minerals, and machines utilizing the principle of hindered settling are used almost exclusively. The majority of the mills use either one, two or three jigs, and some mills use concentrating tables in combination with the jigs. The capacity of a mill is based upon the tonnage of dirt the rougher jig will handle. As a rule these jigs have a capacity varying from two to three tons of feed per square foot of screen area per 10-hour shift. All the other machinery is proportioned accordingly.

The dirt from the hopper passes to the shaker screen, where all the fines made in the mine are screened out and sent direct to the dirt elevator, thus reducing the cost of preparing the dirt for the jigs and eliminating a large amount of fines. This elimination tends to lower the amount of zinc lost in the tailings. The oversize product from the screen is fed to the crusher, where it receives a preliminary crushing. It then goes to the first rolls, where it receives further crushing. The crusher and rolls are spaced so as to crush in balanced stages, thus reducing the fines and preventing the rolls from being choked by oversize material. The dirt is then elevated and passed through a trommel for sizing. The size of openings used in this trommel is based entirely upon the nature of the ore being treated. With free-milling ore much larger openings should be used than with a complex or refractory ore. It is good practice to make the openings as large as the ore will permit. In this manner the circulating load and slimes in the mill are reduced. The undersize product from this trommel is fed to the rougher jig, while the oversize is reground by the second rolls, after which it is elevated and returned to the trommel. The concentrates from the rougher jig pass through the cleaner jig for further concentration, while the tailings pass to the tailings pile and the chats are reground and either returned to the head end of the jig or fed to a sand jig. The concentrates from the cleaner jig, and sand jig where used, compose the final product of the mill, while the tailings from both are returned to the rougher jig.

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*Adapted from an article published in "The Miner," of the Wisconsin School of Mines.

The general jigging practice consists of a roughing and cleaning system. The first jig makes a rough separation, and its concentrates pass to a cleaner jig for re-treatment.

Rougher jigs are of the Harz type and have from six to nine cells, eight being the average number, with a plunger and sieve compartment for each cell. In general practice these compartments are built equal in size. As the plunger is given a clearance of ¼ in. on all sides, there is a loss of hydraulic pressure due to the leakage around it, and as the areas of the sieve and plunger compartments are equal, the hydraulic head delivered to the sieve compartment is reduced by this leakage. To overcome this loss of head, the area of the plunger compartment should be greater than that of the sieve compartment, which condition would permit the use of a shorter stroke, a smaller hydraulic head and a larger throat in the jig, all of which tend to produce a freer action of the beds and a reduction in power consumption.

Care should also be taken that the plungers do not run in synchronism, but rather at 90° apart, for all these conditions tend to produce a freer action of the beds, less wear and tear of the jigs and a reduction in power consumption.

COMBINED ROUGHER AND CLEANER JIG

In one mill the jig is used both as a rougher and a cleaner jig. When used this way, the jig is usually given deeper beds, more back water, shorter stroke and finer-meshed sieves and is run at a higher speed than where used only as a rougher jig.

As cells Nos. 1 and 2 receive a heavy load of galena and marcasite, as well as a large overburden, these cells are not given the long stroke. In order to balance this condition and have free action of the beds, a large amount of back water must be used. As the specific gravity of galena is much greater than that of any of the other products being treated, and since this mineral has a cubical structure, it presents a small face for the water to work upon and therefore settles rapidly and forms lead-cleaning cells from which the lead concentrates are drawn. The float and chatty lead along with a large amount of marcasite not caught in cell No. 1, are caught from the hutch of cell No. 2 and returned to either the rougher or cleaner jig for re-treatment. As this product is lighter than the feed to cell No. 1, it requires a longer stroke with less back water than cell No. 1. The sieves used on these cells usually have ⅛-in. openings.

The practice of treating lead varies with the amount of lead found in the feed. If the feed contains a large amount of lead, three cells are used on both the rougher and cleaner jigs instead of two cells as is the case with a small amount of lead in the feed. The practice of returning the hutch products from these cells varies, it being either returned to the cleaner or rougher jigs. The best practice is to return the product to the rougher jig, for by so doing the lead is kept away from the mill concentrates made by the cleaner jig, resulting in a lowering of the lead assay of concentrates.

Cells Nos. 3, 4, 5 and 6 are used for the concentration of the sphalerite and marcasite. In the case of a one-jig mill these hutch products should not contain more than 2% lime, whereas in the case of a two- or three-jig mill these cells are used in the true sense of a rougher and carry lime to the extent of 4 to 6%. The jig when operating as a rougher has longer strokes, less back water, coarser sieves and shallower beds than when it is used as a one-jig mill.

Cell No. 3, which receives the richest feed of sphalerite and marcasite, produces not only hutch concentrates, but also bed concentrates which are drawn off as required to keep the bed at its proper depth. In order to obtain clean bed concentrates from this cell, a deep bed is desirable. As marcasite has a specific gravity greater than sphalerite, it is important that it be drawn from the jig as soon as possible, for if a heavy bed of marcasite be allowed to accumulate upon the jig, the sphalerite will have a tendency to pass to the lower cells. The reason for this is that the marcasite closes the holes in the sieves, preventing the sphalerite from being drawn down to form a hutch product. This results in a low efficiency of the jig and a high zinc content in the tails.

Cells Nos. 4 and 5 generally carry shallower beds with a long, slow, pulsating stroke and less back water than the preceding cells.

The depth of the beds should vary inversely as the richness of the feed and should at all times be as shallow as possible to give the maximum efficiency. The bed, in order to be a good filtering bed, should grade from fine to coarse sphalerites, followed by the heavier to lighter gangue materials.

The amount of top water increases at the lower end of the jig on cells Nos. 7 and 8, and the products to be recovered are lighter and, being in the form of chats and fine sphalerite, present a comparatively large face to be acted upon by the water, thus producing a tendency toward carrying them into the tailings. To overcome this condition, shallow beds, a long, slow, pulsating stroke and a small amount of back water should be used. As these beds are heavily drawn, sieves with smaller openings should be used to prevent an excess amount of fine free lime from being returned.

The pitch of the sieves used on a rougher jig is based entirely upon the amount of pitch given to the riffle. If it is found that the marcasite at the head of the sieve becomes smooth and rounded, permitting large amounts of lime to be deposited in the hutch and causing live and dead spots in the bed, it may be concluded that the pitch of the sieve is too great to allow the carrying of the bed forward over this grate. Live and dead spots will also occur if the beds are not properly spudded and kept clean. Care should be taken when placing a new sieve in a cell that the perforations are placed with the small opening up, for placed in this manner, they have a greater tendency to keep clean automatically.

THE USE OF CHAT DRAWS

There are three main types of chat draws used, as follows:

Gate and dam draw. This has a tendency to draw the beds too heavily at the point of discharge, thus causing live and dead spots in the bed.

The Missouri hole draw. This has two failings. The first is that it has a lack of water control. The second is that it causes a very noticeable live spot over the entire end of the cell.

The Center or Baldwin draw. This has far greater efficiency than the formerly mentioned types, for it has water control and also tends to draw the beds uniformly, thus avoiding live spots.

The portion of the sieve adjacent to the draw has a tendency to carry a shallower bed than the remainder of the sieve, thus causing this portion to draw more rough products than the remainder. This condition causes this portion of the sieve to have its openings worn much faster than the rest, and also produces a live spot that is liable to pull down an excess of lime.

If, in the operation of the jig, it is found that above certain beds larger amounts of fine, free zinc than coarse lime are present, it may be corrected by reducing the amount of back water.

Oversize products in beds, due to poor screening conditions, destroy a bed for the following reasons: They replace the filtering sized product, thus causing the bed to become loose, which results in a large amount of lime in the hutch and a loss of fine sphalerite in the tailings. Therefore these oversized products should be removed as soon as possible.

In order that the jig may produce to its maximum capacity, it must have even, constant power and load; proper speed and stroke; proper depth of beds, riffles and sieves; a minimum amount of top water, and the sphalerite and marcasite should be properly drawn from the beds on the head sphalerite cells, but enough should be allowed to pass to the lower cells to keep their beds new and in good condition.

Adjustment of the Cleaner Jig

As the cleaner jig is used entirely to produce finished concentrates, it is of importance to keep the adjustments very accurate, for this jig must make a high recovery of sphalerite and a clean separation from the lime. As in the operation of the rougher jig, the lead cells receive a fairly high speed, small-meshed sieves, deep beds and a large quantity of back water. Since the cleaner is used principally to separate the sphalerite from the lime and since its feed contains a greater amount of sphalerite than of gangue, a larger amount of back water and shorter strokes are necessary. Great care should be taken that no dead spots occur under the sieves, due to the presence of foreign materials, such as chips, leaves and waste. Also that the sieve rests do not protrude too far under the sieve, which would likewise produce dead spots. Live spots in the bed may be overcome by the use of baffle boards placed in the beds immediately below the spot, which will build up the bed. The water fed to the plunger compartment should be free from slimy material. If an excessive amount of fine lime be found in a cell, the back water should be increased, but if the lime is coarse and the sieve in good condition, the stroke should be reduced.

If the back-water adjustments fail to reduce the lime in the hutch, the following very simple and accurate method, originated by the author, may be used to determine whether the cell requires a greater or a smaller stroke:

The specific gravity of the bed is increased by the addition of a few shovels of marcasite. If this causes a reduction of the lime in the hutch, a shorter stroke is required, and vice versa.

It is good practice to increase the depth of the beds gradually toward the tail end of the jig, as the bed has a tendency to grow lighter, due to the presence of a greater percentage of chatty material and a consequent reduction in its specific gravity.

The feed to sand or chat jigs is composed of reground chats. They must have deep beds, a high speed and a large amount of back water. The accompanying table gives a complete list of mill equipment required for a standard plant:

EQUIPMENT OF A STANDARD ZINC MILL

1. Grizzly, spaced 8 in.
2. Hopper, 300-ton capacity.
3. Crusher, 20 x 8 in., Blake type, 400 r.p.m.
4. First rolls, 36 x 18 in., spaced, 40 r.p.m.
6. Dirt elevation, 25 ft. high, 60 ft., 20-in., 6-ply belt, staggered cups 9 x 6 in. spaced 9 in., speed 400 ft. per min.; upper pulley 26 in. diameter 60 r.p.m., gear drive; lower pulley 24 in. diameter.
6. Trommel, 48 x 96 in., mesh ⅜ in., 7/16 in., round punched plate, 10 gage, 15 r.p.m., slope ⅜ in. per ft., bevel-gear drive.
7. Return rolls, 24 x 18 in., 40 r.p.m.
8. Smittem elevation, 25 ft. high, 60 ft. 20-in. 6-ply belt, speed, 400 ft. per minute; upper pulley, 26 in. diameter, 60 r.p.m.; gear drive; lower pulley, 24 in. diameter; cups same as dirt elevation.
9. Trommel, 36 x 72 in., 15 r.p.m., slope 1⅜ in. per ft., ¼ in. round punched 12-gage plate.
10. Smittem rolls, 12 in. Cornish, 8-in. face, 60 r.p.m., direct.
11. Chat elevation, 22 ft. high, 50 ft. 18-in. 6-ply belt; cups 9 in., 5 in., 5 in., staggered; gear drive; top pulley, 26 in., 55 r.p.m.; lower pulley, 24 in. diameter.
12. Chat trommel, 36 x 72 in., mesh 3/16 in. round-punched, 12-gage plate, slope 1⅜ in. per ft., speed 15 r.p.m.
13. Chat rolls, 24 x 18 in., spaced, 40 r.p.m.
14. Tailing elevation, 60 ft. high, 130 ft. 8-ply 20-in. belt; speed speed 400 ft per min.; upper pulley, 26 in. diam., speed 60 r.p.m.; cups 9 x 6 x 6 in., staggered; spaced 9 in.
15. Rougher jig, 30 x 36 in., 8-cell.

Cells	Speed	Screen	Stroke	Depth of Bed	Pitch of Bridge, in.	Plunger
1	115	⅛	1¼	6	⅜	Level
2	115	3/16	1	6	⅜	Level
3	115	¼	1⅜	6	⅜	Level
4	115	¼	1¼	6	⅜	Level
5	125	¼	1⅜	6	⅜	Level
6	125	3/16	1⅜	6	⅜	Level
7	125	3/16	1⅜	6	⅜	Level
8	125	3/16	1 3/16	5	⅜	Level
16.	Cleaner jig, 30 x 36 in., 7-cell.					
1	220	5/32	3/16	6	⅜	Level
2	220	⅛	3/16	6	⅜	Level
3	220	3/16	3/16	6	⅜	Level
4	240	3/16	⅛	6	⅜	Level
5	240	3/16	⅛	6	⅜	Level
6	240	⅛	⅛	6	⅜	Level
7	240	3/16	3/16	7	⅜	Level

Foreign Trade in Copper

Exports of copper from the United States in April, 1917, are reported by the Department of Commerce as follows, the figures for March being given for comparison:

	March Lb.	April Lb.
Ore and concentrates, contents	461,131	516,958
Unrefined, in bars, pigs, etc		1,738,430
Refined, bars, etc	102,814,125	102,733,039
Old and scrap	402,752	1,236
Plates and sheets	8,024,657	3,834,546
Wire	3,442,580	2,651,964
Total	115,195,245	111,476,173

The weight of ore exported in April was 4168 tons; of concentrates, 725 tons.

Imports of copper into the United States in April, 1917, are reported by the Department of Commerce as follows:

	March Lb	April Lb
Ore and concentrates, contents	10,732,049	14,632,621
Matte and regulus, etc	218,957	3,617,594
Unrefined, in bars, pigs, etc	31,799,828	29,600,136
Refined, in bars, etc	239,291	224,005
Old, etc., for manufacture	1,691,056	1,853,157
Composition metal, copper chief value	47,679	11,330
Total	44,728,860	49,938,843

Material imported in April was 39,634 tons ore, 13,149 tons concentrates and 5231 tons matte and regulus, etc., which came mainly from Canada, Mexico and Chile.

Continuous Drum Filters

By CARL J. TRAUERMAN
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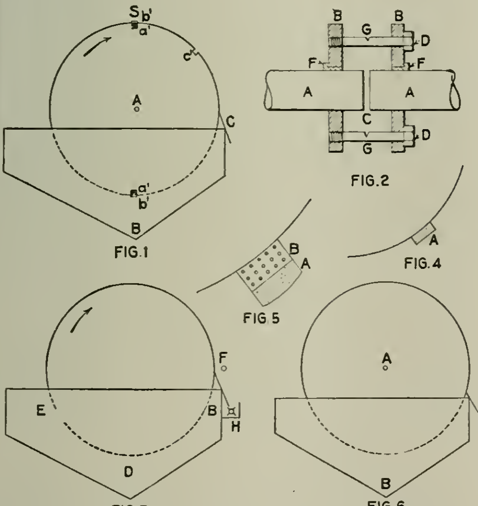
Practical suggestions and information are given as to the operation and maintenance of continuous drum filters such as the Oliver and the Portland. Special attention is paid to winding and cleaning. The advantage of working on thick pulp in preference to thin is emphasized.

In most of the new metallurgical plants, where filtering is part of the process, and in some of the older plants, one will find the continuous drum filter. Of this class there are two well-known types—the Oliver made by the Oliver Continuous Filter Co., of San Francisco, and the Portland, made by the Colorado Iron Works Co., of Denver.

Having had considerable experience with both kinds, I will give some details of their operation and some "wrinkles" that have been used in time of trouble. I have found that these two filters are identical as to performance, but differ slightly in construction. It is not meant to "boost" one nor to "knock" the other, but to give facts as found in my own experience.



SKETCHES ILLUSTRATING DETAILS OF DRUM-FILTER OPERATIONS

The driving mechanism of the Oliver is directly attached to the hopper tank, making a more compact and stable arrangement, there being no tendency for it to get out of line, as when installed on an independent foundation.

The Portland filter leaves are already sectionalized when received. They can be quickly installed and are also superior to the Oliver type in other respects. In Fig. 1 the drum is shown at *A*, the tank at *B*, and the scraper at *C*. The drum is divided into sections, the end of each section being sunk as shown at c'. When the canvas is put on, it is stretched over but one section at a time, a wooden strip, shown at a', being inserted into the slot c' in each section as it is covered, to hold the cloth fast. Thus a good tight cloth is assured. In the Oliver the cloth is nailed to one section at the start and the tension must be held until it is entirely on, as further tacking may cause leaks at the tack holes in later operation.

Before starting a new drum filter, it is always well to fill the tank with water and revolve the drum for at least 24 hours to swell the wood. During this operation the vacuum should be shut off and the air blowoff allowed to operate intermittently, so as to cleanse the pores of the canvas thoroughly. In rewinding and recanvasing a filter, if there are emergency units, it is well to let the filter leaves dry somewhat after the old cloth has been removed, so that they will swell after the new canvas is in place and thereby make it tighter.

WINDING THE DRUM

In winding the Portland filter an oak winding clamp is used, which serves as a tension at the place where the wire goes on the drum. This mechanism is more compact than that of the Oliver Co., who obtain their tension by passing the wire over several small reels and placing weights on the shafts of the reels. The clamp, however, tends to make the wire wear on the wood, necessitating more watching than the Oliver device, where the tension is more or less constant after once set. When winding either filter, I have found that it pays to have a man at the primary reel and one at the point of winding, as well as one to attend to stapling on the scraper or discharge side of the filter. A man should be kept at the tight-and-loose pulley also, unless there is some mechanism by which the winding man can instantly stop the drum.

The man at the primary reel must be on the alert for kinks, broken wires or sticking of the reel. Many a break in the wire may be saved by seeing that it unwinds freely, and a kink, if noticed quickly, may often be straightened out before reaching the winding man If there is a broken wire in the reel, the tension may be held by prompt stapling before the broken end passes through the tension apparatus. Most of the troubles in winding are due to these three causes. The primary reel should be quite a distance from the filter, so that wire troubles can be remedied before they reach the tension apparatus. The primary man can usually judge whether this can be done "on the fly" or whether the filter must be instantly stopped for readjustment and splicing of wires.

The wire used on the Portland drum is so much harder than that of the Oliver, that winding it takes more time, because the kinks are harder to straighten without breaking. However, the softer wire wears faster and requires more repairing after operations is begun. With the harder wire most of the wear comes on the soft steel blade of the scraper. These blades should be filed smooth every day as they tend to tooth and, if not filed frequently, will become so ragged that they will tear the cloth. There is very little wear on the scraper blade of an Oliver, and I have never filed them oftener than once a month.

Another feature of the Portland filter is a thin zinc strip, about one inch wide, which is placed on top of the wooden strip previously mentioned, at two or more points on the drum. This zinc strip, shown at b' Fig. 1, makes possible the soldering of the wire winding wherever it crosses the zinc. The winding is usually held on by staples driven into the wooden strips. The less staples there are, the better the filter operates, for when the wood becomes wet the staples tend to loosen and catch on the scraper, causing leaks in the cloth. Should the wire break during operation, two or three rounds must usually be unwound before a staple is found that is still tightly holding it.

Soldering the wire to the zinc strip is done either when the entire winding is over or at intervals during the winding. It should be done with the zinc strip at the top of the drum, position *S*, Fig. 1, as there is then less danger of the hot solder running over the cloth. The cloth should be protected from the solder by passing heavy cardboard under the wires on each side of the zinc strip. After the entire wiring and soldering has been completed, the rough edge of the solder may be filed perfectly smooth so that it will not be torn from the zinc when passing under the scraper. With the winding soldered in this fashion, if the wire does break, it will not slacken beyond the soldered joint nearest the break, and a short piece can be spliced in very quickly. Thus the danger of staple holes is eliminated.

In splicing a wire on an Oliver drum, it is always well to go back a few sections from the point of break. On the Portland it is best to go back one section beyond the zinc strip thus insuring a soldered as well as a stapled joint.

Stalling of Drums Through Pulp Settling

In drum filters, especially those working on comparatively thin pulp, there is a tendency for the pulp to settle and in time fill the hopper and stop the drum. In the old type of filter, air was used to agitate the pulp in the hopper. I have never found this to be successful, as the air "spots" the cake, making it thin in some places and thick in others, so that washing and drying are not uniform. The new types are equipped with mechanical agitators, placed in the hopper, which are very efficient. However, should anything happen to the agitator, the thin pulp will settle and stop the drum.

Filter men frequently "lean" on the belt to start the drum again when this happens. This usually proves costly. In one such case, during my experience, the worm gear broke and in another the main drum-shaft was sprung. This last-named trouble was remedied by raising the drum shaft by a lever and screw jacks and tumbling it upon its bearings. This was continued for 24 hours, at the end of which time the shaft was true enough to run, although several of the cast-steel uprights holding the leaves were cracked. This, however, did not interfere with the operation of the filter.

Safeguard Against Forcing a Stalled Drum

To protect the gears and shafting against "forcing" when the drum stalls, resort can be had to the device shown in Fig. 2. The Portland driving shaft is coupled with a flanged coupling keyed to the shaft, the flanges being held together with four bolts, which screw into threads in both halves of the coupling. In Fig. 2 the shaft is shown at *A*. The keyway in the shaft should be lengthened on both sides of the coupling and the flanges slid back until they are about two inches apart. The two ends of the shaft should be about ⅛ in. apart. The flanges *B* should then be keyed to the shaft as shown at *F* and fastened together with bolts about four inches long, as at *D*. These bolts, which are about ⅝ in. in diameter, are first sawed half through as shown at *G*. Forcing a stalled filter, so equipped, will result simply in shearing the bolts.

Under normal conditions the half-sawed bolts will be found strong enough, as the power required to rotate the drum is small. Both Portland and Oliver filters are geared very high. If the bolts should break, it usually means that the hopper needs sluicing out. The more quickly this is done the more time one will gain in filter operation. It is well to keep a stock of these half-sawed bolts on hand, so that no time will be lost in starting up again.

If a filter is idle, the drum should be kept running in the solution left in the hopper to keep it wet. In operating a small group of filters it is better, I believe, to have each one connected to its own vacuum pump rather than to have one pump for the whole group. The reason that I advocate this is because I have never seen a valve that will absolutely cut off vacuum.

I had occasion to run a bank of two drum filters, each with a vacuum pump, but with the vacuum lines connected to each other. The connecting pipe had two cutoff valves. When one filter was shut down, we closed down one vacuum pump and shut off both the cutoff valves in the pipe between. The idle filter was revolved in very thin pulp to keep the drum wet. I found that there was still a little vacuum working on the idle filter, just sufficient to pick up the fine slimes in the pulp, which were hard to blow out of the pores of the canvas and caused poor filtering later unless the canvas was first scrubbed. I found it better to sever the connection completely between the two pumps. If a valve could be found that would completely shut off vacuum, it would then be a distinct and obvious advantage to have the pumps connected.

Cleaning the Filter Surface

Where a filter is working on thin pulp or in a solution heavy in lime, it is well to scrub the filters frequently. A good root brush should be used, and in case of lime solution it is better to scrub with weak hydrochloric acid. Where acid is to be used, it is best to empty the hopper as much as possible and to do all the scrubbing from the top of the filter while it is revolving. A man should be kept on the scraper side of the filter to wash off the acid with a hose. Scrubbing may be done by attaching several brushes to a board running the width of the drum. The board and brushes may be drilled so that water or acid solution can be poured down into the brush. A right-and-left-hand screw tension may be placed at the ends and middle of the board, so as to press the brushes down. The scrubbing solution may be applied from a tank or by hand. Scrubbing of this sort is uniform and well done. A spray may be installed on the discharge side of the filter to wash off the acid and thus make the scrubbing entirely automatic, by simply revolving the drum.

I was once referee in an argument over the quality of the canvas on certain filters. I found that the canvas tended to slit under the wires and that it had to be replaced every 30 days. Whenever the cloth rips under the wires, it is unusually due either to failure to wash out all the acid from the cloth after an acid scrubbing or to the strength of the air blowoff which removes the cake. In this case I found that 10 to 15 lb. air pressure was being used to dislodge the cake. I believe this is too much. I installed a small receiver and an air reducer and cut the pressure down to between two and four pounds and found this to be very efficient. After this installation the cloth lasted from four to six months.

SLUICING OUT THE FILTER CAKE

Wet sluicing of filter cake will be troublesome where one does not use a conveyor to dry the discharge and where water is scarce. In one plant I found that the cake dropped into a launder box, from one end of which a hose sluiced the cake down the launder. The fall of the launder was small, and eleven parts of water to one of cake were needed to keep it clear. This was remedied in the following way:

A 2-in. pipe was bored with holes about four inches apart. Through each hole a soft iron rod was run, extending about three inches beyond the pipe on each side. The ends of the rod were then flattened like paddles. The pipe was set in wooden bearings in the launder box below the scraper, as shown at *H*, Fig. 3. By rotating it, a better mixture of cake and water was obtained. A water-spray pipe was installed at *F* in Fig. 3. This spray and the mixer facilitated our tailings discharge so that only three parts of water to one of cake were used and in time of low water even less with good results.

THICK PULP MEANS HIGH EFFICIENCY

In order to obtain full efficiency from a drum filter, it must work on thick pulp. Where pulp settles readily, I have always found it cheaper to buy a Dorr thickener than to put in an additional filter. I have had frequent occasion to settle pulp running 25% solids to one running 50% solids or better. It is hard to do this continually; that is, by one stage thickening with the lower outlet of the thickener open at all times. The greatest success was attained by using a series of Dorr thickeners about eight feet deep (each) and drawing from one while another was filling and thickening.

In Fig. 4 is shown a section of the cake on the filter when the pulp is thin, demonstrating that nothing but the fine portion of the slimes will then adhere to the filter. When working on thin pulp, it is the rule to have the hopper tank almost full in order to obtain good work from the filter. When the drum is at the point *B*, Fig. 3, the filter is drawing very thin solution through the canvas, but as it goes to the point *D* a cake similar to *A*, Fig. 4, is picked up, which is only the finest portion of the slime. The heavier portion of the slime settles in the hopper and, if not agitated, will in time stall the drum, and may do so even with agitation. The fine cake so clogs the pores of the cloth that there is no more pulp added to the cake between the points *D* and *E*, Fig. 3, and all filtering and drying action is largely suspended. All this time the cake is immersed in solution, and the result is that one gets a thin cake which is very moist when discharged. If wash is used, the cake does not get a sufficient cleansing. Frequent scrubbing of the filter, because of the clogging of the canvas pores, is also made necessary.

With thick pulp the same capacity can usually be obtained by filling the tank only about 14 in. to 18 in. deep, as can be gained by filling it full. When the drum reaches the point *D*, Fig. 3, it forms a cake, shown in Fig. 5. The heavy granular portion of the slime *B*, Fig. 5, will be drawn on the canvas first and will make an ideal filtering medium for the lighter portion *A*, Fig. 5. This makes an ideal cake and a thick one. Shortly after leaving *D*, Fig. 3, the drum emerges from the pulp and the cake undergoes a drying action from that point until it is discharged or, where washing is resorted to, until it strikes the water spray at the top of the filter. Such a cake usually leaves the filter well washed and low in moisture.

I do not think such a deep receiving tank is necessary with a filter working on thick pulp. I think a shallower tank, as shown in Fig. 6, would suffice. With such a tank the discharge scraper could be placed farther down and thus insure a longer drying period in the cycle and drier pulp. A shallower tank also ought to cost less.

THIN PULP VERSUS THICK PULP

Appended are some figures covering the operation of a 16-ft. face 11½-ft. diameter drum filter working on two classes of pulp at a cyanide plant where a water wash was used at the top of the filter. The filter was not equipped with a mechanical agitator.

TABLE SHOWING CAKE MADE FROM THICK AND THIN PULP

Hours' Time	Pulp, % Solids	%-200-Mesh Pulp	Filtered, Dry Tons	%Moisture, Cake	%-200-Mesh Cake
8	35	80	35	20	94
8	55	79 7	051	12	80 5

These figures are typical of my experience with drum filters working on thick and thin pulp.

As to water-wash control, there is not much to be said where thick pulp is used with low submergence in the receiving tank. For other cases this feature has been well described and a remedy suggested by E. E. Carpenter, in "Cyaniding Practice of Churchill Milling Co., Wonder, Nev.," Trans. A. I. M. E., Vol. LII, p. 133. However, I have found it better to use spray water from a low-presure tank rather than from a high-pressure water line. In installing a low-pressure tank it is best to screen the outlet so that no dirt will flow to the spray pipe and clog the holes. This is very important because the holes will close frequently, and if the operator is not continually on the jump, the pulp will get an insufficient wash.

ESTIMATING THE POSITION OF OIL AND GAS by chemical analysis of the water encountered in drilling is shown to be possible by recent work done by the United States Geological Survey in the California oil fields (Bulletin 653, "Chemical Relations of the Oil-fired Waters in San Joaquin Valley, Calif.," by Sherburne Rogers). Investigations have shown that the deep seated waters associated with oil in the California fields are different from those found near the surface as well as from the deeper waters outside the field.

Crushing at New Cornelia

By David Cole
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The New Cornelia Copper Co. is not confronted with a "capping" problem. There isn't any waste. A very large part of the orebody stands out in the open with daylight all around it, so to speak. Three small porphyry mountains immediately adjacent to one another, bare of vegetation and covered with an epidermis of mottled brown, constitute the mine, and a most convenient arroyo meanders into the middle of the group and affords ideal sites for the "pits" and for tracks to accommodate the big Marion shovels which are now rooting their way into the ore. The brown surface color is only "tan" and everywhere gives way to gray and green at the first shots. The usual churn-drill rig for blasting purposes is missed, for piston drills are used in stirring up the ground ahead of the shovels. These drills handle steels up to 32 ft. in length, and lifters are mostly used for placing the explosive to best advantage. Standard-gage, side-dump cars of 20-cu.yd. capacity and very latest pattern receive anything that will go through the dippers of the shovels. The haul from pit to crushing plant is short. The grades are easy, making movements cheap and fast. Very little block-holing is necessary because in the crushing plant there is a primary breaker big enough to handle any piece of rock the shovels can.

COARSELY BROKEN ORE AT THE NEW CORNELIA

A No. 21 Gates gyratory breaker, capable of handling the largest sizes of rock while reducing it to 9-in. cubes at the rate of 800 or more tons per hour, is used. This crusher discharges on two sides into four No. 8 gyratory auxiliaries grouped around its base. Each pair is served by a 3-ft. belt conveyor to carry the final product of the plant at 3½ in. maximum size into a 10,000-ton crushed-ore storage bin.

The railroad track leaves the hillside on a trestle and passes centrally over the big crusher on a removable-girder span. The cars are dumped directly into the big ore-cushioned funnel which leads into the maw of the machine. This hopper is a large square room of steel, the corners filled with ore left at the angle of repose. Bridging the neck of the funnel lengthwise, the track is a great spider-beam acting as a fulcrum for the suspended spindle of the crusher, which looks unusually small when contrasted with the crater it is in.

Dumping these 40-ton cars of ore into this funnel is without spectacular effect. The beam and spindle disappear; the mass squirms for a brief period, and is gone. The slowly gyrating spindle emerges from the mass ready for the next onslaught immediately following on the other side. There is little noise (much less than one would expect), and there is little dust because the cars have received a drenching of water while en route. Thus the ore is automatically finished in two breaks from the maximum size, as shown upon the car, to 3½-in. cubes ready to be briefly stored for feed to the fine-crushing plant. Five thousand tons, the capacity of the leaching plant, is handled in 8 hours, and the side-dump trains are used at the leaching vats on another shift for taking away tailings.

THE NEW CORNELIA COPPER CO.'S ORE CARS

The trippers over the storage bins have magnetic head pulleys for removing tramp iron and steel. They also have water sprays which travel with them to add the amount of moisture the crushed mass will absorb without becoming wet or sticky to embarrass handling later on.

The storage bin is a looped steel box, the concrete floor of which is carried upon a group of massive pillars of concrete. There is daylight all around, for it is all above the ground. The bin is emptied by four rows of arc bin gates correctly spaced properly to draw the ore, and these are served by four conveying belts that carry feed to the respective sections of the adjacent plant where the final finishing is done. Four automatic feeders, having their own locomotive features, serve these belts, operate electrically, and are adjusted to give each section of the fine-crushing plant the right amount of feed. As the ore falls from the ends of the conveying belts into the crushers, it passes over magnetic head pulleys for the second time to insure the most complete removal of steel from the material to be fed into the fine-crushing machines.

After much experimentation and study, Symons disk crushers were selected for the finishing work. They promised to make less fines and slimes, require less space and power, and cost less for repairs. They were especially redesigned to fit the work in hand. Each machine has its individual motor direct-connected through flexible coupling, and they are arranged in groups of three, with motors in ventilated galleries by themselves. There are four sections of this kind in which no wheels or belts are seen. The 3½-in. maximum size cubes are reduced in two stages to proper leaching size, which is minus ¾-in. square hole, and the work is so well done that very little will lie on a screen with openings of this size. The ground space covered by the fine-crushing plant is but 130 x 66 ft., and the capacity is 5000 tons in 16 hours, with one section to spare.

This arrangement of fine crushers is an interesting departure from usual practice and is the first one of its kind. It deserves a more detailed and extended description than is possible at this time, but it doubtless will be available later on, with interesting details, especially as to costs.

Report of Copper Production

This table is compiled from reports received from the respective companies (except in the cases noted by asterisk as estimated), together with the reports of the United States Department of Commerce as to imported material, and in the main represents the crude-copper content of blister copper, in pounds.

	March	April	May	June
Alaska shipments	10,959,696	10,585,518	7,146,824	....
Arizona:				
Arizona Copper	5,000,000	5,000,000	5,200,000	......
Cons. Ariz. Smelting	1,750,000	1,650,000	1,650,000	...
Inspiration	11,100,000	11,400,000	11,900,000	11,150,000
Miami	5,338,000	5,364,000	5,112,000	5,349,000
Old Dominion	3,335,000	3,516,000	4,430,000	3,965,000
Ray	8,006,843	7,902,724	8,815,281	
Shannon	950,000	924,000	964,000	956,000
Other Arizona	30,394,138	26,995,962	25,954,310	*24,984,675
California:				
Mammoth	2,000,000	1,850,000	2,000,000	1,800,000
Michigan:				
Calumet & Hecla	14,949,919	14,347,181	14,450,011	....
Other Lake Superior*	9,500,000	9,000,000	8,500,000	.
Montana:				
Anaconda	31,300,000	29,300,000	28,400,000	20,400,000
East Butte	1,597,340	2,081,080	2,008,060	1,519,240
Nevada:				
Mason Valley	1,821,695	1,300,000	1,528,813	....
Nevada Cons	6,864,675	6,727,192	7,239,978	....
New Mexico:				
Chino	6,200,851	6,368,874	6,984.457	....
Utah:				
Utah Copper	15,512,676	17,231,512	19,262,856	....
Eastern smelters*	2,762,825	2,386,855	2,521,800	....
Total reported	167,593,648	163,930,898	163,068,390	....
Others, estimated	24,618,000	24,755,000	24,682,420	....
Total United States	192,211,648	188,685,898	187,750,810	....
Imports, ore and concentrates	10,951,006	18,250,215	....	....
Imports in blister, etc	32,039,119	29,824,141	....	....
Grand total	235,201,773	236,760,254	....	....
British Columbia:				
Canada Copper Corpn	406,072	352,732	270,816	....
Granby Cons	3,901,398	3,775,140	3,159,284	....
Mexico:				
Boleo	1,984,080	1,653,680	1,929,088	....
Cananea	5,500,000	4,730,000	4,370,000	....
Other Foreign:				
Braden	5,942,000	5,102,000	6,750,000	....
Cerro de Pasco	6,074,000	5,936,000	4,670,000	5,032,000
Chile	8,714,000	8,028,000	8,250,000	. . .
Cape Copper	387,520	353,920	396,825	... .
Kyshtim	985,600	1,110,000	.. .	.. .
Katanga	5,996,510	5,070,580	5,643,775	5,246.950

* Estimated.

The grand total, which in the case of March was 235,201,773 lb., includes, under "Imports in ore and blister copper" the production of such companies as British Columbia, Granby, Cananea, Braden, Cerro de Pasco and Chile. As a matter of record, however, the figures are repeated after the total. We also report the production of the Boleo, Cape Copper, Kyshtim and Katanga companies, whose copper does not come here.

The item "Alaska shipments" gives the official figure of the United States Department of Commerce. Kennecott production February-May was 7,090,000 lb.; 7,076,000; 7,180,000; and 7,208,000 lb., respectively.

Efficiency of Screens

By Harold Rabling*

The efficiency of any screening machine, such as a trommel or shaking screen, is equivalent to the ratio between the amount of ore passing through the screen and the amount that would pass through if all the grains in the feed were tried separately in all positions. It may be obtained by measuring the tonnages of feed and products and sizing by hand a sample of the feed on a sheet of material similar to that on the screen. Let

$X =$ Tons of feed per day;
$Y =$ Tons of undersize per day;
$A =$ % of coarse material in the feed sample;
$B =$ % of fine material in the feed sample.

Then $Y =$ the tonnage that passes through the screen, $\frac{B}{100}X =$ the tonnage that should pass through, and the efficiency $= \frac{100Y}{BX}$

It is sometimes inconvenient to measure tonnages, and they may be eliminated by using the following method: Take samples of the feed and oversize, and size them as before on a sheet of the screening material. Let

$A =$ % of coarse material in the feed;
$B =$ % of fine material in the feed;
$C =$ % of coarse material in the oversize;
$D =$ % of fine material in the oversize;
$X =$ Tons of feed per day;
$Y =$ Tons of undersize per day;
$Z =$ Tons of oversize per day.

All the material in the feed that is larger than the screen opening will pass to the oversize and is equal to $\frac{A}{100}X$ tons per day. The oversize will therefore consist of $\frac{AX}{100}$ tons of coarse material, together with a certain amount of fine material that escaped being caught. The sizing tests show that coarse material comprises C% of the oversize, whence the following equation is obtained:

$$\frac{C}{100}Z = \frac{A}{100}X, \text{ or } Z = \frac{AX}{C}$$

The tonnage of undersize $Y = X - Z = X - \frac{AX}{C} = X\frac{C-A}{C}$

The efficiency of the screen

$$= \frac{\textit{tonnage of undersize}}{\textit{tonnage of fine material in the feed sample}}$$

$$= \frac{X\frac{C-A}{C}}{\frac{B}{100}X} = 100\frac{C-A}{BC}$$

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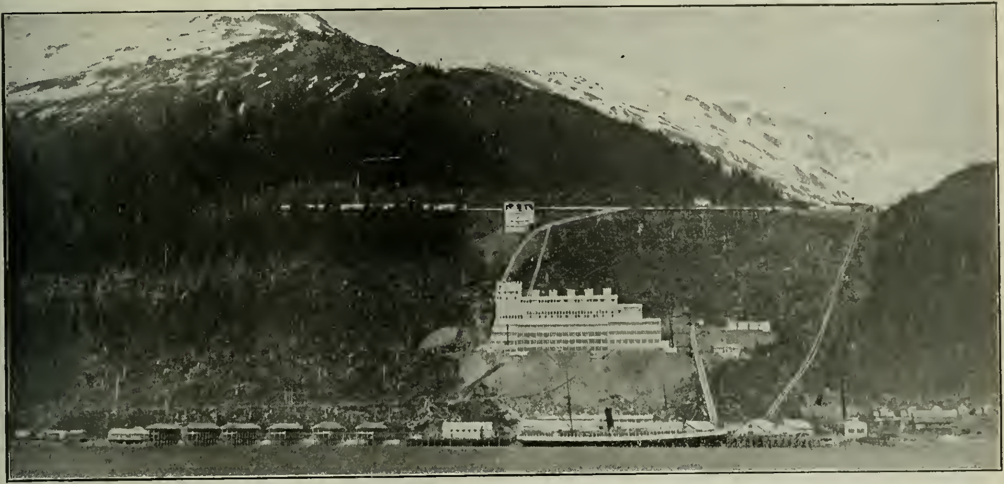
*Metallurgist, Bonne Terre, Mo.

Some Important Go

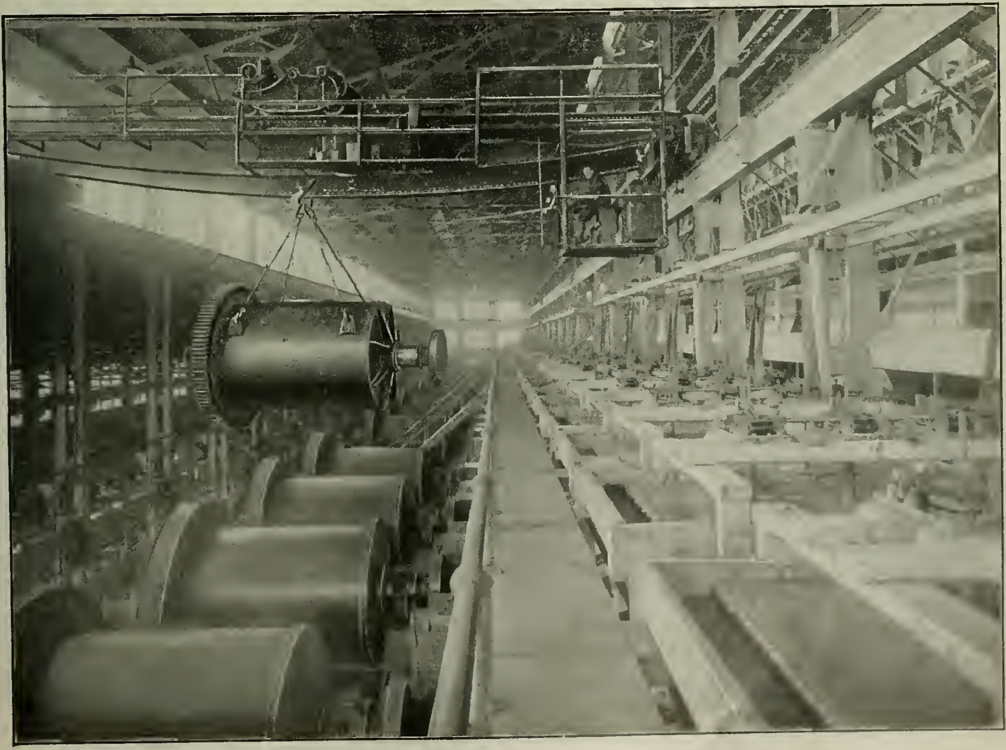
THE 1300-TON MILL OF DOME MINES, LTD., IN THE PORCUPINE GOLD DISTRICT. NORTHERN ONTARIO

SAND LEACHING TANKS IN THE DOME MILL AT SOUTH PORCUPINE, ONT.

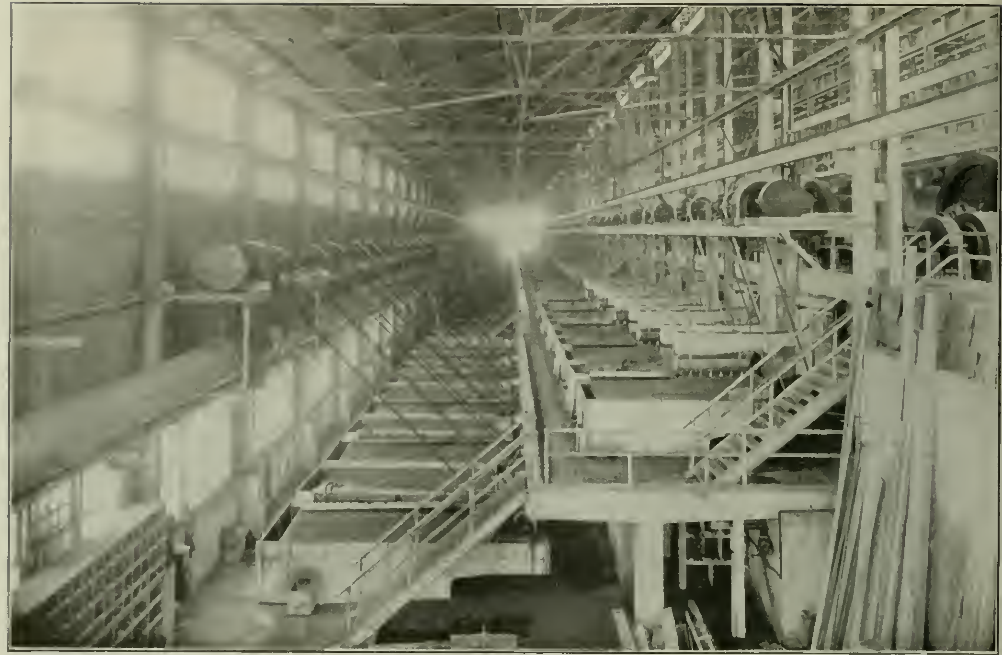
ills of North America



ALASKA GASTINEAU MINING CO.'S 10,000-TON MILL AT THANE, ALASKA

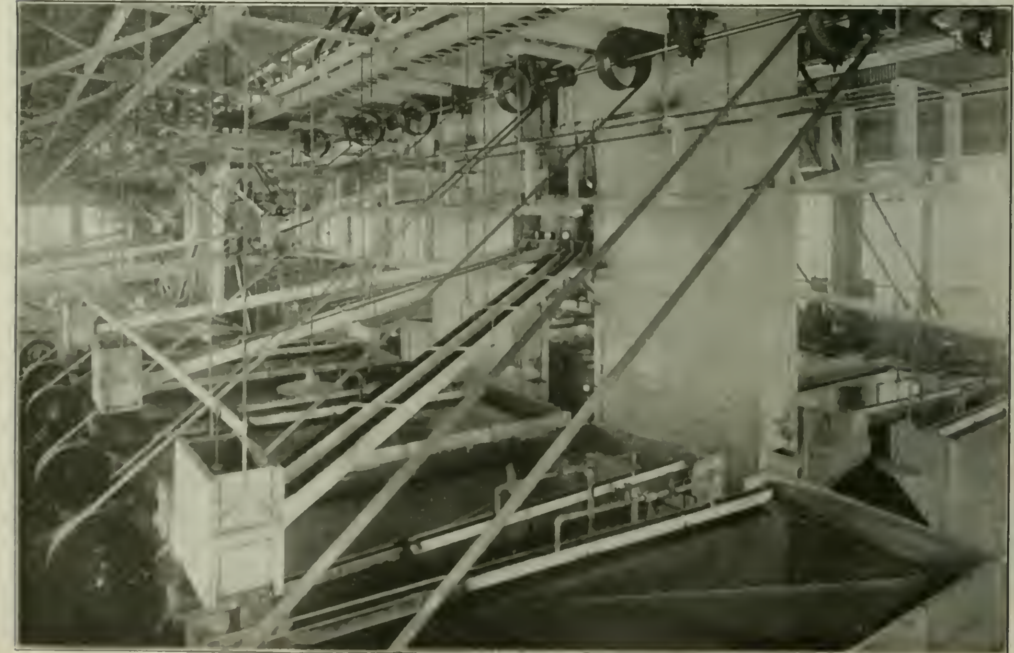


TUBE-MILL SECTION OF ALASKA GASTINEAU MILL, CONTAINING TWENTY 7 x 10-FT. MILLS



SECONDARY-ROUGHING AND CONCENTRATING FLOORS IN ALASKA GASTINEAU MILL, JUNEAU DISTRICT

The product from the twenty 7 x 10-ft. tube mills shown on the preceding page is handled on 40 double-deck Garfield roughing tables, the rough concentrate of which is finished on 40 No. 5 Wilfley tables. The iron and lead concentrate produced in the concentrating department is reconcentrated on 24 Wilfley tables shown in the view below



UPPER FLOOR, RETREATMENT DEPARTMENT, ALASKA GASTINEAU MILL, THANE, ALASKA

MILL OF THE PLYMOUTH CONSOLIDATED GOLD MINES, LTD., AMADOR COUNTY, CALIF.

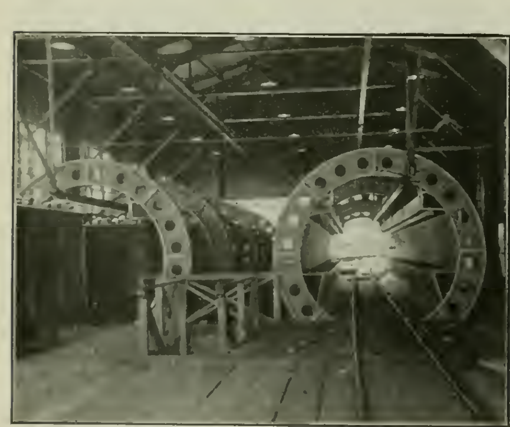
This old Mother Lode producer after lying idle about 30 years, was reopened by a British company on the recommendations of W. J. Loring and Albert Burch. It has been yielding steadily since August, 1914, when the new mill was placed in operation, following unwatering and exploration in the old mine. About 11,000 tons are milled monthly for a yield of about $60,000. Since reopening the mine has produced over $1,850,000 and its success has stimulated the opening of a number of other old gold mines in California

THE PORTLAND GOLD MINING CO.'S OLDER MILL AT VICTOR, COLO.

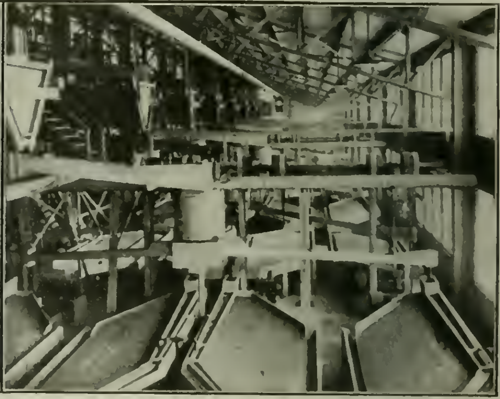
THE NEW PORTLAND MILL—THE REMODELED INDEPENDENCE MILL—WITH PORTLAND SHAFT NO. 1 IN BACKGROUND

THE RECENTLY STARTED ALASKA JUNEAU MILL ON GASTINEAU CHANNEL, NEAR JUNEAU

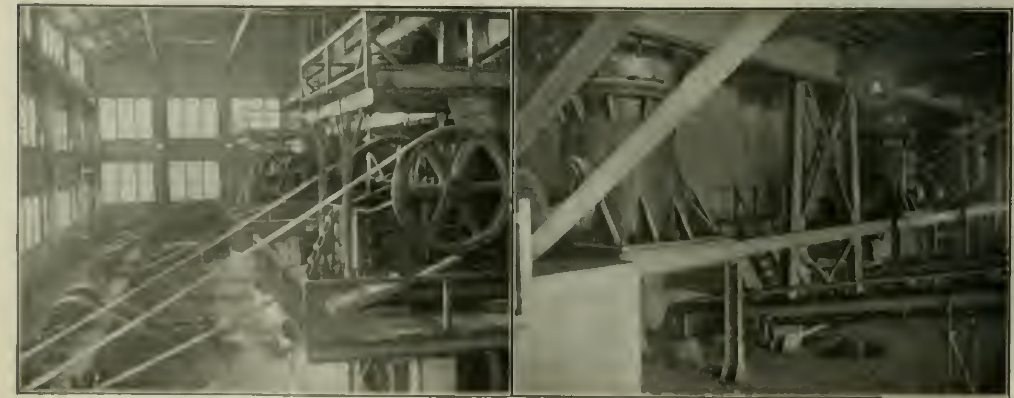
This new gold mill was started in April and is gradually being brought up to capacity. While the grade of ore in the Juneau gold belt has proved disappointing, as mined to date, the mills of this district are giving highly satisfactory results. The Alaska Juneau mill has a nominal capacity of 8400 tons per day, but the company expects by the end of the year to have raised the output above the rated capacity. Crushing is done in jaw and gyratory crushers, followed by ball mills and tube mills. The gold is recovered by table concentration



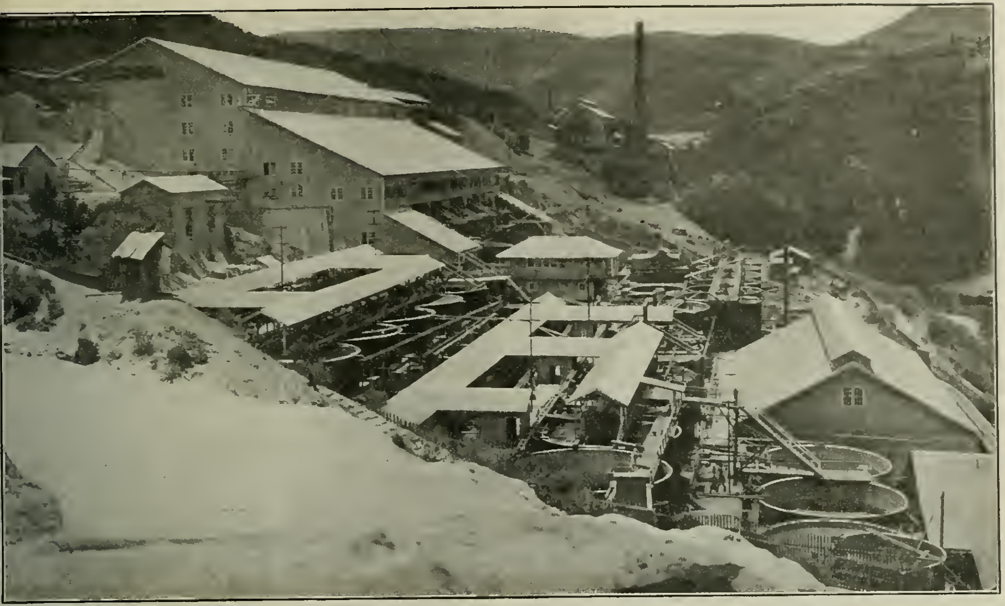
DUMPING TRAINLOAD OF ORE AT TOP OF MILL



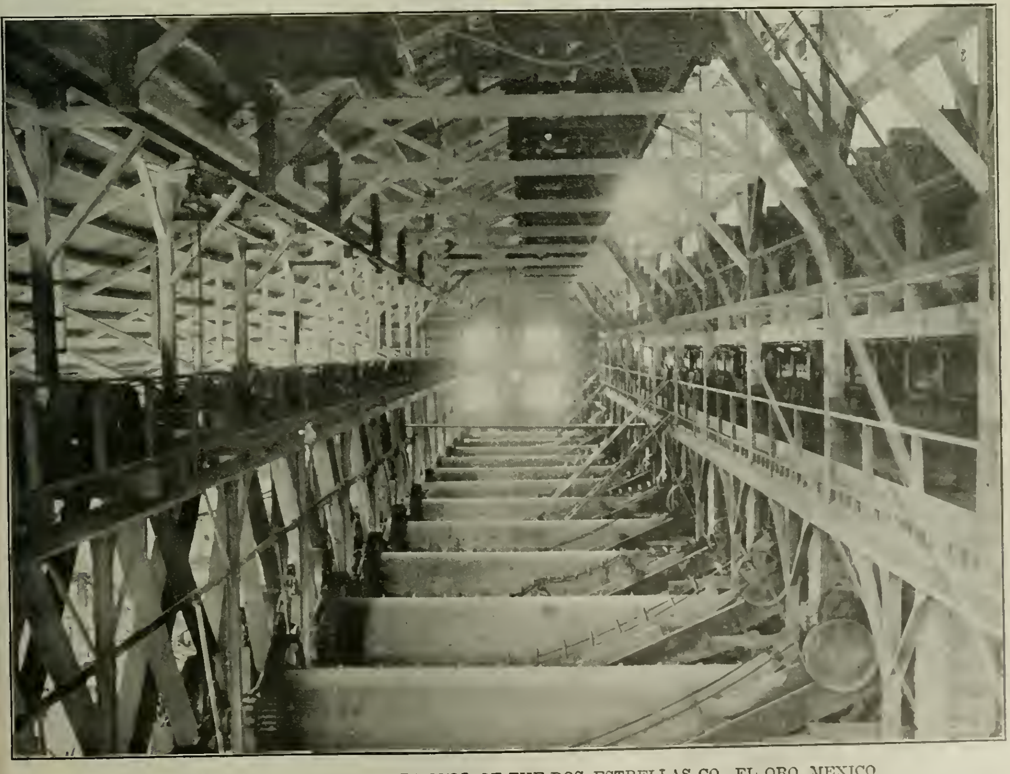
CONCENTRATING SECTION OF ALASKA JUNEAU MILL



JAW CRUSHERS GIVE ORE PRELIMINARY CRUSHING, AFTER WHICH IT IS PASSED TO GYRATORY CRUSHERS



DOS ESTRELLAS MINING CO.'S 1000-TON EL CEDRO MILL, EL ORO DISTRICT, MEXICO



TUBE-MILL FLOOR OF EL CEDRO MILL OF THE DOS ESTRELLAS CO., EL ORO, MEXICO

Eleven of the 14 tube mills are shown in this view, with drag classifiers of the modified Esperanza type, and the stamp batteries at the right-hand side of the illustration. The size of the tube mills is 24 x 5 ft. Each is driven at a speed of 29 r.p.m. by a 75-hp. motor, for an output of about 70 tons per 24 hours, 85% passing through 200 mesh

Standardizing Screens*

Because of the frequent requests received by the United States Bureau of Standards that screens of other sizes than the standard 100- and 200-mesh be tested and certified, a study of the subject was undertaken by the bureau. Opinions of manufacturers were sought as to the desirability and practicability of different screen scales. A scale useful to all industries, making fineness tests, was the end in view. As a result a conference was called at the Bureau of Standards, Apr. 20, 1916, of representatives of the various technical and scientific societies and trade organizations as well as of all the Government bureaus concerned.

This conference adopted as a standard screen scale that given in the accompanying table, and recommends that it be adopted generally by scientific, technical and engineering soicieties and committees, and by branches of National, state and municipal governments as a part of their specifications for materials and methods of test; also that it be used by private firms who have need of standard screens.

EXPLANATION OF THE SCREEN SCALE

In the table is given, in the first column headed "Opening," the width of the opening (on the first line in millimeters, on the second line in inches) for each screen. In the second column, headed "Mesh," on the first line is given the number of meshes per linear centimeter, and on the second line the equivalent number of meshes per linear inch. In the third column, headed "Wire Diam.," is given on the first line the diameter of wire in millimeters, and on the second line its equivalent in inches. In the fourth column, headed "Ratio Wire Diam. to Opening," is given the ratio of the wire diameter to the width of the opening between wires. In the fifth and sixth columns, headed "Tolerances," are given the tolerances for these screens mentioned in the specifications below. These tolerances will, for testing purposes, be used essentially in the metric dimension, but on the second line in each case is given their equivalent in inches in order that they may be compared readily with tolerances in previous use. The tolerance in the fifth column is that for the meshes per centimeter and per inch respectively, and in the sixth column the tolerances for wire diameter in millimeters and inches, on the first and second lines respectively.

The series has been made large enough, it is hoped, to meet the needs of all industries. Some industries may have occasion to use all the screens in a certain section of the series and none of the others, while in other industries it may be desirable to use only certain screens selected from the whole range of the series. In making selections of screens from this scale for various industries it is recommended that this be done on some systematic plan, as for example, the selection of every other screen or of every fourth one in the series below 1 mm. opening and every other screen above 1 mm., in which case the ratio of each opening to the next smaller one would be as 2 to 1.

Because of the wide range of openings in screens now manufactured which are possible with a given number of meshes of wire per unit length by the use of wires of different diameters, and the consequent confusion and uncertainty which arises in designating screens by the number of meshes per unit length, the screens of this series have been designated by the width of the opening in millimeters, as for example, a 1.41-mm. screen, or a 0.36-mm. screen. It is urgently recommended that all users of screens in the future designate these standard screens in this way and that the manufacturers mark and list the screens in this manner rather than by the meshes per inch.

To meet the need for screens of this series at the present time, a temporary provision has been made in the specifications for the acceptance of screens of slight-

TABLE OF STANDARD SCREEN SCALE

Based on a 1-mm. opening screen with the square root of 2, or 1.4142, as the ratio of the openings of successive screens coarser than 1 mm., and the fourth root of 2, or 1.1892, as the ratio of the openings of successive screens finer than 1 mm.

	Opening	Mesh	Wire Diam.	Ratio Wire Diam. to Opening	Tolerances	
					Mesh	Diam.
8-mm. Screen:						
Metric	8.00	1.0	2.00	0.25	±0.01	±0.08
Customary	0.315	2.54	0.079		±0.03	±0.003
5.66-mm. Screen:						
Metric	5.66	1.4	1.48	0.26	±0.01	±0.08
Customary	0.223	3.56	0.058		±0.03	±0.003
4-mm. Screen:						
Metric	4.00	2.0	1.00	0.25	±0.02	±0.05
Customary	0.157	5.1	0.039		±0.05	±0.002
2.83-mm. Screen:						
Metric	2.83	2.75	0.81	0.29	±0.02	±0.05
Customary	0.111	7.0	0.032		±0.05	±0.002
2-mm. Screen:						
Metric	2.00	3.9	0.56	0.28	±0.04	±0.05
Customary	0.079	9.9	0.022		±0.1	±0.002
1.41-mm. Screen:						
Metric	1.41	5.0	0.59	0.42	±0.08	±0.025
Customary	0.0555	12.7	0.0232		±0.2	±0.0010
1-mm. Screen:						
Metric	1.00	7.0	0.43	0.43	±0.15	±0.020
Customary	0.0394	17.8	0.0169		±0.4	±0.0008
0.85-mm. Screen:						
Metric	0.85	8.0	0.40	0.47	±0.2	±0.015
Customary	0.0335	20.3	0.0157		±0.5	±0.0006
0.71-mm. Screen:						
Metric	0.71	9.0	0.40	0.56	±0.3	±0.012
Customary	0.0280	22.9	0.0157		±0.75	±0.0005
0.59-mm. Screen:						
Metric	0.59	10.0	0.41	0.69	±0.4	±0.012
Customary	0.0232	25.4	0.0161		±1.0	±0.0005
0.5-mm. Screen:						
Metric	0.50	12.0	0.33	0.66	±0.4	±0.012
Customary	0.0197	30.5	0.0130		±1.0	±0.0005
0.42-mm. Screen:						
Metric	0.42	14.0	0.29	0.69	±0.6	±0.010
Customary	0.0165	35.6	0.0114		±1.5	±0.0004
0.36-mm. Screen:						
Metric	0.36	16.0	0.26	0.72	±0.6	±0.010
Customary	0.0142	40.6	0.0102		±1.5	±0.0004
0.29-mm. Screen:						
Metric	0.29	20.0	0.21	0.72	±0.8	±0.010
Customary	0.0114	50.8	0.0083		±2.0	±0.0004
0.25-mm. Screen:						
Metric	0.25	23.0	0.185	0.74	±1.0	±0.008
Customary	0.0098	58.4	0.0073		±3.0	±0.0003
0.21-mm. Screen:						
Metric	0.21	27.0	0.16	0.76	±1.0	±0.008
Customary	0.0083	68.6	0.0063		±3.0	±0.0003
0.17-mm. Screen:						
Metric	0.17	31.0	0.15	0.88	±1.0	±0.008
Customary	0.0067	78.7	0.0059		±3.0	±0.0003
0.14-mm. Screen:						
Metric	0.14	39.0	0.116	0.83	±1.0	±0.008
Customary	0.0055	99.1	0.0046		±3.0	±0.0003
0.125-mm. Screen:						
Metric	0.125	47.0	0.089	0.71	±1.5	±0.008
Customary	0.0049	119.4	0.0035		±4.0	±0.0001
0.105-mm. Screen:						
Metric	0.105	59.0	0.064	0.61	±2.0	±0.008
Customary	0.0041	149.9	0.0025		±5.0	±0.0003
0.088-mm. Screen:						
Metric	0.088	67.0	0.061	0.69	±2.5	±0.005
Customary	0.0035	170.2	0.0024		±6.0	±0.0002
0.074-mm. Screen:						
Metric	0.074	79.0	0.053	0.72	±3.0	±0.005
Customary	0.0029	200.7	0.0021		±8.0	±0.0002
0.062-mm. Screen:						
Metric	0.062	98.0	0.040	0.65	±3.5	±0.005
Customary	0.0024	248.9	0.0016		±9.0	±0.0002
0.052-mm. Screen:						
Metric	0.052	110.0	0.039	0.72	±4.0	±0.004
Customary	0.0021	279.4	0.0015		±10.0	±0.00015
0.044-mm. Screen:						
Metric	0.044	127.0	0.035	0.80	±5.0	±0.004
Customary	0.0017	323.0	0.0014		±12.0	±0.00015

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*An abstract of a paper to be presented at the meeting of the American Institute of Mining Engineers to be held at St. Louis, October, 1917 ly different mesh and wire diameter than that called for in the screen scale, provided the resultant opening is the same as the nominal opening within a small range. This will make possible the use of a number of screens now on the market until manufacturers of screens can furnish them made more exactly in accordance with the specifications.

The Bureau of Standards announces that it will test screens of this series to determine whether they conform to specifications given below. This test will consist of the examination of the mesh of both the warp and shoot wires of the cloth to ascertain whether it comes within the tolerances allowed; also measurements of the diameter of wires in each direction to determine the average diameter, and a measurement of any large openings to ascertain whether they exceed the limits given in these specifications; also an examination of the screen to discover any imperfections that may seriously affect its screening value. Screens that pass the specifications will be stamped with the seal of this bureau and will be given an identification number. A certificate will be furnished for each screen that passes the requirements. For screens that fail to meet the specifications, reports will be rendered showing wherein the screen was not up to the standard.

A fee of $2 each will be charged for the test of the screens when submitted singly. For from two to nine screens submitted at one time the fee will be $1.50 each. For lots of 10 or more the fee will be $1 per screen. Only half of the fees mentioned will be charged for such screens as may be rejected for exceeding the tolerances of mesh, in which case the wire diameter will not be measured.

Specifications for Standard Screens

Wire cloth for standard screens shall be woven (not twilled, except that the cloth of 0.062-mm., the 0.052-mm. and the 0.044-mm. screen may be twilled until further notice) from brass, bronze or other suitable wire and mounted on the frames without distortion. To prevent the material being screened from catching in the joint between the cloth and the frame, the joint shall be smoothly filled with solder or so made that the material will not catch.

The number of wires per centimeter of the cloth of any given screen of the standard screen scale shall be that shown in the accompanying table, in the second column, headed "Mesh," and the number of wires in any whole centimeter shall not differ from this amount by more than the tolerance given in the fifth column, that headed "Mesh" under the heading "Tolerances." No opening between adjacent parallel wires shall be greater than the nominal width of opening for that screen by more than the following amounts: 10% of the nominal width of opening for the 8-mm. to 1-mm. screen, inclusive; 25% of the nominal width of opening for the 0.85-mm. to the 0.29-mm. screen, inclusive; 40% of the nominal width of opening for the 0.25-mm. to the 0.125-mm. screen, inclusive; 60% of the nominal width of opening for the 0.105-mm. to the 0.044-mm. screen, inclusive.

The diameter of the wires of the cloth of any given screen shall be that shown in the third column of the table, headed "Wire Diam." and the average diameter of the wires in either direction shall not differ from the specified diameter by more than the tolerance given in the last column, under "Tolerances" headed "Diam."

The Bureau of Standards also reserves the right to reject screens for obvious imperfections in the screen cloth or its mounting, as, for example, punctured, loose or wavy cloth, imperfections in soldering, etc.

Until further notice, to permit the use of screens now on the market which have slightly different mesh and wire diameters from that specified, screens will be certified as satisfactory if the measurements of mesh and wire diameters show the resulting average width of opening to be within 4% of the nominal opening of a given screen, and the ratio of wire diameter to opening of the screen in question is within 0.03 of that given in the table in the column headed "Ratio Wire Diam. to Opening" for the 8-mm. to the 2-mm. screens, inclusive, and within 0.06 of the ratio given for screens of smaller openings than 2 millimeters.

Chronology of Mining for June, 1917

June 4—Miners resume work in Jerome, Ariz., after 10-day strike; union not recognized.

June 7—First electrolytic copper produced by New Cornelia Copper Co.'s leaching plant, Ajo, Ariz.—Announcement of increase in authorized capital stock of American Metal Co. from $3,500,000 to $25,000,000, though immediate actual increase will only be to $7,000,000.

June 8—Fire in Granite Mountain mine of North Butte Mining Co., Butte, Mont., resulted in death of 164 men.

June 11—Beginning of I. W. W. strike at Butte, Mont., curtailing work to day shift for the most part with 10 to 25% of the normal crews—American Smelting and Refining Co. resumed operation of two copper furnaces at Aguascalientes, Mexico.

June 12—U. S. Steel Corporation and many other mining and metallurgical companies declared special dividends, recommending that stockholders endorse checks over to the American Red Cross.

June 13—Strike at Tooele, Utah, smeltery of International Smelting Co.; voted to return to work on June 30.

June 20—Roasting furnaces started at Bunker Hill & Sullivan lead works, Kellogg, Idaho.

June 21—Greene-Cananea copper operations in Sonora, Mex., closed down as result of interference by government officials, American employees returning to the States.

June 22—Canadian government took over operation of Crow's Nest Pass coal mines where strike had been in force for several months resulting in closing of Granby's Grand Forks, B. C., copper smeltery and restriction of other metal production.

June 26—I. W. W. union at Bisbee, Ariz., started strike, about 50% of the miners stopping work.

June 27—United States Government placed order for 60,000,000 lb. of copper at 25c. per lb.

South African Metal Production in 1916 was as follows, according to "Chem. Trade Journ.," May 12, 1917: Copper, 22,861 short tons, compared with 28,970 tons in 1915; tin, 3263 tons, compared with 3441 tons in 1915; silver, 968,904 ounces.

Events and Economics of the War

During the week Russia has shown that she still must be reckoned with. Her offensive continues. The German demand for electoral reform, whether granted or not, is an ill-omen for Prussian autocracy. London has borne another raid of little military value. Other than these, few things abroad draw attention.

In the United States, the importance of checking spies is receiving greater attention. The prohibition enactment, which had the limelight in the Senate, proved a fiasco. Action by the President to secure early passage of a food bill is expected.

Americans May Work Russia's Mines

A cablegram from Petrograd announces that the Mining Commission of the Russian Ministry of Trade decided recently to recommend the transfer of a great part of the empire's mines and other mineral deposits to American hands. The commission has decided to speed up its proceedings in order to reach a decision during the stay of Elihu Root, head of the American mission, and also in view of the impending departure to America of Russian mining experts who will join the party of Ambassador Bakhmetieff. M. Maliavkin, director of the Mining Department, propounded a scheme to the commission to offer American capitalists the Island of Sakhalien, off the eastern coast of Siberia, for working petroleum and coal deposits, and also to offer for the same purposes several districts of Siberia. He also recommended the transfer to American hands of the gold mines in the Altai Mountains, the copper mines in the Caucasus and the railroads in the Ural Mountains.

It is assumed from this dispatch that it is the intention of the Russian government to invite American capital to undertake the development of latent mineral resources of Russia, and that the restrictions and bureaucratic red tape that formerly discouraged investment in these fields are to be removed.

To Establish Aircraft Exhibit

The National Advisory Committee for Aëronautics and the Aircraft Production Board of the Council of National Defense have instituted a project for a permanent exhibit of aircraft materials of all kinds, including engine parts and sections of planes, to be established in Washington for the benefit of army and navy engineers and American manufacturers. A building to house the exhibit is now being constructed by the Government south of the Smithsonian Institution, and the display will be made available to all aircraft manufacturers and kept up to date as the science develops. It is expected to be of material assistance to the new aircraft-building project in that it will enable American manufacturers to become familiar with the latest developments in the art.

The latest foreign machines and specialized parts from foreign makers, reflecting the highest development of European building science after the three years of war, will be displayed. The exhibit promises to be of particular value in the near future in enabling Government engineers and private manufacturers to study the designs and details of construction with a view to learning to what particular branch of the industry manufacturing plants can best be adapted in the creation of the new American air fleet.

"The Aircraft Production Board has no illusions as to the size and character of the job before it," a statement issued by the board says, "but the whole task is one of industrial organization for quantity production, and in this we Americans are above all other nations fitted by experience and tradition to break records. The new permanent aircraft exhibit should furnish a valuable aid to the process of familiarizing the industry with the task and organizing for its accomplishment."

Laboratory for Aëronautic Research

The National Advisory Committee for Aëronautics has just closed a contract with the J. G. White Engineering Corporation for the erection of a research laboratory on Langley Field, near Hampton, Va. At this laboratory, in addition to the usual structural tests on airplanes and airplane parts, scientific research peculiar to aëronautics will be conducted under the immediate supervision of the committee.

Instruments are now designed for use on airplanes to measure the various quantities that enter into the performance of a plane when in free flight. In particular these measurements will include the thrust developed by the propeller, the power absorbed and the revolutions, also the various movements made by the control levers and the resulting motions of the plane, including rolling, yawing, pitching, and likewise the attitude of the plane as a whole in relation to the horizontal.

A wind tunnel of the Eiffel type will be erected for model tests on air planes, surfaces and propellers. Having the results of tests on models and full-sized surfaces, it will be possible to determine more accurately the laws by means of which results from model tests may be applied to full-sized machines and surfaces.

Survey Engineers Assigned to Military Duty

Forty-five engineers of the Topographic Branch of the Geological Survey, who are members of the Engineer Officers' Reserve Corps, have been assigned to active duty and ordered to report by letter to the Director of the Survey, at Washington, for duty in connection with military mapping now being done for the War Department.

Among the men affected are Majors Frank Sutton, William H. Herron, Robert B. Marshall, Glenn S. Smith, George T. Hawkins, Robert Muldrow, James H. Jennings, William H. Griffin, Robert H. Chapman, Joseph

H. Wheat and Albert M. Walker; Captains Claude H. Birdseye, Emory I. Ireland, Clyde B. Kendall, Albert Pike, Herbert H. Hodgeson, Carl L. Sadler, J. G. Staack, William L. Miller, Eugene L. McNair, Asahel B. Searle, William O. Tufts, Bertram A. Jenkins, James W. Bagley and Calvin E. Giffin. The list also includes 20 first and second lieutenants.

Price of Soft Coal Lowered

As a result of the conference between the mine operators, the Secretary of the Interior, Federal Trade Commissioner Fort, Chairman Peabody and the Committee on Coal Production of the Council of National Defense, the following reductions were made to go into effect July 1 in the prices of coal. In the various coal fields east of the Mississippi, a maximum price was set, pending further investigation, ranging, with one or two exceptions, from $3 to $3.50 per ton of 2000 lb. aboard the cars at the mine.

This, according to the Director of the Geological Survey, will effect a reduction to the consumers east of the Mississippi River of $15,000,000 a month, based on the output of free coal in May of this year. These prices do not affect in any way contracts in existence or sales of coal for foreign or export trade.

The operators tendered to the Government a reduction from these reduced prices of 50c. per ton for coal that the Government may need. No action was taken upon anthracite prices because of the fact that these prices had already been acted upon by the Federal Trade Commission. Twenty-five cents per net ton was fixed as the maximum price for coal jobbers' commission, with only one commission, no matter how many jobbers' hands the coal may pass through.

On account of an inadequate representation of operators west of the Mississippi River, no maximum prices were fixed for coal from those districts. A supplementary statement will be issued shortly, covering prices on coal produced in those districts. The operators present at the conference included seven for each coal-producing state.

Fortunes of War

The Germans were prodigal in their use of iron, says the New York *Sun*, when they constructed their defenses along the old line that fell before the rush on July 1, 1916. They intended to stay there for the remainder of the war and then recover the material they had used in construction. When the British bombardment began, with its previously unknown force of destruction, the iron and steel collapsed or was pounded to flinders. Taking any direction from Bapaume, one may walk for hours over fields that are gold mines for salvage parties. If the barbed wire alone could be bought up by one company, its directors could retire for life on the profits. Hundreds of thousands of miles of wire remains intact, some of it still unrusted.

Standing on the summit of the Butte de Warlencourt, one may look for miles over a territory every square foot of which is covered with iron, steel, old boots, rags, caps, bottles and tools of every description. Shell holes are filled with débris of this nature, and clear to the very horizon the ground is pitted with these holes. As the war progresses, the waste of material undoubtedly will be greatly decreased through organizations, but over this area the junkman and the salvage party will reign supreme for years to come.

Wood for Next Winter

The Department of Agriculture authorizes the following: To meet any possible coal shortage in the West next winter, more extensive use of fuel wood from the national forests is urged by the Government foresters, who are advising both ranchers and town dwellers to be forehanded in making arrangements for the supply of their fuel needs.

The supervisors of the 153 national forests will be instructed to afford all possible facilities to local residents wishing to obtain cordwood, which settlers may secure free for their home use and which is sold at low rates to persons cutting and hauling in order to sell to others.

Since the material thus utilized is mainly dead timber, its removal, it is explained, helps clear up the forest and thus lessens the fire menace. Timber that is insect-infested or old and deteriorating, or otherwise damaged or undesirable from the forester's standpoint, is also disposed of for fuel purposes. The demand in the next 12 months is expected to break all records.

There is a possibility of a coal shortage because of the increased demand for coal by industrial plants and the lack of sufficient means of transportation. It is believed that it will be quite feasible and economical for many Western communitites to utilize an increased quantity of national-forest wood for fuel next winter.

Survey to Issue Geographical Handbooks

The geography committee of the National Research Council decided to secure if possible the preparation and publication of a series of handbooks on the geography of the military divisions of the United States, in which a compact statement of their physical features, leading industries, transportation lines, etc., should be presented in form for ready consultation or study by army officers and others.

The plan gained the approval of the council and of the Army War College and was submitted to the Director of the United States Geological Survey, who undertook to have the handbooks prepared by members of the survey in coöperation with the geography committee. They will be published as bulletins of the Survey.

The Remedy for High Prices

In its July circular the National City Bank in discussing high prices among other things says: "High prices are never welcome to those who have to pay them, but it is a great mistake to consider only their immediate and uncomfortable effects without regard to the conditions that caused them or the part that high prices play in correcting those conditions. High prices are a sign of scarcity. The only real remedy for scarcity is increased production, and no other agency is so directly effective in stimulating production as high prices. They not only create an inducement, but they supply the capital for the effort."

Editorials

The Controversy Over Prices

THE controversy over the prices for commodities that has been going on in Washington ever since the United States entered the war is crystallizing. Already a split in the Cabinet is threatened and inevitably there will be the appeal to Cæsar that a fortnight ago we forecasted. In the opinion of many officials the question may involve the entire makeup of the Council of National Defence and its subordinate civilian committees of business men.

One element, said to include most of the membership of the defence council's committees, is for a purchasing policy that will allow liberal profits to producers to stimulate production. These officials declare the Government will obtain far better service if the Government does not try to drive its bargains to hard. This is the view of the business men and of the economists, and apparently is supported by Secretary Lane, the strong man of the Cabinet.

Other officials, led by Secretaries Daniels and Baker, believe the Government should bring every pressure to bear to obtain the lowest possible prices, and some, it is said, are for commandeering supplies. This is the view of the inexperienced theorists, the politicians catering to populistic and socialistic dreamers, who see in every business man the physiognomy of the plunderer and crook.

There is a third and even more alarming view, more alarming owing to its nonsensical vagary. The Federal Trade Commission, which is investigating production and manufacturing costs on basic materials, takes the position that any prices agreed between the Government and producers or fixed under a power to commandeer should go to the general public as well. If the Government goes into the market for large purchases at low prices, it is pointed out, the private consumer will be forced to pay even higher prices than he now pays because producers under no sort of restraint will raise their prices to him to make up for their loss in selling to the Government. Some members of the commission are for legislation to meet the difficulty.

The Federal Trade Commission is correct in its view that if the Government exacts low prices for itself the private consumer will have to pay even higher prices. That is certain. Already has it happened. However, it will not be by producers raising their prices, but by consumers bidding for the curtailed supplies.

But if the views of the Federal Trade Commission should prevail, if the Government should fix low prices for everybody, who is going to attend to the distribution? If, for example, the Government has fixed the price for aluminum at 25c. per lb., if consumers would like to buy twenty million pounds per month at that price but the supply is only ten million, what authority is going to say who shall have it and who shall not?

Suppose the Government itself needed ten million pounds of a commodity, had fixed a price for it at cost plus 10%, and the total supply was but half the amount required? Who is going to furnish the capital to build the plants to produce what is needed?

These questions are not stretching of the imagination. Great Britain had to answer them and analogues of their principles are running through all business today.

If business organization were so simple as Mr. Daniels and Mr. Baker believe, innocently but ignorantly, we might defer to their vanity, or sharp practice, and sell them commodities at less than the market price, making it up from the other customers, just as the greengrocer compensates for his bad accounts. The paying customers would suffer, but the natural law would compel them to pay the penalty for bad business methods. If big business were so simple as this, we say, producers could afford to be indifferent to what Mr. Daniels and Mr. Baker want to do. But unfortunately it is not so simple, and the disturbance that is created plays the mischief to everybody.

Consider, for example, a recent transaction in copper. The Government bought 60,000,000 lb. at 25c., the market price at that time being about 30c. The chairman of the copper committee asks the producers to contribute pro rata to the Government contract. What happens? The small producers—those who sell their ore to smelters, whose output is individually small, but in the aggregate is considerable—can not conveniently be reached and escape their quota, which causes the larger producers to supply more than their share. The refiners who buy copper material on average price contracts, and this represents a large proportion of the total business, can not contribute, for they can not buy copper at 30c. and sell it for 25c. and long remain solvent. Many of these contracts are with foreign producers, including British. If the ideas that prevail in Washington are carried out, that is, not only buying cheaply for this Government but also for our Allies, we are likely to witness this condition, namely: (1) The subtraction from the market of a large quantity of copper at a relatively low price. (2) Further rise in the free market, owing to that subtraction. (3) Payment by American refiners to British producers at the high market prices, according to the contracts with them. (4) Dear copper to American consumers. (5) American producers supplying cheap copper to the British Government and British consumers. (6) American Government losing taxes on excess profits. This would be rank stupidity.

The wiseacres of the Federal Trade Commission apparently have some glimmerings of ideas as to how things would work, so they propose to limit prices to everybody. In other words they would put a bligh upon production. If there is one sure formula for losing the war they have got it.

Not only would their project discourage production in this country, but also would it result in a large decrease in the importation of raw copper into this country, which importations constitute a large part of the supply of our refiners. If the price paid for copper abroad were around 30c., and if sellers in the United States were forced to give away copper at a lower price, it would be but natural that the blister copper now coming to this country from South America, South Africa and elsewhere would first be held back and later, when adequate refining facilities had been established in Europe, would find its way thither.

This whole matter of price fixing, commandeering, etc., has received something of a shock with respect to the foolish whisky amendment that the Senate tacked on to the food bill. According to this the President was directed to commandeer all distilled spirits in the bonded warehouses of the United States; and, after paying to owners thereof the cost of production, plus 10%, redistill this liquor for the production of alcohol for Government use.

The same Senators who voted for this on Saturday admitted on Monday that the project is in direct violation of Article V of the Constitution of the United States, which says: ". . . nor shall private property be taken for public use without just compensation." "In fixing the price at which whisky in bond is to be taken over by the President," said Senator Shields, "this bill has become involved in a judicial complication. The Senate has undertaken to arrogate to itself power that belongs to the courts. Congress may legislate power to commandeer, but when it attempts to fix prices, it encroaches upon the authority of the judiciary. How can Congress say what is to be a fair price for property to be taken over unless there has been an exhaustive inquiry into it? To say that cost plus 10% is a fair price for this whisky is to hit arbitrarily upon a price without any real attempt to arrive at a fair calculation. Manifestly, if any price is to be fixed by Congress, it ought to be the market price and not the cost of production plus something."

It looks as if what would be unconstitutional with respect to whisky would be also unconstitutional in the cases of steel, coal, copper, etc. It looks, moreover, that when Secretary Daniels and Secretary Baker have been obtaining supplies by fair trading with the producers, they have been correct, but when commandeering at prices fixed arbitrarily by themselves they have been acting unconstitutionally.

Moyer versus Haywood

ONCE the pot called the kettle black. Pres. Charles H. Moyer, of the International Union of Mine, Mill and Smelter Workers, is credited with the following remarks about that horrid child of the I. W. W.. the Metal Mine Workers Industrial Union, which is now interfering, by strikes, with the copper production of the West: He charges the I. W. W. with "participation in a nationwide conspiracy to shut down the copper mines of the country. There is no doubt the I. W. W. are trying to put us (the International Union) in a bad light with the Arizona operators. If there should be any violence in Arizona, I lay it at the door of the I. W. W." To mining operators who know his past history, it is interesting to see President Moyer, of the International Union of Mine, Mill and Smelter Workers, posing as an apostle of peace and gentleness.

Only about three years ago Moyer's organization, then known as the Western Federation of Miners, had acquired such a reputation for violence that mining operators would no longer deal with it. Its record of murder and incendiarism had practically wrecked it. It had alienated the active support of the better class of miners, lost all its important strikes and the sympathy of the outside public in the mining communities. Its name meant only strikes, violence, loss of wages and of business. It had passed the zenith of its power through violence. But President Moyer had a vision. The Western Federation was taboo, but who would know it if it were called "International?" The violent Western Federation went into the chrysalis, and by a change of name we are now to understand that it has evolved into a beautifully painted moth of peaceful and model unionism.

After a few sonorous platitudes over the irregularity and destructiveness of the I. W. W. *enfant terrible*, President Moyer expects that mining operators will welcome the opportunity to sign up with the International. Thus might the metal-strike situation be cleared up—to the great advantage of the Western Federation's new child. And President Moyer would have outwitted his old-time associate, W. D. Haywood, now head of the I. W. W., and would also have paid back that old score in Butte where the I. W. W. succeeded in routing the Western Federation's local, dynamiting its hall and requiring the militia to restore order in the internecine fight. Which gets us back to an old question, "Can the leopard change his spots?"

This Milling Number

THIS special number of the *Journal*, devoted especially to the interests of mill-men, is the second of the series, the first having been published just about a year ago. Since that first publication, important things have happened in the practice of ore milling, and we are able therefore to report some exceptionally interesting things in this issue.

Most noteworthy, perhaps, is the successful development of the ammonia leaching process by the Calumet & Hecla company, which is thoroughly described by Mr. Benedict, metallurgist of the company. We feel sure that his article, so excellently presented, will be regarded as one of the most important contributions of the year. Ammonia leaching, both for copper and zinc, has long been a subject of experimentation, but it remained for Mr. Benedict to make it a metallurgical process of application in practice on a large scale. The Calumet & Hecla company is doing other interesting things, such as the oil flotation of finely divided native copper contained in slimes, of which it looks as if we are destined to hear successful things later.

The flotation process receives much attention in this issue, in view of its great importance in the art. The contributions of Mr. Coghill, Mr. Adams and Mr. Kirtley are all illuminating and valuable. The other articles, touching upon such questions as mill lighting, ore crushing, drum filters and general milling practice, are all by competent authorities and are of the kind of article that our milling readers like to have.

The Flotation Litigation

WE CONFESS to feelings of impatience and vexation that the litigation over the flotation patents is so long drawn out that it looks interminable. Court after court decides, even the highest court, and it is hoped that there will be a pronouncement that will settle all things. But it turns out there is only settlement of some things and there is always left some foothold for fresh litigation. Is not there reasonably an irritation that the respective litigants, with their costly lawyers and experts, cannot present this case in such a way as will permit a final adjudication by the courts?

In our last comments on this subject, following the Philadelphia decision, we made the remark, based upon an abstract of the decision, that it seemed to "nail Callow." After reading the full text of the decision, it appears that that may not be so and that there is indeed ground for the further litigation, which is promised.

In order to get a correct idea of how things stand, we must go back to the decision of the United States Supreme Court, Dec. 11, 1916, in the case of Mineral Separation vs. Hyde. That high court dwelt especially upon the essence of the invention being in the use of an amount of oil that is "critical," in fact, less than 1% figured with respect to the ore. Together with the use of oil within that limitation, was the impregnation, by agitation, of the mass of ore, oil and water. The court said:

> The process of the patent in suit, as described and practiced, consists in the use of an amount of oil which is "critical," and minute as compared with the amount used in prior processes "amounting to a fraction of 1% on the ore," and in so impregnating with air the mass of ore and water used, by agitation—"by beating the air in the mass"—as to cause to rise to the surface of the mass, or pulp, a froth, peculiarly coherent and persistent in character.

In rendering its decision, the court said:

> The patent must be confined to the results obtained by the use of oil within the proportions often described in the testimony and in the claims of the patent as "critical proportions" amounting to a fraction of 1% on the ore.

We have published in the *Journal* the full text of the majority opinion of the United States Circuit Court of Appeals for the Third Circuit in the case of Minerals Separation vs. Miami Copper Co., which for convenience is referred to as the Philadelphia decision. In that decision, and in the arguments preceding it, there is apparently a wide difference in the interpretation placed by the contestants and by the court upon decisions previously rendered. This resolves itself essentially into the question of how the mass of ore, oil and water be impregnated with air.

The defendant in the Philadelphia case maintained that the Supreme Court interpreted the patent and limited its scope through the introduction "by beating the air" into mass. The patent, however, does not use the words that are quoted, and the Philadelphia court did not think that these words, as used by the Supreme Court in describing the process, could be construed as a limitation upon the process. The defendant, moreover, maintained that the Supreme Court limited the patent to agitation by mechanical means, thereby excluding pneumatic means, but the Philadelphia court did not agree with that contention. Furthermore, the defendant argued that in the use of the Callow cell alone there was no agitation, the air introduced through the bottom simply rising to the surface in short-lived evanescent metal-bearing bubbles forming a "foam."

The Philadelphia court held that in practices at Miami where the ore was handled by centrifugal pumps and Pachuca tanks, as well as by Callow cells, there was mechanical agitation, and consequently infringement of the Minerals Separation patent that had previously been upheld by the Supreme Court.

The Philadelphia court said, however, that it is true that in the use of the Callow cell the behavior of the froth is different from what it is when agitation is practiced. Also, that it is true that in the Callow cell aëration is direct and is not the result of or caused by agitation. The court said, further: "The operation in the Callow cell certainly possesses these distinguishing features from operation of the process where aëration is caused by agitation."

The Philadelphia court then became distinctly muddled. The defendant in the case urged that the operation of the Callow cell was not dependent upon the precedent treatment of pulp in the Pachuca tank and that the same results could be obtained from the Callow cell without such previous agitation and aëration. The court said that it found "nothing in the evidence or in the demonstrations which justified that argument," but admitted that

> If the only agitation to which the pulp was subjected (after such agitation as in the prior art was necessary to mix the oil and ore) was the agitation of the Callow cells, we would not say that that agitation amounted to or was the equivalent of the violent agitation of the patent disclosure and constituted infringement.

Subsequently, there came the statement of an officer of the Miami Copper Co., which was published in the *Journal* a few weeks ago, to the effect that the centrifugal pump, the break in the circuit and the Pachuca-tank agitation have not constituted a part of the process used by his company for some time back; and that the company does not now infringe, inasmuch as the Callow cell, unless preceded by agitation greater than that of the prior art, is not an infringement. This contention is apparently quite in line with what was said in the Philadelphia decision. It is unfortunate that this important point was not brought out in the trial of the case. Clearly, there must be further litigation to settle the status of the Callow cell and the principle involved in it, which is apparently exempted by the Philadelphia decision, while on this point the Supreme Court decision is doubtful.

Besides this point there is the new contention of Minerals Separation that the decision of the Supreme Court as to less than 1% of oil is not limiting. Altogether there is still confusion, which must be dispelled before the situation will become clarified.

Metallurgical Mills of United States

ACCORDING to a careful compilation of plants listed in the various volumes of "Mineral Resources" up to the year 1912, in that year there were in existence 1592 plants with an aggregate daily capacity of 182,116 tons, or an annual capacity of 54,635,000 tons. These figures did not include any plants operated in connection with the iron-ore industry, or any in the central belt of the states from Michigan to Arkansas, or in the East.

A compilation of the Michigan copper concentrators made from the "Copper Handbook," 1913, gives 19 mills having 69 stamp heads then operating with an aggregate daily capacity of 55,350 tons, or an annual capacity of 16,500,000 tons.

According to the publication of the Missouri Bureau of Mines, in the year 1914 there were then operating within the state 135 mills having an aggregate daily capacity of 44,750 tons, or about 13,425,000 tons annually. The milling capacity of 65 plants in the Wisconsin-Illinois zinc-lead district as compiled by the *Journal's* correspondent is 7130 tons daily of 20% ore, or about 25% greater for 10% ore or, say, 8900 tons. His estimate is in error regarding the capacity of the Mineral Point Zinc Co. as shown by that company's own report to the *Journal*. The correction is about 215 tons daily to be added to the above figures, bringing the total to, say, 9100 tons daily, or 2,730,000 tons annually.

From the *Journal's* annual reports on new construction from 1913 to 1915 inclusive is compiled a list of 231 new mills having an aggregate daily capacity of 56,300 tons, or 16,890,000 tons annually.

Adding the totals enumerated gives a total of 2042 plants having an annual milling capacity of 104,180,000 tons. This does not include iron-ore plants or other metallurgical plants in states of the Atlantic Coast group. Reports from 50 of the largest iron-mining companies show that 10 of them mill annually 4,717,000 tons, so that the total iron milled probably at least approximates 5,000,000 tons.

With no allowance made for destruction by fire and other causes since 1912, we shall not be far wrong in stating that up to the beginning of 1916 there were 2052 mills in existence having an annual capacity of nearly 110,000,000 tons of ore. Exactly how many of these mills are active at present, it is of course impossible to state, but probably a very large proportion operated during 1916.

In the *Journal's* attempt to get an idea of the capacity of those active, 230 requests for information were sent out to the largest companies, which produce about 75% of the total output, of which 170, or about 74% of the total, replied. The replies of these 170 probably represent 60% of the total mineral output of the country. Of the 170 companies replying, 110 operate mills having an aggregate milling capacity of 63,188,695 tons annually, as shown in the following tabulation:

Type of Mines	Number Reporting	Annual Capacity
1. Gold and silver...	46	9,368,225
2. Copper..	30	39,010,500
3. Lead and zinc..................	24	10,093,150
4. Iron mines.....................	10	4,716,820
	110	63,188,695

These figures, imperfect as they are, give some idea of the magnitude of the ore-milling industry of the United States. Probably 50% of all the ore mined in the United States has to pass through a mill. If we exclude iron ore, the proportion is much higher.

Coarse and Fine Crushing of Ores

THE brief article in this issue by David Cole, wherein he describes the recently constructed plant of the New Cornelia company, is full of meat. The chief regret of our readers will be that Mr. Cole did not enlarge upon his interesting subject. Technical literature is incalculably enriched by the contributions of such experts as he.

The coarse-crushing plant was Mr. Greenway's idea and was splendily worked out by Mr. McGregor, as was also the storage bin, which is out of the usual, being a square floor of concrete 90 x 96 ft., standing upon 130 reinforced-concrete posts 10 ft. high and provided with side-boards of looped steel to confine the toe of the pile, so to speak, on the four sides. At Ajo it is referred to as being a reminder of the original University on the Nile.

The fine-crushing plant and the redesign of the crushing units were Mr. Cole's own work. They have proved good as far as they have gone. It is prophesied that the remodeled Symons disk crusher of vertical type will take the place of the horizontal type, and when better known will largely replace rolls for dry crushing, and especially for granulating work.

Mr. Burch was the pioneer in visualizing the possibilities of the fine-reduction disk. If his problem at Inspiration had not worked out best with Marcy mills, he would doubtless have done the remodeling necessary to make the disk crusher reliable and good. It fell to the lot of Mr. Cole to do that, and it is pleasing to report the success that seems to be following his work.

We receive a certain number of anonymous letters. These are more generally of approving character than critical. We should like to make use of some of them, but we cannot break our rule that we do not pay attention to anonymous letters. We do not see why any of our friends should omit to sign communications of this sort. Signature is, of course, simply an evidence of good faith, and not necessarily for publication.

Personals

H. H. Knox has recently returned to New York from a trip to Mexico

John M. Fox has returned to Tonopah, Nev., to make his headquarters there.

W. E. Eells, of the Cia. Metalurgica Mexicana, will leave for the south next week.

W. F. Hansbrouck, of the Anaconda Copper Mining Co., was a recent visitor at Ajo, Ariz

Frederic de P. Hone & Co., engineers, announce the removal of their New York office to 13-21 Park Row.

Herbert C. Hoover, on July 4, was created a Commander of the Legion of Honor by the French Government

W. H. Bennett, W. J Wheelen and Howard Moore, formerly of Morococha, Peru, have recently joined the staff of the Andes Exploration Co., at Arequipa

M. K. Rodgers was reported in the issue of June 30 as having died in Pittsburgh. This was an error. Mr Rodgers has been seriously ill but is said to be improving slowly.

Henry G. Smith, superintendent of the La Luz mine in Nicaragua, recently arrived in Bluefields on his way back to the mine, after a three months' vacation in the United States.

Sumner S. Smith is at the Eska Creek coal mine, Anchorage, Alaska, acting as resident engineer in charge of the opening of the coal mines in the Matanuska coal field for the Government.

J. S. Stewart, superintendent of the Pickands Mather Co.'s mines on the eastern end of the Mesabi range for the last six years, has resigned. He is succeeded by D. Cavin, of McKinley, Minn.

L. D. Ricketts left on July 5 for Warren, Arizona, to take three months' complete rest. His health is very much improved, but it will probably be a long time before he fully regains his strength.

Jay A. Carpenter has resigned as general superintendent of the Nevada Packard Mines Co, at Rochester, Nev. No successor is to be appointed as the president of the company is taking personal charge.

H. Marten, chief engineer for the Oliver Iron Mining Co, at Hibbing, Minn., has been appointed district engineer for the same company at Virginia, Minn. L. L. Davenport has been made chief engineer.

Edwin S. Boalich has resigned his position with the Bureau of Mines to go on the engineering staff of Fletcher Hamilton, state mineralogist of California. B. O. Pickard has been appointed to the vacancy.

S. C. Dickinson, who was in charge of the demonstration work of the United States Bureau of Mines at the exposition in San Francisco, has been appointed safety engineer for the Arizona State Bureau of Mines.

H. Robinson Plate has gone to California as representative of a company that has taken an option on the Sheep Ranch mine on the Mother Lode His address will be Sheep Ranch, Calaveras County, Calif

N. H. Emmons, 2d., formerly general manager of the Tennessee Copper Co, has returned to Boston, after several months' work developing a bauxite mine in Georgia His Boston office is Room 350, John Hancock Building

H. C. Ryding has been chosen vice-president of the Tennessee Coal, Iron and Railroad Co, to succeed Frank H Crockard, who has gone to the Nova Scotia Steel Co. C J Barr has been appointed general superintendent in place of Mr Ryding

Prof. Stafford F. Kirkpatrick, of Queens University, has been awarded the McCharles prize for the discovery of new processes for the precipitation of silver from solutions of Cobalt ores and for the separation of cobalt and nickel in solutions of Cobalt ores The prize consists of a gold medal of the value of $200 and $800 in cash

T. P. Draper, assistant superintendent of blast furnace and steel department of the Youngstown Sheet & Tube Co, Youngstown, Ohio, has resigned to become assistant general manager of operations of the Trumbull Steel Co F C Farrell has been made assistant superintendent of the converting and blooming mill departments. A B Finch is foreman of the converting mills to take the place vacated by Mr Farrell A L Smith has been named assistant superintendent of the open hearth departments H S Braman, superintendent of blast furnace and steel department, is assisted by C H Elliott

Obituary

Leo Frank Arnold of Brooklyn, N. Y., aged 35, passed away at Tucson, Ariz., June 1. He was graduated from the Michigan College of Mines in 1903 and had been with the General Development Co.

W. Scott McCombs, veteran blast-furnace manager of the Mahoning Valley, died recently at his home in Youngstown, Ohio, after prolonged illness, aged 78 years. In the late sixties he became manager of the Struthers, Ohio, blast furnace, where he remained 10 years, and for the following 27 years he was superintendent of the Lowellville, Ohio, stack.

Societies

International Association of Industrial Accident Boards and Commissions will hold its fourth annual convention at Boston during the third week in August, 1917.

Mining and Metallurgical Society, New York Section, will hold a meeting at the Engineer's Club, 32 W. 40th St., on Wednesday, July 18, at 8 p.m., preceded by an informal dinner at 6: 30 p.m.

American Electro-Chemical Society will hold its 32nd general meeting in Pittsburgh, Oct. 3-6. Delegates are invited to arrive on Oct. 2, to get together informally. A symposium on "Electro-Chemical War Supplies" will be held the morning of Oct. 4. Special entertainment features have been provided.

American Association of Engineers has tested, for two years, the rendering of service to technical engineers through its department known as the Service Clearing House The association now proposes to broaden the scope of activity by offering to put business men and men in public office in touch with competent consulting engineers to carry out any work of an engineering nature. Frequently municipalities desire such information, but are at loss as to where they may get in touch with men in whom they may have full confidence. If given publicity, the Association believes that it can render a great service both to the public as well as to consulting engineers. A record of engineers and their work is kept through which employers may find men who, in their opinion, possess desirable qualifications. The average number of men placed in touch with vacancies has approximated 100 per month during the last two years. For this service no commission was charged, the membership dues defraying all expenses.

United Engineering Society's Engineering Council held its first meeting on June 27, in the rooms of the American Society of Mechanical Engineers. The following officers were elected: President, I. N. Hollis; vice presidents, H. W. Buck and George F Swain; secretary, Calvert Townley; executive committee, the four officers named together with J Parke Channing and D. S Jacobus. Ways and means were discussed by which the founder societies through the Council may be of use to the nation. A resolution was adopted instructing the executive committee to coöperate with the Government in procuring the services of engineers A committee of three consisting of H W Buck, A. M Greene, Jr, and Edmund B. Kirby, was appointed to consider the best means of utilizing the inventive ability of members of the founder societies. The Council has recently come into being as a medium of coöperation between the four national engineering societies Its function is to speak authoritatively for all member societies on all public questions of a common interest or concern to engineers The council is composed of 24 members, 5 being appointed by each of the 4 founder societies and 1 by the United Engineering Society

Industrial News

The General Electric Co. announces the removal of its New York offices from the Hudson Terminal Building, 30 Church St, to the Equitable Building, 120 Broadway

United Zinc Smelting Corporation, together with the Pearlman Co, Inc, and the Clarksburg Zinc Co have removed their offices from Clarksburg, W Va, to 99 John St, New York City

Mark R. Lamb has received orders from Bolivia for Dorr classifier equipment and for a 60-hp double-drum electric hoist Reasonably prompt delivery, 12 weeks, has been obtained for the hoist, in view of the present congested state of the machinery market.

Edwin G. Hatch, consulting engineer, New York, is supplying the Mother Lode Copper Mines Co. of Alaska with oil-burning boilers, steam turbine, transmission-line equipment, etc., to increase the company's copper output.

The Miami Metals Co., which is operating one of the Iroquois furnaces at Chicago on manganese alloys, has bought the Zimmerman mine at Iron River, Mich., from the Spring Valley Iron Co. The mine shipped 145,716 tons last year.

New Jersey Meter Co. is offering a new type of air meter that is said to show instantly the flow of compressed air in a pipe or hose. The "Tool-om-eter," as it is called, measures the consumption of any apparatus actuated by compressed air.

Pensacola Tar and Turpentine Co., Gull Point, Fla., producers of flotation oils, announce that commercial conditions make necessary an advance in the price of its products, in addition to extra charges for metal packages, which are becoming extraordinarily scarce.

Edison Storage Battery Supply Co. announces the appointment of D. B. Mugan as resident manager at New Orleans, La, with headquarters at 201 Baronne St. Mr. Mugan was formerly associated with the Illinois Central Railroad Co. as head of its New Orleans Electrical Department.

The Booth-Hall Co., Chicago, has been formed to build electric furnaces. Following are officers of the new company: C. H. Booth, president; Julius A. Hall, vice president; W. K. Booth, metallurgist; W. D. Walker, sales manager, F J. Sheldon, secretary. Patents are being sought on the Booth-Hall electric furnace.

Refractories Manufacturers' Association has endowed a fellowship in the Mellon Institute of Industrial Research with a view to stimulating scientific research work in the manufacture of firebrick and clay products. The Association is made up of manufacturers of firebrick, silica, chrome and magnesite brick and has an office at 220 South Michigan Avenue, Chicago.

New Patents

United States patent specifications listed below may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

Copper—Process of Recovering Copper. Frederick, J. Pope and Albert William Hahn, Douglas, Ariz. (U S No. 1,232,080; July 3, 1917.)

Drill—Hollow-Drill Steel-Punching Machine. Thomas Davies, Jerome, Ariz. (U S. No. 1,232,235; July 3, 1917.)

Electrolysis—Electrolytic Recovery of Metals from Their Solutions and in Apparatus Therefor. Urlyn Clifton Tainton and Malcolm Foerster Lambe Aymé, Johannesburg, Transvaal, South Africa (U. S. No. 1,231,967; July 3, 1917)

Electrolysis—Process for Electrolytically Precipitating Metals. George C Westby, Ludwig, Nev, assignor to Western Process Co, a Corporation of Maine. (U S No 1,231,829; July 3, 1917)

Electrolytic Cell Structure. Henry B Slater, Riverside, Calif. (U S No. 1,231,955, July 3, 1917)

Excavating—Driving-Sheave for Steam-Shovels Ernest E. Crane, Chicago, Ill., assignor to American Manganese Steel Co, Augusta, Me., a Corporation of Maine (U S No 1,231,856; July 3, 1917)

Gold and Silver—Process for Extracting Gold and Silver from Ore Containing Gold, Silver and Manganese Dioxid Martinus H Caron, Weltevreden, Java, Dutch East Indies (U S No 1,232,216; July 3, 1917)

Magnesium Alloy—Process for the Production of an Alloy Containing Magnesium and Serving for the Deoxydization of Cast Iron or Steel Chemische Fabrik Griesheim, Frankfort-on-Main, Germany (Brit No 100,818)

Metal-Distillation Furnace. Edward E Cherry, Trenton, N J, assignor of one-half to Max Movshovitz, Trenton, N J (U S No 1,231,239, June 26, 1917)

Ore Dock. Edgar W Summers, Pittsburgh, Penn. (U S No 1,232,119; July 3, 1917)

Pyrometer—Variation-Pyrometer Charles B Thwing, Philadelphia, Penn, assignor to Thwing Instrument Co, Philadelphia, Penn., a corporation of Pennsylvania (U S No 1,232,108, July 3, 1917)

Refractory Brick. Robert H Youngman, Pittsburgh, Penn (U S No 1,231,681, July 3, 1917)

Editorial Correspondence

SAN FRANCISCO—July 8

Fuel Scarcity in the towns and mining camps of Mojave desert has caused the Southern Pacific to withdraw all its old ties from sale. Recently the town of Daggett was in danger of fuel famine, but was helped out by Rand Mercantile Co., of Randsburg. The fuel problem in this region is a serious one, because of the long haul and isolation from timber lands. Coal is a luxury that costs $25 a ton in times of peace and plenty and wood is almost unknown as fuel. Crude oil is really more available than coal, but the domestic heating equipments do not include oil burners except in rare cases.

Relative Amount of Oil in proved areas of California available but in undrilled territory has been summarized in a report made to the California State Council of Defense by the State Mining Bureau, which shows that the visible supply of oil has been rapidly decreasing during the last year. A special committee, with Max Thelen of the Railroad Commission as chairman, has been engaged for several weeks investigating the oil supply used as fuel for the generating of power for railroad locomotives and many other vital industries. The report of oil in formation and undrilled is compiled from production records and well logs filed with the oil and gas department of the Mining Bureau during the last two years incidental to the protection of wells from infiltration by water and damage from improper drilling. Future use will be determined entirely by the State Council of Defense. In the week ended June 23, records show 12 new wells started, making a total of 540 since beginning of the year, 25 ready for test of water shut-off; 14 deepening or redrilling and 3 wells abandoned during the week.

Merit Rating California Mines for compensation insurance is tentatively set forth in Bull. 6, issued by the Industrial Accident Commission. The schedule was prepared by H. M. Wolflin, state mine inspector and William Leslie, of the State Compensation Insurance Fund, assisted by Edwin Higgins, consulting mining engineer. It is submitted with a view of securing suggestions from mine owners and operators interested in order to make the schedule more applicable to the conditions obtaining in California. The schedule is presented in 10 main divisions, each of which is given the percentage rate named. (1) Safety organization, inspection, service and education, 25%; (2) safety measures, 15%; (3) falls of rock or ore, 15.1%; (4) explosives, 10.6%; (5) haulage underground, 1.7%; (6) falls of persons down chutes, raises, winzes, etc., 4.5%; (7) electricity, 0.7%; (8) miscellanous underground hazards, 10.4%; (9) shaft hazards, 9.8%; (10) surface hazards, 7.2%. These percentages have been computed from a large number of accidents in California in recent years; consideration has also been given to experience in other states where conditions are similar to California. Under the subdivisions are given brief outlines of the condition which must obtain in order that the mine in question may receive no demerits. The schedule provides for increase in rates conforming to increase in distance of medical and surgical aid from the mine, graduated from 3% for a distance of 3 miles to 30% for a distance of 30 miles. Each insurance carrier must ascertain the distance and increase its rates accordingly, and this regardless of the merit rating of the mine. In all cases the requirements of the safety rules and orders of mine safety, electrical utilization, general safety, boiler engine and air pressure, logging and sawmill, wood-working and the orders of the Industrial Accident Commission should be complied with or the risk penalized, unless exemption may be granted by the commission. After careful inspection in the field a trial merit rating was recently made at a mine where conditions are better than the average, and this is used in the tentative schedule to illustrate the method of computing the insurance rate, after deciding upon the demerits. According to the rating based upon this illustrative example the merit rate for this mine would be $5.06 per $100 of pay roll. The merit rating will not result in the rates of all mines being decreased to a point below the base rate, which is now $5.75 per $100 of pay roll. The system must be so conducted that the total amount in premiums to be paid by the mining companies will be approximately the same as without merit rating; but the companies operating under relatively dangerous conditions will pay a larger proportion of this amount. The maximum reduction that can be secured is 40%, which would make the rate $3.45 per $100 of pay roll, based on the present base rate of $5.75. On the other hand, it is stated that it is doubtful if there are any mines in California that would have to pay the maximum rate of $8.05, plus increases required by reason of their being situated more than 3 miles from medical or surgical aid. It is requested that persons interested send to H. M. Wolflin, 525 Market St., San Francisco, all criticism on the proposed schedule, by July 15 or as soon thereafter as possible, in order that due consideration may he given such criticism or suggestion. The bulletin may be obtained without cost by applying to the same address.

BUTTE—July 7

Butte Labor Situation is still unsettled. About half the miners are at work. The situation would probably gradually clear were it not for the complications due to the mechanical unions. Representatives of the Industrial Workers of the World are here in large numbers and are working to make Butte an I. W. W. town. The Metal Mine Workers Industrial Union, while announcing no affiliation as yet, with any union is in reality believed to he a branch of the I. W. W. The action of the miners in Arizona, in going out at this time, shows that concerted action was planned. At the meeting of the Metal Mine Workers' organization, resolutions were adopted calling upon the United States Government to take over every mine in the Butte district and operate it. The miners pledged themselves if this were done to work for the Government and leave to the Government officers the settlement of wage controversies. They also demand that the rustling-card system be abolished. The miners pin their faith on Federal action because they claim the Government must have copper and zinc for munition purposes. The mining companies still stand pat in their determination not to recognize the new miners' union under any circumstances, claiming it is merely a branch of the I. W. W. national organization. Reports for June from the smelteries at Anaconda and Great Falls shows that the copper production in the first 10 days of June amounted to 10,000,000 lb. while for the last 20 days which covered the period of the strike in that month the production was 10,400,000 lb. This shows a curtailment in copper production for the month of about 50%. The mines are all running on day shift only, nearly all of them having a full shift.

DENVER—July 7

"High-grading," far from being an extinct art in the Cripple Creek district, has proved temporarily a most profitable one upon a large scale. Trials now being conducted at Cheyenne, Wyo., of a considerable number of men, arrested by Federal officials, reveal astounding facts. Aside from the confession of the ringleader that he has served eight years for wife murder, his testimony relative to trade in high-grade ore seems almost beyond belief. This man, Antonio Cuaz, has pleaded guilty. He, with Carl and Martin Muehlhausen, have become witnesses for the government. Cuez conducted a fence ("assay office") in Cripple Creek. Here he smelted ores brought to him by many confederates. The gold bullion was carried thence to Cheyenne and stored in the vaults of a liquor house for months before it was shipped to the U. S. mints at Denver, San Francisco and Philadelphia, by the Tivoli Mercantile Co. The value of the gold stolen runs well up into six figures. A flimsy statement made by one of the numerous attorneys for the defendants was that none of the rich ore from which the gold had been smelted was stolen, it coming from rich leases in which the men were interested, and the bullion was sold by devious ways and under fictitious names because the mine-owners' association hampers small producers.

SALT LAKE CITY—July 8

Leaching Plant of Utah Copper, at Garfield, is about two-thirds completed, and will probably be operating in two months with an initial capacity of 4000 tons of ore daily, which will probably be largely increased later. The plant has been in process of construction somewhat over a year, and the work has been held back by the difficulty in securing structural steel.

Tintine Mines Information Bureau has been organized by Tintic mine operators to act as a joint employment bureau. It will have offices on Main St. in Eureka, and G. L. Davis, for many years with the Knight companies, will be in charge. Miners seeking work in the Tintic district must obtain cards from this bureau, which will be informed as to the needs of the various mining companies. With this system of issuing cards it is expected that a better class of labor will be provided; also the men seeking employment will be sent where they are needed, and considerable time will be saved in going from mine to mine seeking work.

WALLACE, IDAHO—July 7

Bonding of Ftynn Group of 17 claims has caused considerable comment in the Coeur d'Alene district. This group was bonded by an Eastern company represented by D. F. Haley, consulting engineer for the Interstate-Callahan. As the dominant factor in the Interstate-Callahan is the American Metal Co., with which Mr. Haley has long been identified, it is the accepted belief that the New York company is interested.

Railroad Up Pine Creek, 10 miles in length, now seems assured. William Beaudry, manager of the Stewart Mining Co., has been notified by J. P. O'Brien, president and general manager of the Oregon-Washington R.R. and Navigation Co., that he has recommended to the executive committee cf the Union Pacific system that the branch be built. This recommendation follows the report made upon the available tonnage in sight on Pine Creek by Albert Burch, mining engineer, who was employed by the railroad company to make a special investigation of the Pine Creek section. With this reasonable assurance that the railroad will be built, it is expected that the Stewart company will proceed at once with the construction of a 300-ton mill to treat the product of Denver-Nabob groups, which the company recently acquired. There are already two mills on Pine Creek, the Highland-Surprise and Constitution, each of 150 tons capacity, and it is officially announced that the Northern Light will build a mill this summer. In addition to these the Anaconda company is making regular shipments from the Douglas, which it is operating under lease. There are also two antimony companies making regular shipments, and several lead-zinc properties nearing the shipping stage.

JOPLIN, MO.—July 7

Associated Zinc Ore Producers is the new name for the Joplin Zinc Ore Producers. Complete reorganization recently was carried out, and as predicted, Burt W. Lyon, of Joplin, was employed as commissioner. The general plan of the association is now being worked out, and the only thing so far known is that an attempt will be made to work with the smelters rather than at swords points with them, in attempting to bring about better prices for ore. Offices have been established at Rooms 217 and 218, Miners' Bank Bldg., Joplin.

Impetus to First-Aid Work in the mines of this district was given by the first-aid field meet held at Lakeside Park, near Carterville, on the morning of July 4. Seventeen teams with a total of more than 100 miners competed, the prize going to the team from the Queen Esther mine, which will represent the district in the national first-aid field meet to be held later in the year. Fully 10,000 persons witnessed the meet and the physicians who acted as judges were generous in their praise of the skill of the contestants. The teams were drilled and the entire meet planned under the management of Dr. W A. Lynott.

Increased Cost of Mine Supplies in this district amounts to 95%, according to the estimate made by W B Shackelford, president of the local operators' association. The comparison is between prices in May, 1914, and those of May, this year In one article, carbide, the increase is only 10%, but in some the increase is as much as 300%, and the average is estimated at 95%. The figures have been sent to the Government authorities at Washington in the hope that they will be considered in fixing prices for spelter to be bought for military purposes

DULUTH, MINN.—July 9

Price of Iron Ore is causing mining men to complain. When compared with the pig-iron prices there is no doubt but that they have a just complaint. Iron-ore prices are usually fixed for the year and the prices are changed after contracts are made. It takes 1 85 tons of iron ore to make a ton of pig-iron. It is little wonder that the mining men feel that they are being slighted They made their prices when pig was selling at about $30 a ton, and it has since doubled in price, but they do not receive any more for the raw product. If pig does not drop in price before the first of next year, the iron-ore operators will be asking a much higher price for 1918 delivery.

WASHINGTON—July 9

Russian Mining Industry has been reported upon by Charles Janin, of San Francisco, one of the consulting engineers of the U. S. Bureau of Mines He conferred last week with Director Manning on his return from a five-months' professional visit to the new republic. During his stay in Russia Mr Janin acquainted himself intimately with mining conditions in both European and Asiatic Russia. While it is hard to understand in America, Mr. Janin said, there is a scarcity of labor in Russia which is interfering importantly with mining operations. At some of the mines it has been permitted to use Austrian prisoners. This arrangement has resulted satisfactorily, and the Austrians were more than pleased to have this opportunity to earn wages. In addition to labor shortage, the difficulties of securing mechanical supplies have resulted in the great falling-off in the activities in the platinum-producing region Most of the dredges are out of commission, due to the impossibility of securing repair parts, Mr. Janin reports. The provisional government, spurred by the most urgent necessity, is taking what promises to be effective steps toward increasing mineral production. Prices have been advanced to make up for the depreciation of the ruble. There is talk of importing Mongol labor.

CANYON CITY, ORE.—July 5

Chromite Mining in Grant County has become an active industry in this section of Oregon during the last year. In May, 1916, Charles McCorkle and E. Beggs located claims on Canyon Mountain, a few miles southeast of Canyon City; these locations afterward became known as the "Big Deposit"; during the summer of 1916, the claims were leased to the Farish company, of Oakland, Calif. This company operated the deposit for a time in the fall and winter, and transferred their lease to the Zenith Chrome Mining Co., also of Oakland, which operated the deposit continuously until the spring break-up of the roads. These companies shipped about 1000 tons and mined about 1000 tons more; it is estimated that there will be at least 10,000 tons taken from this deposit. The Zenith company is also operating a deposit, known as the Ward; it is situated about five miles east of Canyon City and has the appearance of being a good-sized deposit. A number of small deposits were found and worked out during the fall and winter of 1916. This summer, C. W. Brown and I. B. Hazeltine are working a deposit situated about 20 miles west of Canyon City; the ore is hauled to Prairie City for shipment. Dan Powers is working a deposit near the Ward mine; about two miles West of Canyon City, three or four deposits are being opened and one of them, the McIntyre, is shipping. New deposits are being found almost weekly. A local company, headed by F. W. Peet, of Prairie City, is operating most of the properties, aside from the large group held by the Zenith company.

CALUMET, MICH.—July 5

June Production of Copper in this camp was below normal by 15 to 20%, because of labor shortage. There are practically enough miners here but trammers are scarce and many miners have had to go on tramming work. This has caused many of the miners to leave the camp. Now, with more labor coming in, the miners can go back to their usual work. Many experienced men are returning from the strike-infested camps in Arizona and Montana. No labor trouble is feared here, as the men remember the disastrous results of the Western Federation strike in 1913-14, and are not disposed to listen to the I. W W agitators who precipitated a similar unsuccessful strike on the Mesabi iron range last year.

TORONTO—July 7

Danger of Strike at Cobalt is now believed to have been averted. Following the course taken by the mine operators of Porcupine, the Cobalt mine managers have received committees of their own employees and discussed the wage question. The men were principally anxious as to the permanency of the bonuses now being paid instead of a wage increase, and were generally met with the assurance that the bonus will be continued so long as the cost of living remains abnormally high and the price of silver continues at a level where the company can afford the extra outlay. The miners generally appear to be satisfied with the position taken by the managers.

Calgary Oil Field, which has attracted but little outside attention since the subsidence of the boom of a few years ago, is being steadily developed and increasing its production. Since the first development in 1914, about 200,000 gal of oil, principally high-grade gasoline, have been shipped from Okotoks station on the Canadian Pacific Ry., a significant feature being that the larger amount of the shipments were made during the present year. With installation of modern machinery and the drilling of new wells, a considerable increase in the output is anticipated.

Ottawa Mint Increased to refine the large quantities of gold coming from England, South Africa and Russia. According to a recent statement by Sir Thomas White, Canadian Finance Minister, the Canadian mint has been increased in capacity until it has "now the greatest capacity of any gold refinery in the world," being capable of handling 200,000 oz. or $5,000,000 per week with the chlorine process.

The Mining News

ALASKA

ALASKA GASTINEAU (Thane)—Milled in June 202,190 tons assaying $1 10; extraction, 81.25%; tailings, 20.66c. In May, milled 227,900 tons, averaging $1 19 per ton.

ALASKA JUNEAU (Juneau)—One unit of new mill started Mar 31 and additional units in April. Total crushing for April was 7016 tons, averaging 72 6c gold per ton. In May crushed 37,000 tons, averaging 77c per ton First 20 days of June, 33,229 tons were crushed These figures announced by Pres F W Bradley in statement to "Boston News Bureau." Expects to have mill in full operation by end of year The 12 ball-mill units originally designed to have capacity of 700 tons each, but it is planned to push these units to 1600 tons, making total daily output about 11,000 tons Anticipates recovery of 80c per ton at working cost of 40 to 45c. per ton.

ARIZONA

Cochise County

STRIKE SITUATION in Bisbee is improving, about 60 to 70% of men working and output increasing

Gila County

STRIKE SITUATION in Globe and Miami has not changed much No violence at the properties, but Austrians and Serbs are reported to have had battle in streets of Globe, at least three combatants being wounded before Federal cavalrymen restored order Power plants for pumping and lighting being operated, but no mining being done Federal Mediator Meyers expected to arrive in district

Greenlee County

STRIKE SITUATION unchanged in Clifton-Morenci district Mines idle

MIAMI (Miami)—June copper production, 5,439,000 lb., comparing with 5,112,000 for May

INSPIRATION (Miami)—June copper production, 11,150,000 lb., comparing with 11,900,000 lb. for May.

Mohave County

UNITED EASTERN (Oatman)—Initial dividend, 5c. per share, declared payable July 30. Mill began operation in January.

Pima County

MAGGIE (Twin Buttes)—Recently bonded by owner William Reid to Eastern man.

SAN XAVIER EXTENSION (Twin Buttes)—Encountered high-grade zinc ore at 150-ft level Shaft down to 200 level and crosscutting for ore

AJO CONSOLIDATED (Ajo)—Three diamond drills operating Shipping regularly to Copper Queen smeltery at Douglas.

Yavapai County

LABOR SITUATION in Jerome is again disturbed New demands, similar to those at Globe, are expected [Dispatches, July 10, state that I W W's called a strike and on Sunday all properties except United Verde, United Verde Extension and Calumet & Jerome were shut down However, work was resumed again Sunday night On Tuesday 67 I W W agitators were deported in a train of cattle cars over the narrow gage line They were given plenty of drinking water but nothing to eat Destination was Jerome Junction, 27 miles away and 50 armed citizens accompanied them to see that they did not come back.—Editor]

UNITED VERDE (Jerome)—Will electrify entire plant at mine Present steam plant will be discarded probably by September Approximately 2000 hp will be required to handle operations, including steam shovel and other extensions planned to bring production up to 10,000,000 lb. monthly

ARKANSAS & ARIZONA (Jerome)—Only three days drilling was done from the south drift. Drill set up in east crosscut and a flat hole is being drilled eastward. Reason for change not announced Drifting southward resumed

JEROME VERDE (Jerome)—Nothing has been found by diamond drilling since original discovery Last hole was pointed eastward from drift north of the United Verde Extension Another hole being drilled pointed west, about 300 ft north of the original discovery Men still cleaning out old drifts and crosscuts on the 150- and 200-ft levels from the Columbia shaft.

CALIFORNIA

Amador County

CENTRAL EUREKA (Sutter Creek)—Development of good ore at 3350-ft point proved wisdom of deepening shaft from 3300 level Ore found in both north and south crosscut Repair of tailing dam and flume nearing completion

Butte County

ST FRANCIS (Forbestown)—Hydroelectric plant and 50-ton Joshua Hendy ball mill contemplated Property has been developing for several years and operating small mill A 4-ft vein recently disclosed is said to be proving good ore

Eldorado County

CHROME AND MANGANESE ores for shipment to Eastern steel mills are being sought by F W Johnstone, of the Johnstone Engineering Co., of San Francisco, and Harry Stain, of Placerville

Nevada County

GOODWIN (You Bet)—Reported acquired by company composed of Austrians. Owners contemplate construction of dam and adopting hydraulic methods successful in early days when Chinese leasers took out large amounts of gold.

QUAKER HILL-BLUE LEAD (37 Wall St., New York)—These gravel properties in the Colfax quadrangle, optioned by H. R. Berry, of New York, who will have associated with him D. J. McFall, of Nevada City, and H. L. Englebright.

GRASS VALLEY CONSOLIDATED (Grass Valley)—Company acquired Benoit tract of 168 acres adjoining the Allison Ranch mine, which is being unwatered. Permitted to sell additional 50,000 shares capital stock at par $1, to be used in purchase of additional ground.

Placer County

CHROME ORE mined in the Pilot Hill district is being shipped direct to Chicago by Donnelly & Neilsen, of Folsom and Hathaway & Adams, of Fairoaks. Recent development disclosed large deposit and additional men have been employed. Folsom is the railroad shipping point for Pilot Hill and other chrome-mining districts in this region; chrome-ore shipments to date amount to about 6600 tons.

Plumas County

PLACER GROUND, near Cleghorn bar, on middle fork of Feather River, will be developed by Oakland men under management of George C. Richards, of Quincy.

MANGANESE property near Indian Falls owned by Mason and Braito, reported leased by Noble Electric Steel Co. Mine to be operated and ore shipped to Heroult, Shasta County, for treatment in electric furnaces. Stated that company will construct a 700-ft. tramway and employ 30 men in mine.

CHROME deposits at Claremont, south of Quincy, are being developed by G. Maxwell, representing San Francisco men, who have optioned the property which was discovered by Thomas McCarthy. Trail to the deposit, blocked during winter and spring with 5 to 10 ft. of snow, has been shoveled out and the roads are being made ready for hauling by motor trucks to Western Pacific Ry.

Sacramento County

NATOMAS NO. 5 (Natoma)—New wooden hull launched and work of installing machinery from the old boat and such new machinery as necessary, in progress. Dredge was sunk and righted and repaired about 4 yr. ago. Its field is the Rebel Hill district, which contains large areas of cemented gravel that requires strong dredge equipment to handle. Rebuilt dredge will be stronger than the old one and hull is larger.

Shasta County

MAMMOTH COPPER MINING (Kennett)—Estimated June copper output 1,800,000 lb., comparing with 2,000,000 lb. for May. Has optioned nine claims adjoining the Stowell in Flat Creek district. Property owned by G. A. Grotefend, of Redding.

REID (Old Diggings)—Labor strike settled by Superintendent Sallee, who raised pay of miners to $3.75 and muckers to $3.25 a day. Shifts of surface men reduced from 9 to 8 hours.

Sierra County

TIGHTNER (Alleghany)—Final payment on purchase price made to H. L. Johnson, and substantial dividend declared.

BUCKINGHAM (Downieville) — Two-stamp mill being erected to crush rich free-gold quartz developed last year. T. and Z. Buckingham, owners.

MONARCH (Sierra City)—Pushing lower tunnel from Black's Canyon to tap vein at depth. A still lower tunnel will be run later. Under option to R. G. Gillespie, of Pittsburgh, Penn.

WIDE AWAKE (Downieville)—Gravel yielding well in coarse, well-worn gold. Driving main tunnel to tap channel deep in hill. Under option to Thomas Wilson.

SHAMROCK GROUP (Sierra City)—Will install electric plant. Buildings erected and tunnel to be driven to cut main vein. Bonded to Sierra Mining Corporation. John V. Powers in charge.

Siskiyou County

MANGANESE deposits being prospected in Salmon River district by San Francisco and Denver men. Several deposits are said to have been favorably developed. Samples are exhibited at the Yreka chamber of commerce.

KNOW-NOTHING (Etna) — Reported that property in Salmon River district optioned by W. R. Beall, who will immediately install a compressor. The 8-stamp mill is being remodeled Expected the mine and mill will be in operation in August.

COLORADO

Boulder County

GOLD DISCOVERY on extension of Columbia vein, at Left Hand. Ore in 30-ft. shaft assays $20 to $50 per ton.

HURON (Boulder)—Taken under lease and bond by Du Pont-Wooding Co., of Denver.

WISCONSIN (Sugar Loaf)—Will be reopened. H. R. Moldenhauer, manager.

VASCO (Tungsten)—Thirteen leases being actively developed and operated. Mill working at full capacity. Grade of ore ranges from 3 to 50%, averaging about 10%. T. G. McGrath resigned recently as mill superintendent; succeeded by Fred Barrett. New compressor plant installed to supply air to lessees. Sampling operations in charge of F. B. Copeland, formerly of Cripple Creek.

SWARTHMORE (Eldora)—Leased to Consolidated Leasing Co. Small mill will be erected at Eldora. C. E. Kahler, manager.

Chaffee County

LINCOLN HIGHWAY (Granite)—Mine plant will be installed and work started with crew of Cripple Creek miners, soon as road is completed to property in Twin Lakes district.

EDDINGTON (Westcliffe)—Group on Texas Creek sold; mine plant to be installed. Five cars ore from surface workings ready to ship.

STEVENS (Rosita)—Being unwatered by Passiflora company.

Clear Creek County

LAKE (Idaho Springs)—Lessees shipping two cars per week.

DENBEIGH SILVER AND LEAD CO. (Silver Plume)—Operating Terrible mine; has installed compressor; electric power to be used.

JACKSON MILL (Idaho Springs)—New machinery being installed.

LAMARTINE (Idaho Springs)—Test lot of 100 tons shipped to Hudson mill. Large dump will be treated at mill on property.

Dolores County

RICO-ARGENTINE (Rico) — Regular shipments 25 tons daily being made; will be increased soon. Block leased to Marmatite company; now working 20 men.

RICO-WELLINGTON (Rico) — Lead-zinc sulphides and lead carbonates opened in two parallel beds. Rico oreshoots make along nearly vertical fissures and horizontally in limestone at contact under black shale.

Gilpin County

SUB-TREASURY (Central City)—Operated by lessees. Shipments of milling and smelting-grade ore being made from 950-ft. level. Heavy water flow interferes with development work.

EUREKA (Central City)—Shaft sinking and development work on 600-ft. level progressing with satisfactory results. Lost vein of McAllister stope recovered on 600-ft. level and shows shipping-grade ore. Remodeling of mill advancing rapidly.

MARTIN (Central City)—New shaft house built; shaft sinking to be continued; now 200 ft. deep; developing at that level.

EVERGREEN (Apex)—Mill being enlarged to 100 tons daily capacity. Equipment will consist of 175-ton ore bin, crusher, elevator, bin, Marcy mill, Dorr classifier and thickener, flotation machines, Card tables. Electric power to be used; electric pump will be installed on 350-ft. level. Exploration at depth will be done with diamond drill before further sinking. Ore consists of copper sulphides disseminated irregularly through monzonite.

Lake County

IBEX (Leadville)—New leasing policy proving beneficial to company; one lessee already shipping. Company has much unprospected ground. Denver & Rio Grande track to Ibex has been broad-gaged on account of increased tonnage shipped from Breece Hill.

San Juan County

EMPIRE STATE (Eureka)—Work resumed in the main tunnel by Akers & Kunz. Now in 400 ft. Several small veins cut, showing stringers of copper-lead ore.

LINWOOD (Eureka)—Owned by W. C. Wuertz, who has arranged to reopen. Veins containing zinc, copper and lead ore disclosed by previous development.

Summit County

ST. JOHN (Montezuma)—Additional machinery to be installed. Considerable ore ready to ship, but road conditions will not permit. Late spring has greatly delayed work in district.

WASHINGTON PLACER (Breckenridge)—First cleanup made at this hydraulic mine; results satisfactory and additional equipment to be installed.

EXCELSIOR (Frisco)—New machinery will be installed in milling plant and mine reopened.

PROGRESS (Robinson)—Mill will be reopened soon.

MICHIGAN (Kokomo)—Two cars shipped daily to Globe smeltery, Denver, and 10 cars lead ore monthly to Arkansas Valley smeltery, Leadville.

Teller County

CORIOLANUS (Cripple Creek)—Lessees have commenced making shipments. Mine owned by Aloah Gold Mining Co.

LAURA LEE (Cripple Creek)—Will be reopened by leasing company.

MILLASIER MINING CORPORATION (Cripple Creek)—Clyde shaft unwatered and 900-ft. station being retimbered. Shaft will be sunk 500 ft. deeper.

JERRY JOHNSON (Cripple Creek)—Downward extension of rich Caley oreshoot opened on 600-ft. level has been cut in raise from 950-ft. level by Cripple Creek Deep Leasing Co.

MODOC (Victor)—New 3-compartment Frankenberg shaft connected with 11th level of old Modoc incline; timbering in progress. Merrold & Co., leasing above the fifth level, developing payable ore.

MARY McKINNEY (Anaconda)—Lessees developing Gold Hill properties have opened considerable milling ore. Howard shaft in operation.

GRANITE (Victor)—Aërial tram being installed to transport ore from Dillon shaft to loading terminal near Victor depot.

IDAHO

Shoshone County

SHERMAN DEVELOPMENT (Burke)—About 3 ft. of shipping ore encountered in drift at depth of 900 ft. Property formerly known as the Union. Plan to develop to further depth of 700 ft. through old Hidden Treasure tunnel. Preparing to ship ore, mile haul to railroad.

TARBOX (Saltese, Mont.)—Main office in Wallace, Idaho, announces order placed for 150-ton mill. Lead-zinc ore developed on 600 level and shaft now being sunk to 800. Building flume for water power.

NORTHERN LIGHT (Kellogg)—Will build 150-ton mill this summer on Pine Creek. Lead-zinc ore in main vein on 400 level, proved by raise 50 ft. and winze 100 ft. Two parallel veins show ore on 200 and 400.

GIANT LEDGE (Murray)—Will build 150-ton mill this summer. Crosscut from 400-ft. shaft cut body milling lead ore 25 ft wide, which has been drifted upon 50 ft. Same shoot developed on 200 level. Property originally known as the Granite and Allie and was developed to limited extent as a gold mine. Changed to lead at depth of 160 ft., but ore still carries from $5 to $10 in gold.

HECLA (Burke)—Began shipping product to Bunker Hill smeltery, June 25, although contract does not begin until July 1. Shipments diverted because of strike at International smeltery in Utah.

MICHIGAN

Copper

CALUMET & HECLA (Calumet)—Estimated copper production for June was not off over 5 to 8%. Tonnage sent to mills was slightly richer, and leaching and regrinding plants have been increasing their output.

HANCOCK CONSOLIDATED (Hancock)—Showed slight increase in output last month. Sent to the mills, roughly, 36,000 tons of rock, 16,500 from Hancock shaft and remainder from Quincy No. 7. Mechanical tramming helped maintain output despite labor shortage.

OSCEOLA CONSOLIDATED (Osceola)—June production was 99,500 tons, compared with 107,700 tons in May. Deficit was from Kearsarge shafts.

SOUTH LAKE (Houghton)—June production, 5400 tons, against 4700 in May. Ore carrying about 15 lb. of copper per ton.

FRANKLIN (Franklin)—June output was 24,200 tons, compared with 25,300 in May July output expected to reach nearly 30,000 tons.

AHMEEK (Ahmeek)—Output in June was 110,700 tons, against 113,000 in May. Tonnage now about 4400 daily.

MASS (Mass)—Production in June was 20,700 tons, against 22,000 in May. Finding some good ore in Evergreen lode, but greater tonnage comes from the Butler

WINONA (Winona)—Expects to sink King Phillip No. 1 shaft deeper; copper content improving.

LA SALLE (Calumet)—Last month made a slight increase over May output. 15,400 tons of rock, against 14,800 tons.

Iron

HUNGERFORD (Humboldt)—Williams Iron Co. organized in Detroit to open this property. Shaft put down 90 ft. some years ago. Reported that a deposit of hard ore exists. Exact extent of vein is not known. Water will be pumped out. No mines in Humboldt district now working.

MISSOURI

Joplin District

MERRILL (Kansas City)—Started construction on one 400-ton mill and will build second on 120-acre lease one mile east of Picher, Okla. One shaft under way Ore at 127 to 270 ft Power house to be constructed in center of lease; several small compressors will be used W. E. Merrill, of Kansas City, president.

THURMAN (Joplin)—Will build mill on lease of Porter land, near Century, Okla. New shaft down to 144 ft.; drifting with face 20 ft. high in ore. A. W. Thurman, of Joplin, James Luke and Byron Ash, Carthage, Mo., owners.

ROANOKE (Tar River, Okla.)—Starting shaft on lease west of Tar River, and will build mill. Ore from 215 to 335 ft. John T Taylor, manager.

TRUSTEE (Joplin)—Sinking shaft to 300 ft. on lease west of Picher, Okla., to get water. New mill in operation. D. A. McCallum, Joplin, manager.

LUCKY SIX (Springfield)—Has mine near Diggins, 30 miles from Springfield; erecting mill.

PATHFINDER (Miami, Okla.)—To erect new mill on lease near camp of St. Louis, Okla. Twenty drill holes put down. Adam Scott and George Glade, of Joplin, owners.

GEORGETTE (Wentworth, Mo.)—Has developed into one of best mines Newton County ever had. Making nearly a car of good-grade concentrates daily, from 80 ft. level. Owned by Fred Kinennnon, O. B. Henry and associates, of Granby.

MALCONA (Joplin) — Building 150-ton mill on Johnson land, north of Chitwood in Joplin camp Ground operated two years by Cooper & Peters but ore has been custom milled. Third shaft being sunk. Ore at 180 ft.

MONTANA

Silver Bow County

EAST BUTTE (Butte)—June production was 1,519,240 lb. copper; 41,621 oz. silver. May production was 2,008,060 lb copper; 59,345 oz. silver.

NORTH BUTTE (Butte)—Settlements with about 40 widows of miners killed made at cost of $3280 each Estimated total damages for deaths will not exceed $300,000.

Lewis and Clark County

BARNES KING DEVELOPMENT CO. (Butte)—Report for second quarter expected to show cash balance in treasury of $200,000 Balance due on the Shannon will be reduced to $60,000.

NEVADA

Esmeralda County

SANDSTORM-KENDALL (Goldfield)—Exploring ground below old lease workings, where raise has been put up from 300-ft. level; intermediate drift is being run.

SPEARHEAD (Goldfield) — Developing contact at 910-ft. level by north and east drifts. East drift now in leased ground of Blue Bell company.

Nye County

TONOPAH ORE PRODUCTION, for week ended June 30, was 9283 tons, valued $162,452, comparing with 9262 tons for the previous week Producers were: Tonopah Belmont, 2883 tons, Tonopah Mining, 1800; Tonopah Extension, 2380, Jim Butler, 850; West End, 930, Rescue, 190, Montana, 150; and Midway 100 tons

TONOPAH EXTENSION (Tonopah)—May operating profits were $25,381; receipts, $106,545, expenses, $81,161

MANHATTAN CONSOLIDATED (Manhattan)—Drift started west from point where ore shoot was struck on the 300 level Additional work in driving of east drift has proven the continuity of ore

UNION AMALGAMATED (Manhattan) Pierce fissure encountered in east drift, 390 ft from shaft East from this fissure, hard limestone changing to lime shale

TONOPAH MINING (Tonopah) — In May, milled 9830 dry tons, yielding $162,000, or $19.55 per ton. Net profit, $81,255.

TONOPAH BELMONT (Tonopah)—Milled in May 12,356 dry tons, yielding 2123 oz of gold bullion and 108,631 oz of silver bullion Net profit, $98,526.

NEW MEXICO

Grant County

CARLISLE (Steeplerock)—Plans being made to sink from 650-ft. to 1000-ft. level. W Murray Saunders, manager

JIM CROW (Duncan, Ariz.)—Preparing to sink to lower orebodies; additional machinery ordered, including hoist, electric pump, etc. H M. Lindsey, manager.

RIVAL MINING CO. (Duncan, Ariz.)—Has retimbered the New Strike shaft and will sink. Building new wagon road to Wampoo camp H M Ziesemer, manager.

SOUTH DAKOTA

Lawrence County

ORO HONDO (Deadwood)—Operations temporarily suspended until new equipment is installed Shaft will then be sunk below present depth of 2200 ft

TROJAN (Trojan)—Enlargement of cyanide plant being pushed; expect to treat 600 tons daily by autumn.

BALD MOUNTAIN MINES granted employees additional 50c. per day, making lowest wage for underground employees $3.50 for 8 hours.

MONTEZUMA AND WHIZZERS (Deadwood)—J. T. Millikin, of St Louis, who has three-year option has started diamond drilling.

Pennington County

HOMELODE (Silver City)—Amalgamation-concentration plant in operation on pyritic gold ores.

AMERICAN TUNGSTEN (Hill City)—Treatment of tin ore from 200- and 300-ft. levels of Cowboy mine, continues. Incline shaft will be continued.

TEXAS

Culberson County

MINERAL MILLING CO. (Van Horn)—Shipping copper-silver ore from old Hazel mines. Tests show dump ore amenable to flotation; financing of mill being arranged. Henry M. Sutton, president; Walter L. Steele, general manager; Oliver W. Steele, assistant manager; Fred W. Schneider, superintendent of mines.

UTAH

Beaver County

PALOMA (Milford)—Strike of lead-silver ore on 900 level reported.

CROFF (Milford)—Two cars shipped and third being prepared for shipment.

Emery County

MANGANESE ORE, 10 miles from Floy, a station on the Denver & Rio Grande R.R., 15 miles from Green River, is being mined by Col. James A. Shinn and Albert Hahnewald, of Denver. Deposits formerly operated under lease by Colorado Fuel and Iron Co. Present shipments, four or five cars per week, going to Pittsburgh. Output limited by wagon haul; may install trucks. Headquarters now at Green River, Utah.

Salt Lake County

MONTANA-BINGHAM CONSOLIDATED (Bingham)—On 1000 level of Fortuna reported to have opened copper ore. Montana-Bingham tunnel being advanced to open Fortuna ground at depth Flotation mill on Fortuna treating 100 tons daily and capacity to be increased Tiawaukee portion of ground also being developed.

BOSTON DEVELOPMENT (Salt Lake)—Work to be resumed at old Maxfield mine in Big Cottonwood Canyon

CARDIFF (Salt Lake)—Four trucks hauling ore, may add two more. Sending down 80 tons of ore daily

PRINCE OF WALES (Salt Lake)—Lessees making shipment of high-grade silver-lead ore, accumulated during winter and spring Optioned to Alta Tunnel and Transportation Co., which is driving for this vein below 1100 level

Summit County

PARK CITY SHIPMENTS for June amounted to 6895 tons and for the first half of 1917 were 42,925 tons There were 17 shippers, heaviest were Silver King Coalition, Judge Mining and Smelting, and Silver King Consolidated, in order named

IOWA COPPER (Park City)—Ore opened in several places; about 200 tons accumulated for shipment

THREE KINGS (Park City)—Drift from level 110 ft below main level passing into ground which is showing mineralization.

Tooele County

IN DUGWAY DISTRICT, 35 miles southeasterly from Deep Creek, several Salt Lake companies are hauling ore 55 miles to Faust Station for shipment to Salt Lake Some of the properties are the Metallic Hill, the Golconda (both lead-silver), the Dugway Silver Bell, the Canon, the Laurel, the Piedmont, etc. The Bertha is reported to have opened ore of good grade.

UTAH QUEEN (Stockton)—Considerable ore reported accumulated Teams difficult to obtain.

CANADA

Ontario

LITTLE NIPISSING (Cobalt)—Vein, 4 in. wide, carrying native silver, has been found in winze sunk from 200-ft. level, at depth of 50 ft Drifting on vein.

LA ROSE CONSOLIDATED (Cobalt)—Operations begun on Violet property, east of the O'Brien mine Shaft will be put down to 300-ft. level to explore for some of the O'Brien veins.

HOLLINGER-CONSOLIDATED (Timmins)—New vein carrying free gold cut on 425-ft. level of No. 10 shaft.

HARGRAVE (Cobalt)—Preliminary returns from shipment of 12 tons high-grade ore to Deloro give aggregate recovery of about 31,000 oz. of silver.

LAKE SHORE (Kirkland Lake)—Drift on new vein at 200-ft. level is now 270 ft.; 130 ft. is in high-grade ore; for over 100 ft. vein averaged $40 over width of 4 ft. Vein shows milling ore for width of 40 ft. at present face of drift.

TECK HUGHES (Kirkland Lake)—In May treated 1295 tons, averaging $7.50.

WEST DOME (Porcupine)—Official report estimates 70,000 tons of $9 ore developed to date.

MINAKER (Kirkland Lake)—Two test pits being sunk on the vein; improving with depth.

DOME EXTENSION (South Porcupine)—Exploration work is being systematically undertaken. Drilling operations from 600-ft. level, reached by long drift from the Dome workings, have given variable results. Now proposed to drive inclined hole to depth of 1600 ft.

WASAPIKA (West Shining Tree)—Preliminary exploration completed; development will be begun with George R. Rogers, president and general manager, in charge Sampled for approximately 2000 ft. in length. Property formerly known as Ribble gold group.

SHAMROCK (Cobalt)—Following recent visit of J. C Hammond, president of company, and party of New York men, expenditure of $100,000 projected. New shaft to lower contact planned.

BRITISH AMERICA NICKEL CORPORATION (Sudbury)—Original plans for reduction works to be erected near the Murray mine altered to increase capacity to 2500 tons of ore per day. Development being actively pushed. The inclined shaft 700 ft. deep is being connected up with the orebodies and will be continued to the 1000-ft. level; diamond drilling is being carried on to locate another shaft. Machine shop being erected for which equipment is now on ground Force of 150 men at work; 60 in mine; force will shortly be increased to about 225. Definitely decided to build refinery near mine, negotiating with provincial hydro-electric commission, through municipal authorities of Sudbury, for supply of 15,000 hp of electricity. General Manager E. P. Mathewson states that recent explorations have considerably increased ore reserves, estimated at 3,000,000 tons for Murray mine and 5,000,000 tons for company's other properties Diamond drilling has also shown occurrence at 950-ft level that is estimated at an additional 5,000,000 tons. Norwegian nickel interests have joined in the enterprise.

BENBOW (Matheson Township)—Discovery of narrow surface vein carrying free gold reported on these claims; about one mile southeast of the Croesus.

MEXICO

STRIKE AT CANANEA unchanged. Mines and works idle

MOCTEZUMA (Nacozari, Son.)—Working eight-hour night shift again, presumably under Government approval Night shift was discontinued when new law, providing seven-hour night shift, became effective, resulted in laying off about 100 men Governor Calles, recently inaugurated, is anxious to promote industrial activity, and requested resumption.

FRESNILLO (Fresnillo, Zacatecas)—Will soon resume operations

SOMBRERETE MINING CO. (Sombrerete, Zacatecas)—Shipping ore from mine and stockpiles to the Torreon smeltery

CIA METALURGICA MEXICANA (San Luis Potosi)—Preparing for resumption of smelting; receiving coke and other supplies.

TEZUITLAN COPPER (Aire Libre, Puebla)—Sending in coke from Rosita and materials necessary for resumption of smelting operations

The Market Report

Metal Markets

SILVER AND STERLING EXCHANGE

July	Sterling Exchange	Silver New York, Cents	Silver London, Pence	July	Sterling, Exchange	Silver New York, Cents	Silver London, Pence
5	4 7540	78½	39⅞	9	4 7550	78¾	$39\frac{15}{16}$
6	4 7544	78⅜	$39\frac{13}{16}$	10	4 7555	79½	$40\frac{5}{16}$
7	4.7550	78¼	39¾	11	4 7555	80	40⅝

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

DAILY PRICES OF METALS IN NEW YORK

July	Copper Electrolytic	Tin Spot.	Lead N. Y.	Lead St. L.	Zinc St. L.
5	28¾ @29¼	62¼	11	10 90	8¾ @8⅞
6	28¾ @29¼	62¼	11	10.90	8¾ @8⅞
7	28¾ @29¼	62¼	11	10.90	8¾ @8⅞
9	28½ @29	62⅝	10.95 @11	10.90	8 75 @8 80
10	28¼ @28¾	63	10.90 @11	10 85 @10.90	8⅝ @8¾
11	28 @28½	62¾	10.90 @11	10.85 @10 90	8½ @8¾

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

The quotations for electrolytic copper are for cakes; ingots and wirebars. Electrolytic copper is commonly sold on "regular terms" (r.t.), including freight to the buyer's works and is subject to a discount for cash. The difference between the price delivered and the New York cash equivalent is at present about 0.25c. on domestic business. The price of electrolytic cathodes is 0.05 to 0.10c. below that of electrolytic. Quotations for spelter are for ordinary Prime Western brands. We quote New York price at 17c. per 100 lb. above St. Louis.

Some current freight rates on metals per 100 lb. are: St. Louis-New York 17c.; St. Louis-Chicago, 6.3c.; St. Louis-Pittsburgh, 13.1 cents.

LONDON

July	Copper Standard Spot	Copper Standard 3 Mos.	Copper Electrolytic	Tin Spot	Tin 3 Mos.	Lead Spot	Zinc Spot
4	130	129½	142	242	237	30½	54
5	130	129½	142	245	239½	30½	54
6	130	129½	142	245½	240¼	30½	54
7	...	...	..			.	
9	130	129½	142	246	242	30½	54
10	130	129½	142	246½	242½	30½	54
11	130	129½	142	245½	242	30½	54

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2,240 lb. For convenience in comparison of London prices, in pounds sterling per 2,240 lb., with American prices in cents per pound the following approximate ratios are given, reckoning exchange at 4.80. £15 = 3.21c.; £20 = 4.29c.; £30 = 6.43c.; £40 = 8.57c.; £60 = 12.85c. Variations, £1 = 0.21⅜c.

NEW YORK—July 11, 1917

The metal markets all around were dull this week and exhibited a weaker tone. The controversy about prices and the uncertainty respecting Government policy, focusing in Washington, has had the effect of killing business. In spite of the strikes shortening production of copper and zinc, buyers have shown no interest in contracting for additional supplies.

Our Washington correspondent telegraphs us this afternoon that the metals which were added to the Food and Fuel Control Bill, now pending in the Senate, were today excluded from the substitute bill which is being prepared by the Senate's Committee on Agriculture. It is believed that this action of that Committee will be supported by the Senate if the substitute bill is caused to replace the measure that is now before the Senate.

Copper, Tin, Lead and Zinc

Copper—No business was reported by producers and the market is quoted on offers to sell. Lower prices were made from day to day, and at the close it was easy to buy August-September copper on the basis of 28¼c. cash, New York, while fourth-quarter delivery was to be had at half a cent less.

The Anaconda company is going to build at Great Falls, Mont., a copper rod and wire mill, with daily capacity for 200,000 lb. of rods and 25,000 lb. of wire. The estimated cost of the plant is $500,000.

Copper Sheets are quoted at 39@40c. per lb. for hot rolled, and 1c. higher for cold rolled. Wire is quoted at 35c. per lb., f.o.b. mill.

Tin—Very little Straits tin is immediately available; on the other hand, the demand for it was slight. In brief, the tin market was very narrow and there was but little change in price. Banka tin was quoted at about 2c. per lb. under the price for Straits.

Lead—The volume of business was relatively small. Conditions were distinctly easier as to supply, and there were transactions at figures below the price of the A. S. & R. Company.

Zinc—Sales were made right through the week at small concessions in price from day to day. At the close, future spelter was offered at 8⅜c. and near-by at 8⅝c., with reports that these prices had been shaded on actual business.

Reports of curtailment of production are now coming in. Several plants in Kansas and Oklahoma have been shut down, or are about to be, and furnaces are being put out of commission at other plants.

Zinc dust is quoted at 16@17c.

Zinc Sheets—Price of zinc sheets has not been changed. Market is still at $19 per 100 lb. f.o.b. Peru, Ill., less 8% discount.

Other Metals

Aluminum—The aluminum market continues extremely quiet. Quotations slightly lower, quick delivery being offered at 57@58c. per lb. for No. 1 ingots at New York; futures slightly lower.

Antimony—The antimony market continued dull and lifeless. Such business as was reported was at materially reduced prices. We quote spot at 16@17c., and July-August shipment from China at 14@15c. The contraction in the differential between the prices for spot and futures is noteworthy.

Bismuth—Quoted at $3.50 per lb.

Cadmium—Quoted at $1.50@1.75 per lb.

Cobalt—Quoted at $1.70 per lb.

Magnesium—Ingot is quoted at $2.50.

Nickel—Steady at 50@55c. per lb., with premium of 5c. per lb. for electrolytic.

Quicksilver—The lower prices prevailing recently interested buyers, who seem to have absorbed the spot supplies, and there is said to be no longer any California quicksilver in stock in New York. This has led to an advance in price, and we quote $100@105. Late in the week sales were made at as high as $105, and one important interest quoted that price only for quicksilver to arrive. San Francisco reports, by telegraph, $100, market excited.

Tungsten—Quoted at $2.40 per lb.

Cerium—Ferroalloy firm at $28 per lb. Safety Lamp alloy at $40 per pound.[1]

Magnesium—Ingot metal, $2.50 per lb.; powdered, $3.90 to $4.20.[1]

Molybdenum—Metal wire at $125 per kg.[1]

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[1] Quotations supplied by Foote Mineral Co., Philadelphia.

Gold, Silver, and Platinum

Gold—Imports of gold in New York for the week were $6,500,000 from Ottawa, which was turned over to the Federal Reserve Bank.

Silver—This metal has advanced rapidly in London during the last week from 39⅞d. to 40⅝d. This has been owing to local and continental demands for silver coming in a poorly supplied market. The diversion to the Orient, by way of San Francisco, is still absorbing the bulk of our shipments, but it has been intimated that this diversion may subside a little later in the season. Eastern rates of exchange are not advancing on a parity with the rise in London.

Silver was quoted on July 11 in New York at 80c. per oz., the highest price recorded since 1892. Supplies are not large and demand is strong. The advance during the last month has been about five cents. It is in part due to a current scarcity in supplies, coupled with a large demand from India; in part also it is a result of the unsettled state of affairs in China.

Mexican dollars at New York, July 3, 61¼c.; 5, 61⅝c.; 6, 61⅝c.; 7, 61½c.; 9, 61⅞c.; 10, 62½c.

Platinum—We quote this market unchanged at $102@104, although figures as high as $105 and as low as $100 were mentioned in the trade.

Palladium—Quotation is unchanged at $110@115.

Zinc and Lead Ore Markets

Platteville, Wis., July 7—Blende, basis 60% Zn, $75 for premium ore down to $70 for medium grade. Lead ore, basis 80% Pb, $120 per ton. Shipments reported for the week are 2430 tons of zinc ore, 349 tons of lead ore, and 915 tons of sulphur ore. For the year to date the figures are: 72,607 tons of zinc ore, 3298 tons of lead ore, and 14,849 tons of sulphur ore. Shipped during the week to separating plants, 3236 tons of zinc ore.

Joplin, Mo., July 7—Blende per ton, high, $79.65; basis 60% Zn, premium ore $75, medium to low $70@65; calamine per ton, basis 40% Zn, $40; average selling price, all grades of zinc, $64.56 per ton.

Lead, high, $123.50; basis 80% Pb, $120; average selling price, all grades of lead, $120.88 per ton.

Shipments the week: Blende 7186 tons, calamine 1049 tons, lead 1260 tons. Value, all ores the week, $716,960.

Each week the production in the sheet-ground area lessens, and mill after mill is closing down because they cannot be operated on 2% ore with present expenses and the current market price for blende. Some of the mills are being removed to the Oklahoma field, now a continuous string of camps from Commerce, four miles north of Miami, to the Kansas state line, with one big mine over the line and a second mill building. The larger camps, north of Commerce, are Cardin and Picher, frontier mining camps in many particulars, with Century, St. Louis and Treece pushing forward for recognition. Picher is near the Oklahoma-Kansas state line in Oklahoma and Treece is in Kansas.

Other Ores

Antimony Ore—Quoted nominally at $2.20 per unit.

Chrome Ore—Standard, 40% or over, firm at $1 per unit. Little offered.[1]

Manganese Ore—Firm and in active demand, with a further advance in price, $1.10 per unit having been paid for metallurgical ore on the spot.

Molybdenum Ore—Small transactions at $2.10@2.20 per lb. of molybdenum sulphide in concentrates assaying 90 per cent.

Monazite Sand—Guaranteed 5% thoria, firm at $65 per unit of ThO_2 per ton.[1]

Strontium Ore—Crude carbonate, 83%, 7c. per lb. for 200-mesh material. Crude sulphate, 90%, 1c. for lumps and 2c. for 200 mesh.[1]

Zirkite—The 80% ZrO_2 firm at 6c. per lb. for lumps, or 8c. for 200 mesh.[1]

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[1] Quotations supplied by Foote Mineral Co., Philadelphia.

Pyrites—Spanish lump quoted at 15½c. per unit on basis of 10s. ocean freight, buyer to pay war risk, excess freight and any duty. Ocean freights are 42s. 6d. from Huelva to southern ports, two steamers having lately arrived under such charters.

Tungsten Ore—But little was done in this market, supplies having been practically exhausted. Such transactions as were reported were at unchanged prices, viz.: $22 for wolframite and $25 for scheelite. Charles Hardy reports, under date of July 10, that "the stocks in New York are probably at their lowest since the beginning of 1917 and no shipments to any extent are expected."

Iron Ore—Prices, delivered lower Lake ports are for old-range bessemer, $5.95; old-range nonbessemer, $5.20; Mesabi bessemer, $5.70 and Mesabi nonbessemer, $5.05.

Iron-ore shipments down the lakes in June totaled 9,639,991 tons, or 130,000 tons increase over those of the preceding June. On account of the light shipments in April and May, due to late breaking up of the ice, shipments to July 1 are 3,500,000 tons short of last year's record, but no serious scarcity of ore is expected.

PITTSBURGH—July 10

The iron and steel markets have grown still quieter, suffering under the combined influences of the summer season, the sold-up condition of the mills, the uncertainties as to deliveries, the extremely high prices now quoted as the market, and the belief in many quarters that within a few weeks there will be price regulation for coke, pig iron, unfinished steel and finished steel products.

While the Senate wrestles with the Food Bill with its prohibition amendments and the amendments relating to price fixing for iron, steel, cotton, etc., a movement has arisen in the steel trade looking toward the establishment of a schedule of prices by the producers themselves, somewhat on the order of the recent coal-price agreement. Meanwhile conferences continue between the steel makers and the authorities at Washington relative to prices for steel involved in Government orders. Not much progress appears to have been made but this week's conference may have tangible results.

Whatever the cause, iron and steel price advances appear practically to have ceased. Pig iron and unfinished steel are no higher than a week ago and finished steel prices, as far as they can be quoted, appear to be about the same. Scrap has weakened slightly. Frequently it is a trustworthy barometer.

The Steel Corporation's unfilled obligations decreased by 503,304 tons during June, showing that the Corporation booked about 60% as much tonnage as it shipped. The Corporation has been practically out of the market since April, but it has been forced to book some business from regular customers, while it has accepted all the Government business offered.

Pig Iron—There has been a little buying of prompt foundry and malleable at $1 above the previous maximum, but otherwise the market has become extremely dull, with little inquiry for forward deliveries of any grade and no buying of consequence. We quote Bessemer, $56@57.50; basic, $54@55; foundry and malleable, $53@56, f.o.b. valley furnaces, 95c. higher delivered Pittsburgh.

Steel—Authorities in the trade consider the market unchanged, there having been no recent transactions of consequence, and we quote billets at $95@100 and sheet bars at $105@110.

Ferroalloys

Ferromanganese—The spot market is rather irregular, quotations ranging from $425 to $475, with not enough done to establish a level. Second half is quoted at about $425. For first half $350 was recently done but $375 is now the minimum quotation.

Coke

Connellsville—The feverish buying before Independence Day sent the market up until $16 was paid for spot furnace coke and there are rumors of slightly higher prices. Late last week the market declined but there has been no further decline this week and we quote spot furnace coke at $13@14.50, depending on what road the cars loaded belong to, with spot foundry about $1 a ton higher.

STOCK QUOTATIONS

N. Y. EXCH.†	July 10
Alaska Gold M.	5[illegible]
Alaska Juneau	4
Am.Sm.& Ref.,com	105[illegible]
Am. Sm. & Ref., pf.	113
Am. Sm. Sec., pf., A	100
Am. Sm. Sec., pf. B	94[illegible]
Am. Zinc	30[illegible]
Am. Zinc, pf	62[illegible]
Anaconda	79[illegible]
Batopilas Min	1
Bethlehem Steel	132[illegible]
Bethlehem Steel, pf.	‡120
Butte & Superior	40
Cerro de Pasco	35
Chile Cop	21[illegible]
Chino	54[illegible]
Colo Fuel & Iron	50[illegible]
Crucible Steel	85[illegible]
Dome Mines	12
Federal M. & S	20
Federal M. & S., pf	45[illegible]
Great Nor., ore ctf.	32[illegible]
Greene Cananea	41
Gulf States Steel	124
Homestake	105
Inspiration Con	60[illegible]
International Nickel	40
Kennecott	44
Lackawanna Steel	92[illegible]
Miami Copper	41
Nat'l Lead, com.	‡56
National Lead, pf	‡109
Nev. Consol	23
Ontario Min.	5[illegible]
Quicksilver	1[illegible]
Quicksilver, pf	2[illegible]
Ray Con	28
Republic I.&S.,com.	91[illegible]
Republic I. & S., pf	102[illegible]
Sloss-Sheffield	56[illegible]
Tennessee C. & C.	17[illegible]
U. S. Steel, com	126[illegible]
U. S. Steel, pf	118
Utah Copper	108[illegible]
Va. Iron C. & C.	68

N. Y. CURB†	July 10
Big Ledge	1[illegible]
Butte & N. Y.	1[illegible]
Butte C. & Z	10[illegible]
Caledonia	58
Calumet & Jerome	1 43[illegible]
Can. Cop. Corpn	2[illegible]
Carlisle	4
Cashboy	08
Con. Ariz. Sm.	2[illegible]
Con. Coppermines	5[illegible]
Con. Nev.-Utah	08
Emma Con	‡[illegible]
Ferber	.60
First Nat. Cop.	3[illegible]
Goldfield Con.	51
Goldfield Merger	06
Greenmonster	93[illegible]
Hecla Min	8[illegible]
Howe Sound	5[illegible]
Jerome Verde	1[illegible]
Joplin Ore & Spel.	‡15
Kerr Lake	4[illegible]
Magma	45
Majestic	‡40
McKinley-Dar-Sa	‡47
Mohican	62[illegible]
Mother Lode	27
N. Y. & Hond	‡12
Nipissing Mines	7[illegible]
Ohio Cop	1.56[illegible]
Ray Hercules	4
Rochester Mines	50
St. Joseph Lead	19
Standard S. L.	68[illegible]
Stewart	[illegible]
Success	.36
Tonopah	6[illegible]
Tonopah Ex	1.43[illegible]
Tribullion	[illegible]
Troy Arizona	26
United Cop	[illegible]
United Verde Ext.	38[illegible]
United Zinc	5
Utica Mines	24
White Knob, pf.	2
White Oaks	‡12
Yukon Gold	2[illegible]

SAN FRAN.*	July 7
Alta	04
Andes	11
Best & Belcher	02
Bullion	02
Caledonia	15
Challenge Con	01
Confidence	10
Con. Virginia	33
Gould & Curry	02
Hale & Norcross	03
Jacket-Cr. Pt	08
Mexican	12
Occidental	85
Ophir	10
Overman	03
Savage	07
Seg Belcher	03
Sierra Nevada	10
Union Con	20
Utah Con	01
Belmont	4.00
Jim Butler	80
MacNamara	25
Midway	09
Mont.-Tonopah	20
North Star	10
Rescue Eula	21
West End Con.	‡ 68
Atlanta	10
Booth	07
Comb. Frac	1.04
D'field Daisy	03
Florence	18
Jumbo Extension	31
Kewanas	13
Nevada Hills	23
Nevada Packard	43
Round Mountain	35
Silver Pick	10
White Caps	1.35
Big Jim	70
United Eastern	4.25

BOSTON EXCH.*	July 10
Adventure	2[illegible]
Ahmeek	98[illegible]
Algomah	60
Allouez	62
Ariz. Com., ctfs	13
Arnold	30
Bonanza	20
Butte-Ballaklava	58
Calumet & Ariz	77[illegible]
Calumet & Hecla	535
Centennial	16[illegible]
Copper Range	60[illegible]
Daly West	1[illegible]
Davis-Daly	5[illegible]
East Butte	12[illegible]
Franklin	6[illegible]
Granby	82
Hancock	14
Hedley	15
Helvetia	25
Indiana	2
Isle Royale	30
Keweenaw	2
Lake	11[illegible]
La Salle	3
Mason Valley	6[illegible]
Mass	12[illegible]
Mayflower	2[illegible]
Michigan	4[illegible]
Mohawk	81[illegible]
New Arcadian	2 1/16
New Idria	14
North Butte	17
North Lake	1
Ojibway	1[illegible]
Old Dominion	57[illegible]
Osceola	85
Quincy	86
St. Mary's M. L.	78[illegible]
Santa Fe	1
Seneca Mines	10
Shannon	8
Shattuck-Ariz	24[illegible]
So. Lake	3[illegible]
So. Utah	.20
Superior	7
Superior & Bost.	4[illegible]
Trinity	7[illegible]
Tuolumne	1
U. S. Smelting	57[illegible]
U. S. Smelt'g, pf	49[illegible]
Utah Apex	2[illegible]
Utah Con	15[illegible]
Utah Metal	4[illegible]
Victoria	3[illegible]
Winona	3[illegible]
Wolverine	44[illegible]
Wyandot	.50

BOSTON CURB*	July 10
Alaska Mines Corp	70
Bingham Mines	12[illegible]
Boston Ely	40
Boston & Mont	53
Butte & Lon'n Dev	.14
Calaveras	3[illegible]
Calumet-Corbin	.01[illegible]
Chief Con.	‡2[illegible]
Cortez	20
Crown Reserve	28
Crystal Cop	1 1/16
Eagle & Blue Bell	2[illegible]
Houghton Copper	95
Intermountain	1[illegible]
Iron Cap, Com	14[illegible]
Iron Cap Cop., pf	14[illegible]
Mexican Metals	.28
Mines of America	1[illegible]
Mojave Tungsten	40
Nat. Zinc & Lead	65
Nevada-Douglas	1[illegible]
New Baltic	1[illegible]
New Cornelia	‡18[illegible]
Oneco	.50
Pacific Mines	30
Rex Cons	24

SALT LAKE*	July 10
Bannack	1.00
Big Four	35
Black Jack	06
Cardiff	5.50
Colorado Mining	20
Daly-Judge	8.00
Empire Copper	1.25
Gold Chain	18
Grand Central	63
Grand Gulch	19
Iron Blossom	1.00
Lower Mammoth	03
May Day	06[illegible]
Moscow	12
Prince Con	1.12[illegible]
Silver-King Coal'n	3.02
Silver King Con.	3.70
Sioux Con	12
So. Hecla	1.07
Uncle Sam	02[illegible]
Wilbert	16
Yankee	07[illegible]

TORONTO*	July 10
Bailey	03
Beaver Con	36
Buffalo Mines	1.15
Chambers Ferland	12
Coniagas	4.30
La Rose	40
Peterson Lake	12
Right of Way	05
T. & Hudson Bay	‡38.00
Temiskaming	38
Wettlaufer-Lor	05[illegible]
Dome Exten	18
Dome Lake	16
Foley O'Brien	60
Hollinger	4.35
Jupiter	‡ 28
McIntyre	1.57
Newray	52
Porcu. Crown	48[illegible]
Schumacher	40
Vipond	‡ 28
West Dome	10[illegible]

STOCK QUOTATIONS—Continued

COLO. SPRINGS	July 7
Cresson Con.	5.43[illegible]
Doctor Jack Pot.	04[illegible]
Elkton Con.	06
El Paso	30
Gold Sovereign	04
Golden Cycle	2.14[illegible]
Granite	52
Isabella	10
Mary McKinney	.17
Portland	1.49
United Gold M.	.21
Vindicator	.72

LONDON	June 15		
Alaska Mexican	£0	10s	0d
Alaska Tre'dwell	1	5	0
Burma Corp.	4	3	9
Cam & Motor	0	8	6
Camp Bird	0	7	0
El Oro	0	10	0
Esperanza	0	11	0
Mexican Mines	4	7	6
Nechi, pfd.	0	11	9
Oroville	0	16	3
Santa Gert'dis.	0	10	0
Tomboy	0	19	3

* Bid prices. † Closing prices. ‡ Last Quotations.

MONTHLY AVERAGE PRICES OF METALS

Silver	New York			London		
	1915	1916	1917	1915	1916	1917
January	48.855	56.775	75.630	22.731	26.960	36.682
February	48.477	56.755	77.585	22.753	26.975	37.742
March	50.241	57.935	73.861	23.708	27.597	36.410
April	50.250	64.415	73.875	23.709	30.662	36.963
May	49.915	74.269	74.745	23.570	35.477	37.940
June	49.034	65.024	76.971	23.267	31.060	39.065
July	47.519	62.940	......	22.597	30.000	......
August	47.163	66.083	.....	22.780	31.498	...
September	48.680	68.515	..	23.591	32.584	..
October	49.385	67.855	...	23.925	32.361	
November	51.714	71.604	..	25.094	34.192	
December	54.971	75.765	..	26.373	36.410	
Year	49.684	65.661		23.675	31.315	.

New York quotations cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Copper	New York		London			
	Electrolytic		Standard		Electrolytic	
	1916	1917	1916	1917	1916	1917
Jan.	24.008	28.673	88.083	131.921	116.167	142.895
Feb.	26.440	31.750	102.667	137.895	133.167	148.100
Mar.	26.310	31.481	107.714	136.750	136.000	151.000
April	27.895	27.935	124.319	133.842	137.389	147.158
May	28.625	28.788	135.457	130.000	152.522	142.000
June	26.601	29.962	112.432	130.000	137.455	142.000
July	23.865	.....	95.119	...	125.500	....
Aug	26.120	.....	110.283	..	126.304	....
Sept.	26.855	......	113.905		134.071	....
Oct	27.193	...	122.750	.	142.523	..
Nov.	30.625	..	134.659	.	155.432	..
Dec.	31.890	.	145.316	..	162.842	..
Year	27.202	....	116.059		138.281	..

Tin	New York		London	
	1916	1917	1916	1917
January	41.825	44.175	175.548	185.813
February	42.717	51.420	181.107	198.974
March	50.741	54.388	193.609	207.443
April	51.230	55.910	199.736	220.171
May	49.125	63.173	196.511	245.114
June	42.231	62.053	179.466	242.083
July	38.510		168.357	
August	38.565		169.870	
September	38.830		171.345	
October	41.241		179.307	
November	44.109		186.932	
December	42.635		183.368	
Av. year	43.480		182.096	..

Lead	New York		St. Louis		London	
	1916	1917	1916	1917	1916	1917
January	5.921	7.626	5.826	7.530	31.167	30.500
February	6.246	8.636	6.164	8.595	31.988	30.500
March	7.136	9.199	7.375	9.120	34.440	30.500
April	7.630	9.288	7.655	9.158	34.368	30.500
May	7.463	10.207	7.332	10.202	32.967	30.500
June	6.936	11.171	6.749	11.123	31.011	30.500
July	6.352		6.185	....	28.137	
August	6.244		6.088	.	29.734	
September	6.810		6.699		30.786	
October	7.000		6.898		30.716	
November	7.042		6.945	.	30.500	
December	7.513		7.405		30.500	
Year	6.853		6.777		31.359	

Spelter	New York		St. Louis		London	
	1916	1917	1916	1917	1916	1917
Jan.	16.915	9.619	16.745	9.449	89.810	48.329
Feb.	18.420	10.045	18.260	9.875	97.762	47.000
Mar.	16.846	10.300	16.676	10.130	95.048	47.000
April	16.695	9.459	16.525	9.289	99.056	54.613
May	14.276	9.362	14.106	9.192	94.217	54.000
June	11.752	9.471	11.582	9.201	68.591	54.000
July	8.925		8.755		50.750	
Aug.	8.730		8.560		51.587	
Sept.	8.990		8.820		52.095	
Oct.	9.829		9.659		54.150	
Nov.	11.592		11.422		56.023	
Dec.	10.665		10.495		55.842	
Year	12.804		12.634		72.071	

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton. ‖ Not reported.

Pig Iron, Pitts.	Bessemer‡		Basic‡		No. 2 Foundry	
	1916	1917	1916	1917	1916	1917
January	$21.60	$35.95	$18.78	$30.95	$19.70	$30.95
February	21.18	38.37	18.93	30.95	19.51	30.95
March	21.81	37.37	19.20	33.49	19.45	35.91
April	21.65	43.23	18.95	38.00	19.45	40.06
May	21.78	46.91	19.11	42.84	19.58	43.60
June	21.95	54.22	18.95	50.05	19.34	50.14
July	21.95		18.95		19.20	.
August	21.95		18.95		19.22	.
September	22.88		19.58		19.53	
October	24.61		21.36		21.51	
November	30.07		28.18		26.55	
December	35.16		30.95		30.79	
Year	$23.88		$20.98		$21.15	.

‡ As reported by W. P. Snyder & Co.

Current Prices—Materials and Supplies

IRON AND STEEL

DRILL STEEL—New York price in cents per pound is:

Solid	12	Hollow	24

In St. Louis the price of solid is 14½c.

SHEETS—Quotations are in cents per pound in various cities from warehouse, also the base quotation from mill:

	Large Lots. Pittsburgh	St. Louis	Chicago	San Francisco	New York July 6, 1917	New York One Yr. Ago
Blue Annealed						
No. 10	7.85	9.55	9.50	10.50	9.50	4.25
No. 12	8 10	9.60	9.55	10.55	9.55	4.30
No. 14	8.35	9.65	9.60	10.60	9.60	4.35
Black						
Nos. 18 and 20	8.05	9.15	9.30	10.80	9.80	3.45
Nos. 22 and 24	8.10	9.20	9.35	10.83	9.85	3.50
No. 26	8.15	9.25	9.40	10.88	9.90	3.55
No. 28	8.25	9.35	9.50	10.9S	10.00	3.65
Galvanized						
No. 10	9.00	Premium	9.75	....	....	4.50
No. 12	9.10	Premium	9.85	12.15	....	4.50
No. 14	9.25	Premium	10.00	12.15	11.85	4.50
Nos. 18 and 20	9.40	Premium	10.15	12.45	11.65	4.80
Nos. 22 and 24	9.80	Premium	10.55	12.62	12.55	4.95
No. 26	9.95	Premium	10.20	12.77	12.70	5.10
No. 28	10.25	Premium	10.50	13.06	13.00	5.40

CORRUGATED SHEETS—Price of corrugated sheets (2½-in. corrugations) in cents per pound:

Gage		Cincinnati	Birmingham	St. Louis	Denver
18–20	Black	$18.00*	....	$0.092	....
28	Black	5.75*	....	.094	$0.10
10	Galvanized	....	....	....	....
18–20	Galvanized	22.50*	$0.11	....	....
28	Galvanized	8.75*	.12	.113	.12

*Price per square of 100sq.ft.

STEEL RAILS—The following quotations are per ton f.o.b. Pittsburgh and Chicago for carload or larger lots. For less than carload lots 5c. per 100 lb. is charged extra:

	Pittsburgh July 6, 1917	Pittsburgh One Year Ago	Chicago July 6, 1917	Chicago One Year Ago
Standard bessemer rails	$38.00	$33.00	$38.00	$33.00
Standard openhearth rails	40.00	35.00	40.00	35.00
Light rails, 8 to 10 lb.	63.00	50.00	68.00	43.00
Light rails, 12 to 14 lb.	62.00	49.00	67.00	42.00
Light rails, 25 to 45 lb.	60.00	47.00	65.00	40.00

Note—Rerolled rails sell for same price as new light rails.

TRACK SUPPLIES—The following prices are base per 100 lb. f.o.b. Pittsburgh for carload lots, together with the warehouse prices at the places named:

	Pittsburgh July 6, 1917	Pittsburgh One Year Ago	Chicago	St. Louis	San Francisco
Standard railroad spikes	$4.50	$2.65	$5.00	$4.85	$5.75
Track bolts	6.25	3.25	6.25	5.05	7.50
Standard section angle bars	...	2.00	4.00	Premium	...

STRUCTURAL MATERIAL—The following are the base prices f.o.b. mill, Pittsburgh, together with the quotations per 100 lb. from warehouses at the places named:

	Pittsburgh	New York July 6, 1917	New York 1 Yr. Ago	St. Louis	Chicago	San Francisco	Dallas
Beams, 3 to 15 in.	$4.50	$5.25	$3.25	$5.05	$5.00	$7.75	$6.00
Channels, 3 to 15 in.	4.60	5.25	3.25	5.05	5.00	7.75	6.00
Angles, 3 to 6 in., ¼ in. thick	4.50	5.25	3.25	5.05	5.00	7.75	6.00
Tees, 3 in. and larger	4.50	5.30	3.30	5.05	5.00	7.75	6.00
Plates	9 00*	9.00	4.00	6.55	7.00	10.00	9.00

*Price running wild. For prompt delivery from warehouse, $12.

New York extras on other shapes and sizes per lb. are as follows:

I-beams over 15 in.	$0.10
Angles over 6 in., on one or both legs	.10
Angles, 3 in. on one or both legs less than ¼ in. thick	.70
Cutting to lengths, under 3 ft. to 2 ft. inclusive	.25
Cutting to lengths, under 2 ft. to 1 ft. inclusive	.50
Cutting to lengths, under 1 ft.	1.55

No charge is made for cutting to lengths 3 ft. and over.

HORSE AND MULE SHOES—Warehouse prices per 100 lb. in cities named:

	Cincinnati	St. Louis	Denver	Birmingham
Straight	$6.75	$5.85	$7.25	$6.50
Assorted	7.25	6.00	7.50	7.00

WIRE ROPE—Discounts from list price on regular grades of bright and galvanized are as follows:

	New York July 6, 1917	New York 1 Yr. Ago	St. Louis	Chicago
Galvanized	10—2½%	25—2½%	10—2½%	10—2½%
Bright	20—2½%	35—2½%	20—2½%	15—2½%

BAR IRON—Prices in cents per pound at the places named are as follows:

	July 6, 1917	One Year Ago
Pittsburgh, mill	4.75	2.50
Warehouse, New York	4.75	3.25
Warehouse, Cleveland	4.95	3.25
Warehouse, Chicago	4.50	3.10

SWEDISH (NORWAY) IRON—This material per 100 lb. sells as follows:

	July 6, 1917	One Year Ago
New York	$20.00 to 26.00	$6.00
Cleveland	12.30	6.30
Chicago	12.00	5.25

In coils an advance of 50c. usually is charged:
Note—Stock scarce generally.

PIPE—The following discounts are for carload lots f.o.b. Pittsburgh, in effect May 1, 1917:

BUTT WELD

Steel Inches	Black	Galvanized	Iron Inches	Black	Galvanized
⅛, ¼ and ⅜	42%	15½%	¾ to 1½	38%	22%
½	46%	31½%			

LAP WELD

Steel Inches	Black	Galvanized	Iron Inches	Black	Galvanized
2	42%	27½%	1¼	23%	8%
2½ to 6	45%	35½%	1½	30%	16%
			2	31%	17%
			2½ to 4	33%	20%
			4½ to 6	33%	20%

BUTT WELD. EXTRA STRONG PLAIN ENDS

Steel Inches	Black	Galvanized	Iron Inches	Black	Galvanized
⅛, ¼ and ⅜	38%	20½%	¾ to 1½	38%	23%
½	43%	30½%			
¾ to 1½	47%	34½%			

LAP WELD. EXTRA STRONG PLAIN ENDS

Steel Inches	Black	Galvanized	Iron Inches	Black	Galvanized
2	40%	28½%	1¼	24%	8%
2½ to 4	43%	31½%	1½	30%	16%
4½ to 6	42%	30½%	2	32%	19%
			2¼ to 4	34%	22%
			4½ to 6	33%	21%

Note—National Tube Co. quotes on basing card dated Apr. 1.

Stock discounts in cities named are as follows:

	New York Black	New York Galvanized	Cleveland Black	Cleveland Galvanized	Chicago Black	Chicago Galvanized
¾ to 3 in. steel butt welded	38%	22%	34%	20%	43%	28%
3½ to 6 in. steel lap welded	28%	10%	38%	23%	39%	25%

Malleable fittings, Class B and C, from New York stock sell at 5 and 5% from list prices. Cast iron, standard sizes, 34 and 5%.

MISCELLANEOUS

FLOTATION OILS—Prices of oils for flotation, in cents per gallon:

	New York
Pure steam-distilled pine oil	$0.50½
Pure destructively distilled pine oil	.40
Pine tar oil	.26*
Crude turpentine	.37
Hardwood creosote	.19½*

*F.o.b. Cadillac, Mich.

SODIUM CYANIDE—New York price is 30c. per lb.

SODIUM SULPHIDE—In New York the price per pound is 3¾c. for concentrated, 1¾c. for crystals. The St. Louis price for concentrated is quoted at 6c.

ZINC DUST—New York price is 16@17c. per lb.

CALCIUM CARBIDE—Price f.o.b. cars at warehouse points east of Mississippi (except in Alabama, Georgia and Florida) is $82.50 for Cameo, $87.50 for Union. In territory between Mississippi River and the Rockies and in Alabama, Georgia and Florida, add $5; west of Rockies, add $10 to $15.

HOSE—

Fire

	50-Ft. Lengths
Underwriters' 2⅝-in.	60c. per ft.
Common, 2½-in.	50%

Air

	First Grade	Second Grade	Third Grade
¾-in. per ft.	$0.55	$0.30	$0.25

Steam—Discounts from list

First grade	30%	Second grade	30-5%	Third grade	40-10%

RUBBER BELTING—The following discounts from list apply to transmission rubber and duck belting:

Competition	50–10%	Best grade	25%
Standard	40%		

LEATHER BELTING—Present discounts from list in the following cities are as follows:

	Medium Grade	Heavy Grade
New York	40%	35%
St. Louis	50%	40%
Chicago	40—5%	35—10%

RAWHIDE LACING—40%.

MANILA ROPE—For rope smaller than ⅝-in. the price is ½ to 2c. extra; while for quantities amounting to less than 600 ft. there is an extra charge of 1c. The number of feet per pound for the various sizes is as follows: ⅝-in., 8 ft.; ¾-in., 6; ⅞-in., 4½; 1-in., 3⅓; 1⅛-in., 2 ft. 10 in.; 1¼-in., 2 ft. 4 in. Following is price per pound for ⅝-in. and larger, in 1200-ft. coils:

Boston	$0.32½	Kansas City	$0.31½
New York	.31¼	New Orleans	.31
Cincinnati	.29	Los Angeles	.31½
Denver	.34	St. Paul	.31½

PACKING—Below are prices each per pound in cities named:

Asbestos

		St. Louis	New York	Chicago
Valve and Stuffing Box	Twisted plain, 25-lb. cartons	$0.80	$0.65 to 0.70	$1.00
	Twisted graphite, 25-lb. cartons	.90	.90	1.35
	Braided plain, 25-lb. cartons	.80	.80	1.20
	Braided graphite, 25-lb. cartons	.90	1.00	1.55

Asbestos wick in balls, ¼, ½-, 1-, 25- and 50-lb. cartons, $0.65@ 0.70, New York; $1, Chicago.

Rubber asbestos, compressed sheet, medium grade about $0.80, New York; $1, Chicago.

STEAM

Following in 25- and 50-lb. cartons:

	New York	Chicago	St. Louis
First grade	$0.83	$1.10	$1.45
Second grade	.55	.85	.90
RUBBER AND DUCK			
High grade	$0.50	$0.55	$0.60
Cold water	.30	.30	.40
PISTON			
Asbestos, duck and rubber	$1.75	$2.00	....
Flax, first grade	.94	1.00	$0.90
Rubber and duck	.90	1.00	.70

RAILWAY TIES—For fair-size orders, the following prices per tie hold:

	Material	6 in. x 8 in. by 8 Ft.	7 in. x 9 in. by 8 Ft. 6 In.
New York	Yellow Pine	$1.06 to 1.11	$1.25
St. Louis	White Oak	1.00	.75
Chicago	Green	.85	.97
San Francisco	pə1osoəɹƆ	1.18	1.60

GREASES—Prices are as follows in the following cities in cents per pound for barrel lots:

	New York	Chicago	St. Louis
Cup	5 to 7	7½	4⅝
Fiber or sponge	5 to 7	7¾	5⅝
Transmission	5 to 7	6¼	5⅜
Axle	3 to 7	5	3 1/16
Gear	4 to 5	6½	3
Car journal (S. & F.)	6½ to 7	6	9½

COTTON WASTE—The following prices are in cents per pound:

	New York		Cleveland	Chicago
	July 6, 1917	One Year Ago		
White	13.00 to 15.00	12.50	14.00	13.00 to 15.00
Colored mixed	10.00 to 12.00	9.00	12.00	10.00 to 12.00

WIPING CLOTHS—In Cleveland the jobbers' price per 1000 is as follows:

13¼ x 13¼	$35.00	13¼ x 20½	$45.00

In Chicago they sell at $30 to $33 per 1000.

LINSEED OIL—These prices are per gallon:

	New York		Cleveland		Chicago	
	July 6, 1917	One Year Ago	July 6, 1917	One Year Ago	July 6, 1917	One Year Ago
Raw in barrels	$1.26	$0.71	$1.28	$0.73	$1.29	$0.73
5-gal. cans	1.36	.81	1.38	.83	1.34	.83

WHITE AND RED LEAD in 500-lb. lots sell as follows in cents per pound:

	Red				White	
	July 6, 1917		1 Year Ago		July 6, 1917	1 Yr. Ago
	Dry	In Oil	Dry	In Oil	Dry and In Oil	Dry and In Oil
100-lb. keg	13.25	13.50	10.50	11.00	13.00	10.50
25- and 50-lb. kegs	13.50	13.50	10.75	11.25	13.25	10.75
12½-lb. keg	13.75	14.00	11.00	11.50	13.50	11.00
1- to 5-lb. cans	15.25	15.50	12.50	12.50	15.50¼	12.50

NUTS—From warehouse at the places named, on fair-sized orders, the following amount is deducted from list:

¼	New York		Cleveland		Chicago	
	July 6, 1917	One Year Ago	July 6, 1917	One Year Ago	July 6, 1917	One Year Ago
Hot pressed square	List	$2.00	$1.65	$2.75	$3.00	$3.25
Hot pressed hexagon	List	2.00	1.50	3.00	3.00	3.25
Cold punched square	List	1.50	1.40	2.50	1.75	3.00
Cold punched hexagon	List	2.00	1.40	3.00	2.25	3.50

Semifinished nuts sell at the following discounts from list price:

	July 6, 1917	One Year Ago
New York	50%	50—10%
Cleveland	50%	60%
Chicago	50%	65%

MACHINE BOLTS—Warehouse discounts in the following cities:

	New York	Cleveland	Chicago
¾ by 4 in. and smaller	30%	40%	35—5%
Larger and longer up to 1 in. by 30 in.	15%	30%	20—2½%

WROUGHT WASHERS—From warehouses at the places named the following amount is deducted from list price:

New York	$5.00	Cleveland	$1.50	Chicago	$5.00

For cast-iron washers the base price per 100 lb. is as follows:

New York	$2.25	Cleveland	$3.40	Chicago	$3.25

EXPLOSIVES AND ACCESSORIES

EXPLOSIVES—Price per pound in small lots at cities named:

	Low Freezing 20%	Gelatin 40%	Gelatin 60%	Gelatin 80%	Black Powder*	Fuse†
New York	....	$0.24½	$0.29½	....	....	....
Boston	....	....	31¼	.35	....	....
Kansas City	$0.17	23½	28¼	31½	....	....
New Orleans	18¼	23¼	27¼	....	....	....
Los Angeles	19	25	.31½	....	....	....
St. Paul	17	23½	28¼	31½	....	....
St. Louis	14¼	20½	25½	31¾	$1.85	$5.80
Denver	10	20	25	33	....	....

*Price per keg. †1000 ft.

BLASTING POWDER—Price per keg:

		Delivered Carload Lots
Ohio, f.o.b. Columbus	400 kegs	$1.74½
Indiana, f.o.b. Aetna		1.79½
Indiana, f.o.b. Indianapolis		
Illinois, f.o.b. Chicago	400 kegs	
Iowa points on Mississippi River, f.o.b. St. Louis		
Iowa points on Mississippi River, f.o.b. Fond du Lac		1.82
Missouri points on Mississippi River, f.o.b. Des Moines		
Missouri points on Mississippi River, f.o.b. Saginaw		
Michigan, South Peonsula only, f.o.b. Kansas City		
Iowa points not on Mississippi River, f.o.b. Duluth	800 kegs	1.84½
Missouri points not on Mississippi Riiver	400 kegs	1.87
Wisconsin (except Counties of Ashland, Bayfield, Douglas Florence and Iron	400 kegs	1.94½
Minnesota, f.o.b. Minn. Transfer, Kansas Citiy, Omaha.	800 kegs	1.84½

Above prices are for CC, C. F, FF, FFF sizes. Price on FFFF size 5c. per keg advance over above prices.

SAFETY FUSE—Prices f.o.b. New York and Chicago, per 1000 ft., less quantity discount:

Cotton	$6.65	Beaver	$6.75
Single tape	6.85	Anchor	7.65
Double tape	7.75	Crescent	7.65
Triple tape	8.60		

BLASTING CAPS—Liist price of blasting and electric blasting caps f.o.b. shipping points in states named:

	Electric Blasting Caps, Copper Wire					Blasting Caps	
		Price per 100					
	No.	4 Ft.	6 Ft.	8 Ft.	10 Ft.	No.	p. 1000
New York, Ohio, Indiana, Illinois, Kentucky and South Michigan	6	$6.00	$7.00	$8.00	$9.00	5	$14.00
	8	8.00	9.00	10.00	11.00	6	17.00
						8	28.00
Missouri, Iowa, Minnesota, Wisconsin and North Michigan	6	6.10	7.11	8.12	9.13	5	14.15
	8	8.10	9.11	10.12	10.13	6	17.15
						8	28.25
Kansas, Nerbraska, North and South Dakota	6	6.15	7.16	8.17	9.18	5	14.30
	8	8.15	9.16	10.17	11.18	6	17.30
						8	28.55

CONSTRUCTION MATERIALS

ROSENDALE NATURAL CEMENT—Price to dealers for 500 bbl. or over, f.o.b., including bags:

New York	$1.15

30c. allowed for bags.

BRICK—The price per 1000 in cargo or carload lots is as follows:

	Common			Paving	
	July 6, 1917	One Month Ago	One Year Ago	Brick	Block
New York	$9.00 to 9.50	$10.25	$8.00	$25.00	$35.00
Chicago	8.00	8.00	6.25	16.75	24.00
Kansas City	11.00	10.00	....	....	20.00
Los Angeles	....	7.50	....	....	28.00
Denver	8.00	....	....	....	....
Cincinnati	13.50	9.50	....	....	22.50

PORTLAND CEMENT—These prices are for barrels in carload lots, including bags:

	July 6, 1917	One Month Ago	One Year Ago
New York	$2.22	$2.22	$1.72
Chicago	2.31	2.31	1.81
Pittsburgh	2.31	2.31	1.81
Cleveland	2.44	2.41	1.94
St. Louis	2.45	2.45	1.86
Deover	2.30	...	...
Los Angeles	2.40	2.40	...

LUMBER—Price per M in carload lots:

	1-In. Rough, 10 In. x 16 Ft. and Under			2-In. T. and G 10 In. x 16 Ft	
	Y.P.	Fir	Hemlock	Y.P.	Fir
Cincinnati	$38.00	....	....	$36.00	....
Kansas City	43.25	$41.50	$43.50	48.00	.
Denver	....	34.00	....	....	$30.00
St. Paul	....	51.00	33.50	50.00	37.50

	8 x 8-In. x 20 Ft. and Under				12 x 12-In., 20 Ft. and Under	
	Y.P.	Fir	Hemlock	Spruce	Y.P.	Fir
Cincinnati	$36.00	....	....	....	$40.00	....
Kansas City	38.00	$35.00	$35.00		42.50	$35.00
Denver	....	40.00	....	$36.00	....	41.00
St. Paul	....	40.00	31.50	32.00	....	45.00

ROOFING MATERIALS—Prices per ton f.o.b. New York or Chicago:

	Carload Lots	Less Than Carload Lots
Tar felt (14 lb. per square of 100 sq.ft.)	$50.00	$60.00
Tar pitch (in 400-lb. bbl.)	15.00	17.00
Asphalt pitch (in barrels)	29.00	30.50
Asphalt felt	60.00	62.00

PREPARED ROOFINGS—Standard grade rubbered surface complete with nails and cement costs per square as follows in New York and Chicago:

	1-Ply		2-Ply		3-Ply	
	c.l.	l.c.l.	c.l.	l.c.l.	c.l.	l.c.l.
No. 1 grade	$1.15	$1.30	$1.45	$1.60	$1.75	$1.90
No. 2 grade	1.00	1.15	1.25	1.40	1.50	1.65

Asbestos asphalt saturated felt (14 lb. per square) costs $5.35 per 100 lb.

Slate-surfaced roofing (red and green) in rolls of 108 sq.ft. costs $1.85 per roll in carload lots and $2.10 for smaller quantities.

Shingles, red and green slate finish, cost $1.75 per square in carloads, $5 in smaller quantities, in Philadelphia.

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Prospecting an Iron Ore Property

BY J. F. KELLOCK BROWN*

Difficulties experienced in district where few miners could be found and where local labor was inefficient and susperstitious. Some of the costs incurred and why; some of the delays caused and why.

THE property, containing an occurrence of magnetic iron ore, was situated in the hills 18 miles from the nearest railway station, and that on a branch line with triweekly traffic. For nine miles from the station the road was good and fairly level but the remaining nine miles was down and then a heavy climb up again; the road was a mere track through heavily timbered country with grades ranging up to 30 degrees.

PLANT AND GENERAL TERRITORY IN DISTRICT PROSPECTED FOR IRON

The actual outcrop of the orebody itself existed in the heart of the timber land, and a road had to be cut into it for over a mile. About the only time that new road was reasonably passable was in the winter; in the summer it degenerated into a bog and had to be made into a corduroy. No houses were near enough to be of service as boarding establishments, consequently house room had to be provided at the scene of the operations. Food was readily obtainable from a small village 10 miles away, and even from stores at the station without any trouble.

When the operations began, the outcrop of the vein showed a width of 8 ft. over a distance of 300 ft. The surface soil and clay averaged about 20 ft. deep and the position of the openings where the ore was visible had been carried out with a small dip needle. The magnetic attraction of the orebody was sufficient to draw this dip needle to the vertical position. No actual outcrop of the orebody had ever been visible at the surface, and very little float ore had been found.

General Geological Conditions

From what could be learned of the geology in such a heavily timbered country and where the outcrops were hidden under a very considerable depth of surface soil, it appeared that the iron occurred along or near the contact of pre-Cambrian rocks and rocks of Lower Carboniferous age. The Carboniferous stratum was not visible in any of the shafts sunk, but was in evidence in a brook some miles from the iron on the probable strike of the contact. The actual contact rock in all the holes sunk was either a granite or a white pre-Cambrian limestone. The ore and limestone graded into each other, but the granite formed one wall. Unfortunately, the limestone was not consistently on the foot wall, sometimes being absent, and sometimes crossing over to the hanging wall, and it therefore lost some of its value as a guide. The general dip was about vertical but, varying a little toward the slope of the hill, ranged down to 80 degrees.

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*137 McGill St., Montreal, Canada.

The ore itself, as first discovered, was a hard steel-gray compact magnetite. In some of the later discoveries the color changed to a distinct blue shade and the character from a compact rock to one of a more granular appearance. Pyrite was not present to any extent and, when it did occur, appeared in lumpy aggregations easily separated. The analysis of the ore as determined by a number of tests ran about as shown in the table.

HEADFRAME AND SHAFTHOUSE USED IN PROSPECTING FOR IRON

APPROXIMATE CONTENT OF ORE

Shaft No.	Fe	SiO_2	S	Ph
1	65.90	5.12	0.080	0.005
2	63.90	5.58	0.053	0.008
3	63.77	5.64	0.060	0.011
4	64.70	3.66		
5	65.03	5.30		
6	65.10	5.36		

The material was a very attractive ore and provided ample justification for the outlay upon proving its existence in quantity.

Operations began in the fall of a dull year, and labor was for that reason comparatively easy to get, despite the fact that the rate of wages, except for general labor, was high owing to the position of the property, the unattractiveness of the situation and difficulty in getting there. A number of rolling stones in the shape of old miners and prospectors appeared out of the unknown in the hope of getting a steady winter's work. One man in particular made quite a sensation on his arrival one evening with his stock in trade and belongings piled upon his head in the form of three old and battered hats which he wore all at once. The first was a winter wool cap, surmounted by a hard hat and that crowned by a summer and much-battered straw. The hard hat contained all his earthly possessions.

The wages paid throughout the work were: General labor, \$1.50 per day; blacksmith, \$2; carpenter, \$2.50; pipe fitter, \$2.20; mechanic, \$3; enginemen, \$2.50; boilermen, \$1.75; sinkers muckers, \$2.25; machinemen, \$3; chief sinker, \$4; shift boss, \$5 per day. Board at the mine worked out at about \$17 per month, per man, this being the cheapest for which it could be done.

Work was begun by hauling in as much material as possible before the roads got bad through the fall rains. This included a 60-hp. vertical boiler weighing three tons, a 38-hp. vertical boiler, an air compressor of the two-stage type and one which finally proved to be a regular glutton for steam, a two-cylinder double-drum steam hoist, smoke-stack, two Cameron sinking pumps, one horizontal boiler-feed and general-service pump, four hammer drills, one larger drill on tripod and a considerable quantity of minor material in the way of ropes, hose, pulleys and general supplies.

For ordinary hauling purposes the rates paid per day averaged for single team and driver or without driver, \$4; double team and driver, \$8; double team and two men, \$10; team of four horses, \$14.

To take the heavier pieces—and in fact it came down to being pretty near anything as the weather got worse—the teams available in the neighborhood proved far too light weight, consequently arrangements were made with a teamster from a mining district and accustomed to work of that class. The cost of bringing in the material with his aid was for the large boiler, \$94; hoist, \$35; compressor, \$62; 17 tons coal, \$73.72; a total of \$264.72.

This showed a great variation per ton mile, and an even worse variation per ton. The reasons for this, however, were readily apparent. Three days were required for taking the boiler in, while the rest of the material, being much less in weight, came in more rapidly. The cost on the coal averaged almost $4.10 per ton, and considering that it cost $3 per ton at the railway track, the price reached a relatively high figure, for those days, delivered at the mine. As it afterward turned out, that coal was extremely useful because, owing to poor labor and the rapacity of the compressor for steam, it became almost impossible to maintain the steam pressure with wood, the boilers being too small for the work.

EFFICIENCY OF CREW BELOW PAR

The class of general labor available was very poor, all being full of superstitions and extremely ignorant. At times when the boiler might prime, the boiler house would be promptly deserted by a quaking gang of firemen, and on days when a gage-glass burst, the landscape was decorated with legs "hiking" for the woods. Quite a number of men refused to work alone at night for fear of "spooks." With this class of men constant watch is required in even the most trifling details about the place, and trouble and damage to the small plant is liable to occur any hour of the day and night. Once it was being called out of bed on a cold winter's night to explain why the hoist should refuse to hoist, nothing being the matter with it except want of oil, the cylinders having been allowed to get absolutely dry. Another time a pump refused to do its duty, and investigation disclosed the fact that one of the amateur pumpmen on the job had taken upon himself the task of replacing a gasket on the steam cylinder and in replacing the head had left a nut inside. Such occurrences are terribly exasperating on work of this nature where the time lost and the material wasted is not easily replaced, but they have to be expected and represent the price paid for inefficient labor.

Immediately on the arrival of the plant, work started on the preparation of the foundation for the various parts of the machinery; the erection of houses over them; a bin, headframe and bunkhouse. The foundations were of hardwood, and while no difficulty was experienced with the boilers or the hoist, considerable trouble developed with the compressor since it consisted of a number of separate parts. A composite foundation of timber and broken stone is difficult to level and will not in many cases stay level when the weight of the machinery begins to come on it. In this case, too, some brilliant genius provided foundation bolts that had to be used from below, requiring in turn that small shafts be sunk under each hole before this could be done. With foundations of this class, all frost has to be out of the ground, since otherwise there will be a great tendency toward unequal sinking. Timber for all this work was obtained locally. Heavy timber, black pine (so-called), cost $12 to $14 per M.; softwood, up to eight inches, $1 per tree; hardwood sticks, for the cutting; cordwood for firing, $2 per cord delivered at boilers.

Some strange conditions arose through the timber question. Contractors anxious to get work on any terms would offer timber for 50c. a cord, and then find after a few days' trial that they could make nothing at it. Others for divers unknown reasons refused to allow a tree to be cut on their ground, although this work afforded them an opportunity of acquiring some money in return. The variations in the prices for cordwood actually ran from $7 down to 50 cents.

The houses, headframe, bin and sorting house were all locally designed, cut in the adjoining woods and erected by the self-elected staff of carpenters. Being used to the erection of wooden buildings, that part of the work proceeded rapidly, but the erection of the headframe, with its long timbers, notching and bracing, required a deal of work and explanations. A self-tipping type used in the Cobalt region was built, and during the course of making it, the spectacle of the two bosses of the outfit doing the work while the gang stood round and looked on was often witnessed.

COST OF CONSTRUCTION

Headframe, 30 ft. in height, longest sticks 10x10 in.x33 ft.		$230 19
Compressor house,	24x17 ft.	186 95
Hoisting house,	16x12 ft.	128 12
Boiler house,	18x12 ft.	87 04
Store,	12x12 ft.	74 95
Forge,	12x12 ft.	79 34
Half-buried magazine,	13x10 ft.	86 05
Bin and sorting house attached to headframe, 12x18 ft., supported on columns		180 09
Bunkhouse,	18x15 ft.	110 10
		$1,162 83

The houses erected and plant in order, arrangements were made for double-shifting the operations. The shaft was to be 8 x 10 ft. in the clear, timbered for 20 ft. down where solid rock would probably be reached. Drilling and pumping by compressed air required that the compressor run constantly. Three shifts of 8 hours each were in the shaft. The surface day shift ran 11 hours and the night 13, changing at the week ends. Work stopped at 11 o'clock on Saturdays and began at midnight Sunday. Cordwood being delivered in large pieces and the boilers being of different sizes necessitated a man working part of the time splitting down, and further, the steam demands on the boilers being great, steady attention had to be given them. In the course of the work a few differences of wages had to be made, but the table shows substantially the cost per day.

COST PER DAY OF OPERATIONS

Boilers:	
Day, 2 men @ $1 75	$3 50
Night, 2 men @ 1 75	3 50
Hoist:	
Day, 1 man @ $1 75	1 75
Night, 1 man @ $1 75	1 75
Compressor: *	
Day, 1 man @ $1.75	1 75
Night, 1 man @ 1.75	1 75
Forge:	
Day, 2 men @ $1 50 and $2.50	4 00
Deckhead:	
Day, 2 men @ $1 50	3 00
Night, 2 men @ 1.50	3 00
Shaft:†	
3 machinemen @a$3	9 00
9 muckers @ $2 25	20.25
Overseeing:‡	
Day, 1 foreman @ $5	5 00
Night, 1 foreman @ $4	4 00
	$62 25

*The compressormen also attended to pumps and did any odd repairing work. †Three shifts 4 men each, 1 machineman and 3 muckers and helpers ‡The nightman was chief sinker and the day man helped prepare timber.

Twenty-eight men in all were employed, 13 below and 15 above ground.

After the initial troubles were over and everybody had settled down into knowing what they were doing, after the men had learned the difference between a Stillson wrench and a globe valve, knew how to thread a pipe coupling, and had managed to maintain a steady steam pressure instead of blowing off one hour and no pressure the next—the rate of sinking kept constant at about 8 ft. in the 24 hours, so the cost per foot worked out at about $8, which shows the kind of going.

From experience on this job in particular, I am inclined to think that there are two things to be devoutedly wished for on all prospecting work, and these are a well-trained crew of men and some backing from the crowd financing the operation. It is a pleasure to work with a slick bunch of men; everything goes along smoothly and should any breakdown occur, it is attended to with the minimum of trouble. Looking back on the days and nights spent on this work, it appears a marvel that we ever progressed at all. Only four men out of the whole crew knew anything about the work; 20 had never worked near either an engine or a boiler, and 24 had never been down a shaft. At first over 20 would not work in the shaft at all, until acquaintance made them more confident. Threading and putting together a pipe line was a mystery to all. The first man who claimed he was a blacksmith produced such work that his resignation was demanded instanter, and nine self-taught handlers of the hammer and tongs were tried before a satisfactory one was found.

Poor backing from those responsible for the beginning of an enterprise is not only a stupid policy, but it is extremely mortifying to those responsible for the carrying out of the work. To have plant and supplies promised and delivery agreed to for a certain date, and then have to keep "nagging" a head office for them when weeks overdue is not conducive to speedy and steady work; and the spectacle of the whole crowd of men amusing themselves shingling a house because something has been lost on the way that has kept the work behind may be ludicrous, but it also tends to make the man in charge a perpetual grouch. Worse still is the concern that is careless about the payday. To have to lamely explain that such an important matter has been overlooked and promise that the money will come up by the next mail (and then it doesn't) creates a state of affairs under which it is impossible to hold the men worth holding on the work and tends to keep the labor constantly changing.

Risk Assumed by Mine Timberman

By A. L. H. Street[*]

An experienced mine timberman assumed the risk of being injured through fall of material from the part of a roof he was timbering, due to jarring of the earth in the near-by operation of pneumatic drills, although his "partner" had assured him that the roof was safe and the shift boss declined to stop the drills when the danger of falling rock was suggested. (Utah Supreme Court, Golesh vs. Utah Apex Min. Co., 162 Pacific Reporter, 369).

Construct 85-Ton Steel Hopper Car

A steel car of 85 tons, or 2900 cu.ft. capacity, and having five hoppers instead of four has recently been constructed by the Pennsylvania R.R. The car has a length, coupled, of 50 ft. 4 in. and an extreme width of 10 ft. 2 in., while the inside dimensions are 46 ft. 6 in. by 9 ft. 4¾ in. The height above rail is 10 ft. 6 in., and the front wheelbase is 5 ft. 10 in. A heap capacity of 328 cu.ft. brings the total capacity to 3228 cu.ft. The light weight of the car is 60,000 pounds.

Shaft-Sinking Record at Jerome, Ariz.

Since the discovery of the United Verde Extension Mine the district about Jerome, Ariz., has received a great deal of attention from mining engineers and operators. Prospecting resolved itself first of all into a question of shaft sinking, and the development companies formed were organized on a basis permitting sinking a shaft to 1200 or 1400 ft. before crosscutting and drifting commences. Under these conditions it was natural to look for something pretty good in shaft-sinking records, and the Gadsden shaft is the first one to "draw blood."

The Gadsden is a development prospect of the Calumet & Arizona Mining Co. It is in the mineral belt about 1½ miles south and east of Jerome. The work is under the general direction of John C. Greenway, general manager of the Calumet & Arizona at Bisbee, and J. K. Hooper is the superintendent directly in charge. It was decided to open the property by a shaft to approximately the 1000-ft. level before drifts were run.

The shaft is 5 ft. x 17 ft. 10 in. in the clear, divided into two hoisting compartments and a pipe and manway; 12 x 12-in. timbers are used, and the ground is broken about 8 x 21 ft. The surface plant consists of a 220-hp. direct-motion electric hoist, an 888-cu.ft. Imperial belt-driven compressor and full blacksmithing equipment, including a No. 5 Leyner sharpener.

By May 1 the work was well under way. A satisfactory bonus rate had been worked out by Mr. Hooper, and the men were instructed to go to it. For seven consecutive days the shaft went down nine feet a day, and no part of the work was allowed to drag. The shaft was close timbered, guides, ladderway, air and water pipes kept up each day. During the month some time was lost because of power trouble and the Jerome strike tied the work up several shifts; in spite of all this a grand total of 202 ft. was made for the month—a record which is now a mark for all the properties in the district.

GADSDEN SHAFT, JEROME, ARIZ.

The Gadsden shaft during the record month was in limestone, which varied from a fairly solid uniform drilling rock to a shattered fitchery ground. The regular shaft round was used, cut holes running from 10 to 12 ft. deep. Five Ingersoll Jackhamers with ⅞-in. hollow hexagon steel were used, and no difficulty was experienced in drilling the deep holes, steels being fitted with standard four-point bits. All holes were loaded with 40%, and 60%, gelatin powder, the 60% being placed in the bottom of the holes.

At the end of the month the shaft was in excellent condition, no detail having been slighted.

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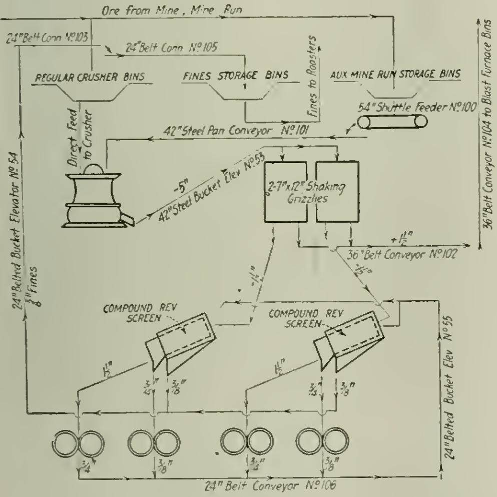
The United Verde Crushing Plant

By T. C. ROBERTS
Chief Engineer, United Verde Copper Co.

A crushing and screening plant was built by the United Verde Copper Co. at the mine to prepare the ore for shipment to the smeltery at Clarkdale, Ariz. The installation is described.

THE old smeltery of the United Verde Copper Co., at the mine at Jerome, which was abandoned on account of mine caving, was entirely a blast-furnace plant. When the new plant was erected at Clarkdale, it was decided to build four 26-ft. x 48-in. blast furnaces, and three 19 x 100-ft. reverberatory furnaces. A test of the ore appparently showed that sufficient fines would be available by screening for two reverberatory furnaces. However, it was found shortly before the reverberatories were ready to start that the character of the ore had changed and that it would be necessary to build a crushing plant. It was thought advisable to attempt to sort the waste rock from the ore to avoid hauling the former from the mine to the plant, and it was decided to place the crushing and screening plant at the mouth of the 1000-ft. tunnel, which is also at the upper end of the Verde Tunnel & Smelter R.R., over which the ore is hauled a distance of six miles to the smeltery at Clarkdale. This plant is called the Hopewell.



HOPEWELL CRUSHING PLANT OF THE UNITED VERDE COPPER CO.

The original installation consisted of two sets of 54 x 24-in. crushing rolls, one No. 9 gyratory crusher, one 60-in. x 18-ft. screen, with the necessary bins, elevators and conveyors. It has been decided that more reverberatories will be built in the Clarkdale plant, and additional equipment was ordered for the crushing plant at the mouth of the tunnel.

The plant has a normal capacity of 400 tons per hour of mine-run ore. There is, adjacent to the crushing plant, a system of storage bins, the tops of which are equipped with tracks over which the ore trains operate and dump into the bins. Underneath these bins the main-line trains of the Verde Tunnel & Smelter R.R. operate, into which the treated ore is loaded to be hauled thence to the smeltery for treatment.

The ore is first brought in on the mine train and dumped either into a regular crusher bin of two compartments or into the auxiliary mine-run storage bin. From the regular crusher bin and from the auxiliary mine-run bin, the ore is fed directly into a No. 9 Gates gyratory crusher, and from it a shuttle conveyor discharges upon a 42-in. steel-bucket elevator, and is elevated from the ground floor of the crusher building to the top floor and discharges upon two 7 x 12-ft. Timber Butte-type shaking grizzlies. The reject from these grizzlies, +1½ in., is discharged upon a 36-in. belt conveyor and delivered to the blast-furnace section of the storage bins. The undersize, —1½ in., is delivered to two compound revolving screens. The internal screen is 60 in. in diameter and 18 ft. long, having ¾-in. round holes. The external section of the screen is 80 in. in diameter and 15 ft. long, and has ⅜-in. round holes. The first reject from the screens, namely, —1½-in., is discharged into two sets of 54 x 24-in., Anaconda-type crushing rolls set to ¾-in. The product of these rolls is discharged upon a 24-in. belt conveyor. The second reject from the screens, —¾ in., is discharged into two 24 x 54-in. Anaconda-type crushing rolls set to crush to ⅜-in. The discharge from these rolls is also received by the 24-in. belt conveyor. The third reject from the screens, —⅜ in., is discharged into a 24-in. belt-and-bucket elevator, is elevated to the top of the crusher building and discharged upon a 24-in. belt conveyor and delivered to the fine-storage section of the mine bins. The product from the four sets of rolls, —¾ in. and —⅜ in., having been discharged upon a belt conveyor, is discharged into a 24-in. belt-and-bucket elevator and returned to the screens to be rescreened or recrushed, as its size requires.

A double-compartment storage bin is placed directly over the No. 9 gyratory crusher, having two air-operated gates in each compartment. The capacity of this bin is 3426 tons. Operating in conjunction with the bin a portion of the mine-storage bins are used, termed auxiliary storage bins, the capacity of which is 6800 tons of ore. Operating in connection with transferring the ore from the bins to the conveyor system, there has been installed a 54-in. shuttle-operated belt conveyor arranged to operate along a set of rails in alignment with the discharge gates of the mine bins. This shuttle is placed so as to receive ore from the gates beneath the bins and discharge it upon a 42-in. steel-pan conveyor. The shuttle conveyor is equipped with one 5-hp. 220-volt compound-wound direct-current motor for operating the bridge backward and forward to align the shuttle with any one of the given six discharge gates of the auxiliary-mine bins.

The belt-head pulley on the shuttle is a magnetic separator 58 in. in length and 18 in. in diameter, having 16 sections and 16 poles, thus providing a strong enough magnetic field for the extraction of drills, spikes, hammers and any apparatus that might get into the ore. The pan conveyor operating to receive discharge from the shuttle is a steel conveyor 42 in. wide, with 12-in. pans on two side-link chains, equipped with 8-in. self-oiling rollers. The pans are padded on the base with 4 x 10-in. maple blocks. The speed of this conveyor is 40 ft. per min., and it is driven by a 50-hp. motor. Ore can be discharged into the No. 9 gyratory crusher by two different methods, either by direct discharge from the bins directly above, or from the auxiliary mine storage bins by the employment of the shuttle conveyor and pan conveyor. The maximum size of any piece of ore coming from the mine is approximately 18 in., while the average size is about 8 inches.

The No. 9 gyratory crusher is set to crush this material to —4¾ in. This makes a product 70% under 1½ in. The No. 9 gyratory crusher is operated by a 150-hp. slip-ring type motor and has a capacity at this size of crushing of 400 to 450 tons per hour. The No. 9 gyratory crusher discharges into a 42-in. bucket elevator and is elevated 68 ft. to the top of the building, where ore is discharged into a chute and is equally distributed upon two grizzlies.

The crusher elevator is of steel throughout; it has a speed of 45 ft. per min. and is driven by a 75-hp., slip-ring type motor. The pockets are held in alignment by steel-link chain, operating on 8-in. self-oiling rollers.

The floors of the main building are divided and named as follows: First or ground floor is called the drive floor; second floor is called the rolls floor; third floor is called the crusher floor; fourth floor is the screen floor, and the fifth floor is the conveyor floor, all of which is shown in Fig. 6.

The crusher elevator discharges sufficiently above the conveyor floor to distribute equally its ore upon two 7 x 12-ft. shaking, Timber Butte-type grizzlies. These grizzlies are set on a slope of 11½ deg. and reciprocate on 1⅝-in. eccentric, with 110 revolutions of shaft or 220 strokes per minute. Each grizzly has a capacity of 400 tons per hour. They are driven by a 75-hp., slip-ring type motor. The oversize from the grizzlies, being above 1½-in. and up to 4¾-in., is discharged upon a 36-in. belt conveyor, operating at a speed of 300 ft. per min. and driven by a 25-hp. induction motor. This 36-in. belt conveyor is discharged into a similar 36-in. conveyor, running in parallel with the storage bins and has operating in conjunction therewith a traveling distributor, for the purpose of distributing the ore on this conveyor to any one of the several bins that may be selected. This conveyor is driven by a 440-volt, 15-hp. motor. The undersize from the grizzlies is discharged into two revolving screens.

Compound Revolving Screen

The internal screen is 60 in. in diameter and 18 ft. long, made up in four sections, each of four segments of manganese-steel screens with ¾-in. round holes. The external section is 80 in. in diameter and 15 ft. long, with three sections of four segments each, and has ⅜-in. round holes. The product through the ⅜-in. round holes from the external section of the screen is discharged into a chute beneath and into a fines elevator having 24-in. buckets on a 26-in. belt, operating at a speed of 250 ft. per min. and discharging the fines upon a 24-in. belt conveyor on the conveyor floor. This conveyor has a normal capacity of 200 tons per hour and a possible overload of 150% and operates at a speed of 300 ft. per min. This conveyor, in turn, discharges its fines upon a 24-in. belt conveyor, No. 105, running in parallel with the storage bins and over the top, with a distributor arranged in order that the fines upon this belt may be placed in any one of the several bins selected. The second reject, —¾-in. and +⅜-in., is discharged into two sets of 54 x 24-in. Anaconda-type crushing rolls, having a peripheral speed of 1040 ft. per min. and driven by a 150-hp. motor. The rolls are set to crush to ⅜-in. or less, and discharge upon a 24-in. belt conveyor, which elevates the product to the screens by way of the same inlet that takes product from the grizzlies. The third reject from the screens, —1½-in. and +¾-in., is discharged into a second pair of 54 x 24-in. Anaconda-type crushing rolls, having a peripheral speed of 1040 ft. per min. and set to crush to ¾-in. or less. These rolls are also driven by a 150-hp. motor. The discharge from these rolls is to the same 24-in. belt conveyor that receives the discharge from the first set of rolls, and is also discharged into the bucket elevator and is elevated and discharged into the screens through the same inlet with the product of the other rolls and the grizzlies. This elevator is driven by a 35-hp. induction motor, and the 24-in. belt conveyor is driven by a 15-hp. motor. It will be seen, therefore, that the product 1½-in. and less, passing through the grizzlies is discharged into two revolving screens, and that these screens are arranged to classify this product into three different sizes, namely: —1½-in. to +¾-in., —¾-in. to +⅜-in. and —⅜-in. All the product less than ⅜-in. is considered as fines and is discharged through the screens only to the fines elevator No. 54 and to the conveyor on the conveyor floor. The second product of above ⅜-in. and not larger than ¾-in. is discharged into two sets of rolls to crush less than ⅜-in. The product of these rolls, however, is not discharged into the fines, but is returned to the screens to be screened out as fines, therefore avoiding the possibility of having oversize in the fines, due to the wearing or corrugating of rolls. The third classification, the product over ¾-in. and not greater than 1½-in. is discharged into the roughing rolls set at ¾-in. or less. This product is also returned to the screens to be rescreened and classified again. In other words, the screens and rolls are operated in closed circuit, therefore the entire product of fines must repass through the fine section of the screens before it can be delivered to the fines storage.

New Caledonia Ores

Exports of ores from New Caledonia for the three months, ended Mar. 31, as reported by the *Bulletin du Commerce* of Noumea were 5350 metric tons of chrome ore and 10,994 tons of nickel ore. In addition there were 2871 metric tons of nickel matte exported.

The annual report of the Mines Department for 1916 states that the Societé Le Nickel exported from New Caledonia during the year 30,000 tons of nickel ore and 2400 tons of 45% matte. The Societé des Hauts Fourneaux exported 3000 tons of ore and 3350 tons matte.

Sulphatizing with Weak Sulphurous Gases

BY GEORGE C. WESTBY*

A method of utilizing the sulphurous gases derived from the roasting or smelting of pyritic ores, for the sulphatizing of oxidized copper-bearing ores, from which the copper is subsequently leached. Coarse and fine ores are treated separately, 90% and even higher recovery of the copper content having been effected in experimental work.

THE methods described in this article were devised to treat low-grade copper ores from the mines of the Nevada Douglas Consolidated Copper Co., at Ludwig, Nev. The ores contain a considerable percentage of acid-soluble aluminous and calcareous material, associated with copper minerals which are not rapidly acted on by dilute acids.

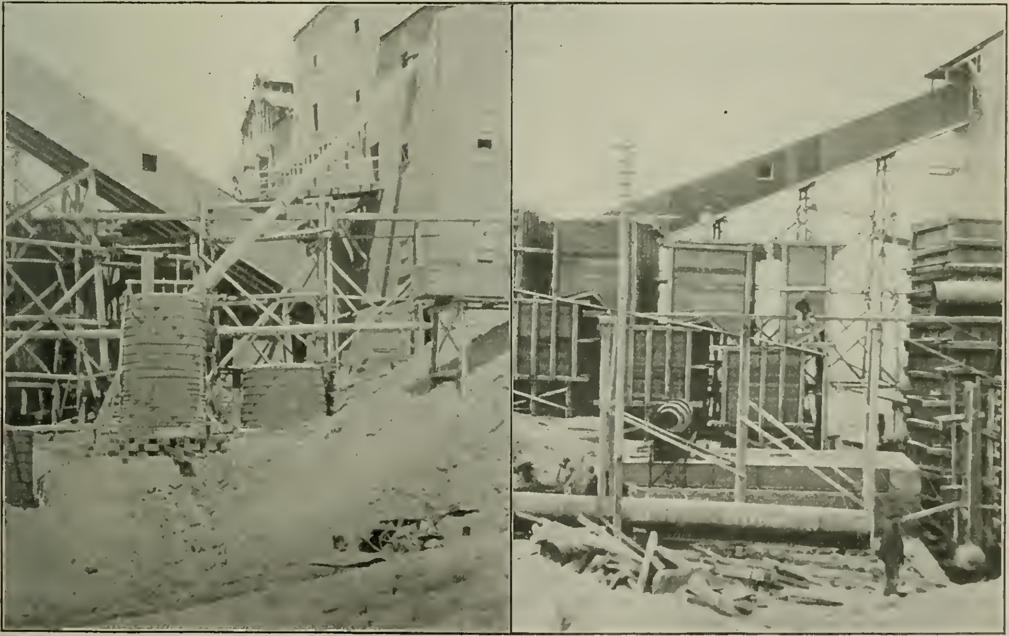
General conditions forbade the use of a smelting treatment, and the character and grade of the ore prevented more than consideration of accepted hydrometallurgical processes in which even moderately expensive reagents were called for.

Results of previous experimental work on smelter fumes carried on at the Utah Consolidated smeltery, from 1902 to 1906, suggested the scheme of treatment that was finally adopted. The process, in brief, consists of the utilization of sulphurous gases arising from roasting sulphide ores as a sulphating reagent on wetted oxidized ores or calcines, leaching with circulating liquors and precipitation of copper from the resultant solutions with iron.

The treatment ordinarily involves screening of the ore after crushing into coarse material and fines, and different apparatus for applying the fumes and liquor to the separated products, but so far as possible, differentiation of treatment has been avoided.

The sulphurous smoke used as the reagent in the process is derived from combustion of copper-bearing pyritic ores carrying about 18% of combined sulphur. The smoke is brought into direct contact with the ore, in the presence of vapor, steam or percolating liquor, and sulphatization is effected by the combined action on the wet ore of the hot sulphurous gases, excess oxygen in the smoke, oxygen with sulphites and water vapor.

Under the varying conditions the smoke has contained at different times, by volume, between 0.3% and 5.5% sulphur dioxide, but experience has shown that whether the gas was relatively weak or strong in sulphur dioxide, it was possible to utilize the fumes effectively in the extraction of soluble metal from the ores when treated under the established conditions of the process. It follows as a corollary that practically all the sulphur dioxide of the smoke can be abstracted from the fumes during moderately prolonged contact with soluble constituents of an ore.



No. 2 Experimental Tank Leaching Plant Experimental Sulphatizer and Absorption Tanks

EXPERIMENTAL TANKS, SULPHATIZING TANK

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*Ludwig, Nev.

In the progress of the treatment, the sulphide ore sent to the mill is crushed and ground to pass a 10-mesh screen and later passes from fine-ore storage bins to the roasters. The sulphurous gases emanating from the roasting ore are forced through flues leading to the treatment tanks, while the roasted material discharged from the furnaces is conveyed to the fines-treatment section of the plant.

The oxidized ores are crushed to pass a 1-in. ring. The material then is discharged on a 10-mesh screen and the oversize transferred to the coarse-ore system of the plant. The undersize passes to the fines-treatment apparatus.

TREATMENT OF COARSE-ORES

The coarse ore is brought from the mill by a system of conveyors and charged to a series of closed tanks or towers. The sulphurous furnace gas is then forced through the interstices of the wetted ore in all the sulphurizers in commission. Simultaneously, the top of the ore columns are sprayed with liquor drawn from sump tanks which receive the drainage from the sulphurizing towers. The sump liquor is used over and over until it becomes strongly charged with copper; barren liquor and water then replace the cupriferous solution, which is pumped to the precipitation plant.

When the metal is exhausted to the economic limit from the ore contained in any tower of the series, the residue is washed by continuing a spray of barren liquor over the mass for some time. The sulphurous fumes are diverted, the discharge doors opened and the tailings sluiced to waste. The emptied tower is recharged with ore, and a new cycle is initiated by again admitting the sulphurous gases and starting the liquor spray.

The present leaching equipment of the coarse-ore treatment plant consists of six closed redwood towers, each of which is 40 ft. in diameter and 21 ft. high. Each sulphurizer is fitted with a filter bottom which is characterized by the use of spaced, parallel strips, of a triangular cross-section, pegged to supporting stringers that rest on a foundation of 12 x 12-in. timbers brought up from the bottom of the tower. The spaces between the triangular pieces are filled with insoluble rock approximately the size of an egg. This forms an effective means for disseminating the smoke volume through the orebody above the filter bottom, besides performing its function as a filter in the retention of slimes from the draining solutions.

A 4-ft. space between the filter and bottom of the tower is provided to facilitate free passage of the sulphurous gases. Oval apertures about 6 sq.ft. in area admit the fumes to the space beneath the filter and a 4-in. lead drainage pipe, flanged to the bottom of the tower, conveys the solutions to the sump tanks.

A system of balloon-shaped iron flues, lined with acid-proof brick, provide channels for the acid gases drawn from the furnaces. The fumes are preferably caused to flow first through the fine-ore sulphurizers in order to remove the flue dust from the smoke, before it is forced to the flues leading to the coarse-ore tanks. The flues, which are about 3 sq.ft. in area, are of a sufficiently small cross-section in relation to the volume, of the smoke to insure that the velocity of the gases will be great enough to prevent any considerable deposition of flue dust in the flue.

A No. 8 Sturtevant hard-lead fan is situated near the bottom of each tank, and conduits are arranged so that the issuing gases may be drawn from the space between the gas-tight top of the tank and the surface of the ore column, and driven beneath and through the ore column of any other tank; in this way the sulphurous reagents may be driven through consecutive ore columns and progressively eliminated by combination with the soluble elements of the ore contained in the series of towers.

Redwood tanks, 20 ft. in diameter and 8 ft. high, are placed so as to receive by gravity the drainage from each sulphurizer. An outlet controlled by a valve at the bottom of the tank is connected with the inlet of a 3-in. lead pump. In operation the pump draws the liquor from the sump tank and forces it through the pipe serving the spray nozzles, which are located around the inner periphery of the top rim of the sulphurizing towers.

The time required for treatment of any column of ore necessarily depends on a number of factors, among which might be mentioned the following: (1) The volume of gas passing through the ore per unit of time; (2) the strength of the gas in SO_2, SO_3 and O; (3) the quantity of acid soluble constituents in the ore; (4) the quantity of copper in the ore, its mode of occurrence and generally the physical character of the ore; (5) the sizing of the material; (6) the temperature of the gas passing through the ore.

The results obtained under one set of conditions are given in the table. The strength of copper in the solution discharged to the precipitation system varied between 3 and 0.25% Cu, depending on the degree of ore exhaustion, the period of circulation and the general requirements of the plant.

TABLE OF RESULTS OBTAINED

Analysis of Ore		Screen Analysis	
Cu	3.11%	+ 2	10.7%
Fe	17.58%	+ 4	30.7%
SiO_2	59.80%	+10	31.6%
Al_2O_3	5.90%	+20	9.5%
CaO	6.40%	+40	5.9%
		+60	3.2%
		+80	2.9%
		—80	5.5%

Average percentage by volume of SO_2 entering tower	1.77
Average percentage by volume of SO_2 leaving tower	*0.86
Average fan pressure required for drawing gas through ore, oz.	2.37
Approximate power required for fan, hp	8.0
Approximate power required for pump, hp	2.0
Liquor circulated per minute (approximate average), gal	150

* This gas passed as heads to the next tank in series.

Figured on actual time of fume application to the ore, the following extractions, in round numbers, were obtained: 37% of copper extracted in 10 days; 82% in 20 days; 92% in 30 days; 98% in 40 days.

The comparatively slow action during the first ten days was largely due to the fact that the somewhat large percentage of lime present in the ore is more susceptible to the action of the sulphating reagents than the copper minerals. The absolute quantity of gas available for action on the copper minerals is therefore minimized during the first period of treatment.

Under another set of conditions with ore of a different character and containing 1.7% Cu, an extraction of 97.8% of the copper was made in 20 actual working days.

TREATMENT OF FINE ORES

Attempts were made to apply the same method for treating fines as that described for leaching coarse ore, but it was found to be commercially impracticable to rce any considerable volume of gases through limited pths of fine ore, or even intermixed coarse and fine aterial (such as "mine-run") if the fines were argilceous. In one case an experiment with wetted, rather anular fines represented by the screen analysis showed at a distributive surface of 38,200 sq.ft. would be quired in forcing 5000 cu.ft. of gas per minute through ft. of ore with a fan pressure of 3 oz. The screen ialysis of the material tested showed: +10-mesh, one; +20-mesh, 64.2%; +40-mesh, 14.1%; +60-mesh, 0%; +80-mesh, 3.7%; —80-mesh, 11.0%.

A second experiment was made with a very argilceous wetted ore and a degree of fineness represented y the screenings shown on +10-mesh, none; +20-iesh, 19.1%; +40-mesh, 35.9%; +60-mesh, 16.3%; -80-mesh, 8.7%; —80-mesh, 20.0%. This showed that lmost 3,200,000 sq.ft. of transverse area would be necesary to provide a sufficient channel to convey 5000 cu.ft. er min. through 2 ft. of ore under a fan pressure of 6 z. As the ore used in this experiment was representative of much of the oxidized ores of the Nevada ouglas Consolidated Copper Co., the conception of lowing sulphurous gases through masses of fines was bandoned as impracticable.

A method of fines treatment adopted for provisional se consisted in causing a spume of pulp and liquor o fall in retarded cascades through the sulphurous umes. The method is applied in an apparatus arranged s follows:

Leaching Tanks, Looking West

Large Tanks for Leaching, Small Tanks, Dumps

LEACHING TANKS, SULPHATIZING PLANT

Four tanks fitted with gas-tight tops, each 14 ft. n diameter by 20 ft. high, were set in line so that the tanks are consecutively two feet lower than those next in order. The tanks are fitted inside with a false bottom forming an inverted cone sloping at an angle of about 30° to a 7-in. discharge hole at the center. Above the sloping bottom a network of 1 x 1-in. pieces with 2 x 4-in. spacers, was built up from the periphery of the cone, and the whole is capped by a perforated cone sloping from its apex to the sides of the tank.

The tanks are connected by lead-lined gas flues which are flanged alternately to the upper and lower peripheral surfaces of the connected tanks, so that the sulphurous smoke is caused to traverse the height of the tank, but not necessarily in counter-current to the pulp. The lowest tank in the series is directly connected with the main flue from the furnaces, while the uppermost discharges to a flue which conveys the residual vapors and gases to the coarse-ore sulphurizers.

Each tank is equipped with a 7-in. corrosion sand pump direct-connected to a 25-hp. motor. The intake of the pump is flanged to a 7-in. steel-armored corrosion pipe joining the discharge hole at the center of the tank with the pump. A 6-in. armored corrosion discharge pipe rises vertically to the top of the tank and enters a square wooden conduit direct-connected with an elbow which is flanged to the rim of an opening in the top of the closed tank immediately above the apex of the upper cone. Branch conduits connect the main discharge conduits with one another.

In practice the mixed fines and liquor in the tanks drain to the discharge opening at the bottom of the tank, are drawn into the sand pump and again discharged to the apex of the cone at the top of the tower. The mixture is distributed over the entire top area of the network as it flows over the perforated cone, then flows in relatively thin films downward over the network and through the sulphurous smoke passing through the apparatus.

As the mixture flows back through the wooden conduits, a fractional portion is cut off by means of a movable deflection plate and caused to discharge to the next lowest tank in series, the lowest tank discharging to the washing and clarifying system; this discharge is approximately equal to the quantity of material charged to the upper tank. Close regulation may be effected by means of a float in the bottom of the tank and an electrically operated deflection plate.

The action of the hot sulphurous gases on the vast surface of shifting films of ore mixture brings about a rapid dissolution of the soluble constituents, but the absolute effect necessarily depends on the composition of the ore, rate of charging, ratio of pulp to liquor and other factors previously enumerated in the account of the coarse-ore treatment.

Under the conditions of operation obtaining at different times during tests made with the apparatus described, it was established that when treatment was continuous and at the rate of about 50 tons per 24 hours, between 60% and 90% of the copper was extracted from the ore tested. Further, it was shown by experiment and deduction, drawn from results secured on many related tests, that to effect a 90% extraction from the most refractory of the Nevada Douglas Consolidated Copper Co. ores continuously charged to the upper tank at the rate of 250 tons per 24 hours, it would be necessary to use nine 30-ft. tanks in series equipped similarly to the 14x20-ft. tanks described, but using 8-in. sand pumps and 3-in. strips for the interior network.

While the general results of the method described for fine-ore treatment were sufficiently encouraging to warrant commercial use of the process, it was an insistent fact that the rapid erosion of the working parts of the sand pumps introduced a serious item of costs for replacement. The logical means of escape from the difficulty seemed to be to effect a greater retardation of the fall of the mixture dropping through the apparatus, with a consequent diminished use of the pump. The development of this idea led to the case where the use of a sand pump was not required.

Of the methods and apparatus tried, the simplest means consist in sulphatization of the ore fines by bringing the fumes into contact with vast numbers of low heaps or piles of the dampened or wetted ore inclosed within a series of towers or chambers. In this method a latticework of superimposed staggered shelves is built up from the foundation of the towers and forms the support of the ore heaps under treatment.

The fine ore is charged to the top of the latticework and progressively falls from shelf to shelf throughout the tower as the upper layers of shelves become heaped to capacity and the excess material drops to lower levels.

When the tower is filled, the flow of ore is stopped and sulphurous vapors are let into the tower and around the ore heaps by the blower effect of a steam jet which is introduced in a flue entering the base of the tower. The jet thus serves a double purpose, for it economically impels the smoke volume through the tower and also introduces the water vapor that effectually disseminates moisture through the whole of the ore in the tower The heat of the gases and steam materially accelerate the chemical combinations in the towers.

Admission of the gases to the ore particles is facilitated by the construction of the shelves. These are formed preferably of three or more 1 x 1-in. strips of wood or 1 to 1½-in. rope. The strips are set sufficiently close to prevent the ore falling freely through the slits formed, but at the same time the aperture is wide enough to permit percolation of liquor from the ore heap and the free introduction of vapors to the bottom.

The space between parallel superimposed shelves is about 3 in., and the space between shelves in the same layer varies between 1 and 2 in. These distances provide ample room for free passage of the smoke volumes about the ore heaps and also for solid material to drop freely through the tower.

While it is possible to leach completely and wash the sulphatized heaps in place, it is usually better economy to sluice the sulphatized residue from the shelves into a Dorr or some similar type of classifier at a definite rate, then treating the material in accordance with current practice, finally diverting the copper solution to the precipitation system and discharging the tailings to waste.

It is apparent that in cleaning out the tower a murky or slimy liquor from the classifier could be used over and over until the tower was cleaned, thus avoiding dilution of the copper liquor.

Agitation of Ore Heaps Beneficial

Sulphatization of the ore can be much expedited by agitation or movement of the ore heaps during the treatment, but it is not certain that the advantages of accelerated action are great enough to warrant complications of apparatus and increased costs incident to the use of mechanical appliances.

A curve indicating the results obtained by treating 10-mesh ore with 1.2% SO_2 fumes by the shelf-tower method is shown in the accompanying diagram, in which the percentage extraction in any given time may be seen.

In order to express the processes described in terms of dollars and cents, the approximate cost items are given in the accompanying table:

COARSE-ORE SULPHATIZATION

Capacity of plant, 250 tons per day

Costs per Ton of Ore Treated

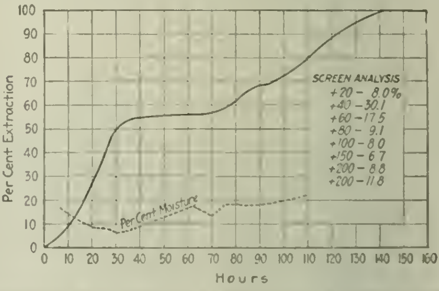
Sulphide-ore charge	$0 100
Depreciation	065
Interest	040
Labor (leaching and sluicing)	056
Repairs	012
Power @ 15c per hp.-day (fans and pumps)	054
Foreman, assay, office, etc	060
Crushing (labor, power, etc., included)	.120
Precipitation — 36 lb. of copper	.360
Switching, conveying, etc	080
	$0 947

FINE-ORE SULPHATIZATION

Costs per Ton of Ore Treated

Sulphide-ore charge	$0. 100
Depreciation	080
Interest	050
Labor	056
Repairs	.012
Power	.012
Foreman, assay, etc	060
Crushing	120
Precipitation	360
Switching, conveying, etc	080
	$0 930

In conclusion it may be safely said that the processes described promise in their development to provide simple and economical means for treating low-grade ores containing metal soluble in sulphuric acid, especially where sulphides are associated with the ores and where considerable quantities of soluble gangue matter make other hydrometallurgical methods inapplicable. It is possible, too, that the processes could be economically used for the extraction of potash and soda from certain of the igneous rocks and to refine clays.



CURVE SHOWING RESULTS OBTAINED BY SHELF-TOWER TREATMENT OF 10-MESH ORE

The reagent used in the processes is still dissipated in huge quantities through many smeltery stacks into the atmosphere wherever sulphide smelting is practiced. It is hoped that the experiments made and the data secured will define the way for one more solution of the smelter-smoke problem, at the same time solving a low-grade ore problem. Such a solution would be doubly valuable, since it would accomplish two desirable objects.

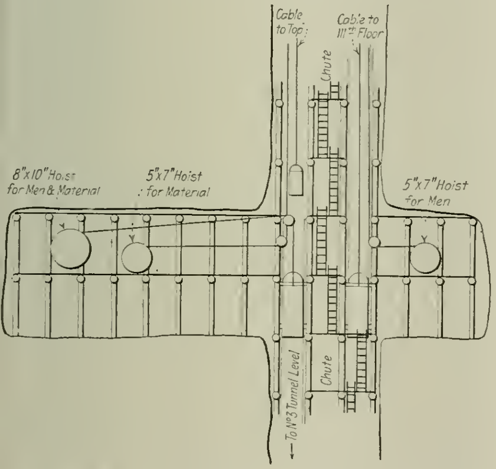
In any case the work has shown that a sulphurous fume carrying only 0.15% SO_2 by volume may economically extract copper from low-grade ores and in doing so produce as high as 3½% Cu as copper sulphate in solution. Since smelter smoke often assays 1½% to 2% SO_2 by volume, the significance of the figures submitted is believed to be both obvious and encouraging.

A Fourteen Hundred Foot Raise

By CHARLES H. FOREMAN
Mining engineer for the Hecla Mining Co., Burke, Idaho

Details of operations in raising approximately 1400 ft. where the principal difficulties ordinarily encountered in long raises were readily overcome; costs; wages on bonus system for all work done over a given distance each month.

THE Hecla Mining Co., operating at Burke, Idaho, recently opened up a body of ore remote from the courses that ventilate the old workings. It was proposed to drive a raise from the No. 3 Adit tunnel level to the surface, a distance of approximately 1400 ft., to properly ventilate the new workings and all development work contemplated in their vicinity. This raise would also greatly improve the ventilation in the old Hecla stopes. The work was begun in November, 1915, and has progressed steadily, except for a delay of four months, during part of which time a station was cut on the 57th and 58th floors.



ARRANGEMENT OF SKIPS AND LADDERWAY, HECLA LONG RAISE

The raise was driven about 9 x 18 ft. in the clear and is timbered by four sets of timbers, making three compartments. A timber slide is carried in one compartment, a chute in the center and a manway in the third. The ventilating pipe and air line are carried in the chute or center compartment, leaving the manway clear for the passage of men. The vertical distance between floors is 9 ft., while the horizontal distance between caps is 5 ft. Stull sets are used, the caps averaging 14 in. and the posts 8 in. in diameter. The floors are covered with 3-in. lagging, random width and 4 ft. 11 in. long.

Methods of Raising Used

A crew of four men on each shift consists of two miners, one timberman and one timberman's helper, two shifts being worked, the day shift going on at 7:30 a.m. and the night shift at 4 p.m. Room was made on the first floor for a timber hoist, and the four men hoisted their own material until the 40th floor was reached, when it was found necessary to add a hoistman, who also acted as general handy man around the bottom of the raise, to each shift. These men continued the raise until the 64th floor was reached, when the climb occupied so much time that some other method had to be adopted.

The work of raising was then stopped and a station fitted up on the 57th and 58th floors, the former being used as a working station and the latter as the hoisting station. The timber slide was fitted with guides from the No. 3 level to the 58th floor, and a working cage equipped with safeties was installed. An 8 x 10-in. air hoist was placed on the 58th floor and connected by a ¾-in. cable to a cage weighing 1700 lb.; a telephone, electric bell and flash system were installed on the 57th floor. The stations are equipped with electric lights.

It was necessary for the hoistman to climb the 57 floors on going to work in the morning and going off the night shift, but the day hoistman started in time to be at his station when the men were ready to go to work. Men, timbers and all supplies were hoisted to the 57th floor by this cage, the manway being used only by the hoistman and in cases of emergency.

A 5 x 7-in. hoist with ½-in. cable and steel bucket was installed on the 58th floor to hoist timbers and supplies up the timber slide from the 57th floor to the top of the raise. The raise at this point was offset, giving room for transferring supplies. A cager was added to the crew, to handle supplies from the No. 3 level to the 57th floor.

When work was again resumed in the raise, it was possible for the men to ride to the 57th floor, but it was necessary to climb from this point to the top. The work continued until the 112th floor was reached, when the climb was again getting to be a big problem and some other means of transportation was considered necessary to get the men to and from their work. It was not considered advisable to continue the guides from the 57th floor to the top of the timber slide as it would necessitate cutting another station or the installation of a much larger hoist. The ladders in the manway were taken out from the 57th to the 111th floor, guides were installed and a small cage holding four men and weighing 1100 lb. was handled by a 5 x 7-in. hoist using a ⅝-in. cable, set on the 58th floor. The ladders from the 57th to the 111th floor were placed in the chute set to be used only in case of emergency. This scheme allowed the men to ride to the 108th floor before starting to climb. All hoists on the 58th floor were fitted with indicators, and one man on each shift attends to all three hoists.

At the time this was written, the raise was on the 135th floor with about 33 floors to go to the surface. It is contemplated to raise the sheave in the manway compartment to the 141st floor, hoisting the men to the 138th floor, which will leave only about thirty floors to climb to the extreme top of the raise. It is the intention to stop raising and to drift out as soon as broken or disturbed ground is encountered, estimated to be at about 100 ft. from the surface; the exact length of the raise is not known at this time.

METHODS OF TIMBERING ADOPTED

A set of timbers is not placed until the ground has been broken at least 16 ft. above the last set. This allows a set of timbers and 7 ft. of room for drilling. It has been found unsatisfactory to drill off a staging through the timbers, as it occasions loss of time and also increases the chance for blasting out sets. An average of 30 holes is drilled to the round. After drilling, the floor is covered with three thicknesses of 3-in. lagging and a V-shaped opening is placed over the chute to allow the miners to get to their work after blasting; the grizzly is taken off the top of the chute and the round blasted. Twelve feet of fuse is used for each primer; 300 sticks of 1½-in. 40% gelatin is the average for each round. After blasting, the men replace the grizzly over the chute and the miners go to the face through the "V" opening, trim the back, and begin drilling from the top of the muck pile. It is generally unnecessary to draw any muck at this time. The second round is drilled, the V-shaped opening over the chute is raised, the grizzly is removed and the round is blasted. The miners go back to the face and trim the back, while the timbermen build a temporary muck slide to the chute, which is always carried two floors behind the other timbers. The muck is then drawn into the chute and the floors are cleaned for timbers. The timbers are hoisted to the top floor, and the whole crew is engaged in timbering. A gin-pole is not used for hoisting the timbers, as the weight of the cable causes the pole to spring and work loose. The timber is wrapped with a chain very close to the lower end, and the top end is held by a dog which is attached to the cable by a clevis, allowing it to be moved up and down the cable. The timber is hoisted up to the sheave wheel, the men landing it with their picaroons; the dog is removed from the end of the timber, which is then hoisted until the chain holding the lower end is near the sheave wheel, when it is removed and the timber landed on the top floor, above the sheave. After the timbers have been placed, the miners again start drilling and the timbermen raise the chute, timber slide and manway and do any necessary repairing. The chute is made of 6 x 10 x 9-in. fir and is held in place by a short piece of 6 x 10 about four feet long, which is dapped between the two center caps. The center of the chute is reinforced by 3-in. plank strapped around the front and sides. A 6 x 8-in. hole is cut in the chute on each floor so as to prevent an air cushion breaking the chute should the muck hang up and then suddenly release. The muck is never drawn down more than 10 floors from the top of the chute, except when making repairs. The chute is offset on the 30th, 57th and 111th floors and a chute lip provided. Repairs in the bottom of the chute do not necessitate drawing the entire chute. Movement of material in the timber slide is handled by a system of flash signals to the hoist, the wiring being carried to the top of the raise by a two-conductor reinforced weatherproof cable. It is necessary to box this cable, carried in the manway compartment.

The men have received a bonus for their work depending on the number of completed floors advanced each month. The miner's and timberman's helpers are paid $3.50 per day and the timberman $4 for an advance up to and including six complete floors per month. For every complete floor advance above six they receive an additional 25c. per day. This does not include the bonus regulated by the price of lead, which is additional. For the last three months the timberman has acted as "pusher" and has received an additional 50c. per day for supervision. Only the miners, timbermen and timbermen's helper receive this raise bonus.

Some very good time has been made in advancing this raise, 14 floors having been made in October, making a bonus of $2 per day; 18 floors in November, making a bonus of $3 per day; 16 floors for December making a bonus of $2.50 per day and 16 floors for February, making a bonus of $2.50 per day. January advance suffered on account of putting in guides from the 57th to the 111th floors.

MACHINES REPAIRED IN RAISE STATION

Ingersoll-Rand CC-11 drills were used during the entire course of the raise, two being at the face and three on the 58th floor as extras. Water sprays are used on all machines, the water for which is hoisted from the 57th floor. The hoistman keeps the machines in repair on the 58th floor, where a complete set of repairs is at hand.

The raise is ventilated by two 10-in. No. 5 Buffalo blowers, operated by 5-hp. motors, one being on the first floor and the other on the 57th floor. No complaint has been made by the men on account of bad ventilation.

The costs for November were $253.93 per floor, or $28.22 per foot. December costs were $256.38 per floor, or $28.49 per foot. This includes all labor connected with the raise, cost of explosives, timbers and all supplies, but does not allow for the expense of cutting stations on the 57th and 58th floors.

No serious inconvenience has been encountered in driving this raise, and while several problems have presented themselvs during the course of the work, they have been met without serious difficulty.

Uses of Ferro-Uranium

A description is given by H. W. Gillett and E. L. Mack, in the *Journal of Industrial and Engineering Chemistry*, of experiments made with the object of obtaining iron-uranium alloys. By using pure uranium dioxide, a low-ash coke and pure iron as raw materials, it is possible, with the furnace described, to produce a ferro-uranium of any uranium content desired (40-70%) with carbon below 2%, silicon under 0.75%, vanadium under 0.5%, and traces of aluminum, sulphur, phosphorus and manganese.

The furnace used was of the tilting, direct-arc type with water-cooled magnesite hearth and sides. If experiments with such a ferro-uranium show that uranium steels high in uranium are not valuable, but that a little uranium is useful, and if the amount required is so low that the carbon introduced by the ferro-uranium is harmless, then the hearth might be uncooled and the ferro-uranium would contain 4 to 5% of carbon.

Conserving The Food Supply

It has been difficult to convey to the mind of the average citizen the meaning of the state of war in which this country finds itself. The courses that ought to be followed to bring it to the inevitable conclusion in the promptest manner have not been enunciated with sufficient force. In so far as the food situation is concerned, the address of Herbert C. Hoover, food administrator, made before a meeting of the Editorial Conference of Business Papers, at Washington, provides a clear statement of the actual condition and points out the lines to be pursued. Mr. Hoover's address ought to be read and considered by everybody. It is reproduced herewith.

WE have entered upon a war entirely unique in its character in that it is a war against ideas. The German people have adopted the theory of the survival of the strongest, the right of might, a biological interpretation of the theory of evolution, without any of that fine tempering which the Anglo-Saxon race has included in its sociological application through the belief that civilization spells the protection of the helpless. This has so permeated German character and German institutions that it has builded a system of state based on the subversion of all individual right to the interest of the state and holds out to its membership as compensation for the loss of individual liberty the prospect of mastership of the world.

ATTACKING AN IDEA

The military problem arising out of this situation becomes one, today, of defeating an idea. There might have been some hope that it could have been overcome in an early and crushing campaign, but the relaxation of effort by Russia has practically reduced us to a war of attrition. It is possible that with the infusion of democracy in Russia it may be re-created in strength and again enter upon the field of action, but at the present moment we can look for but moderate support from that source. We must adjust our minds to a long-continued war, a war of attrition, a steady grinding, and through the suffering of the German people to have brought them to a realization of the futility of their ideas and ambitions. Our objective does not consist of a destruction of the German state nor an extermination of the German people, but consists of effecting a revolution in the German mind.

A war of attrition means a long war and we must face the situation for two or perhaps five years.

In order that we may contribute our share to this and secure our ultimate objective, we must bring to bear every possible national resource. We have got to build ships to supply munitions and food; and ultimately we will have to supply soldiers at the front to maintain the strength of the Allied ranks.

To do all those things we have in effect the mobilization of the whole American people. This is not a war of the type that we have heretofore known, where the average proportion of civilians involved with the army amounted to the activities of approximately one or two civilians to each soldier in the field. We will require in some direction the activity of the whole population.

Now, to particularize a little on the food situation, our allies have hitherto drawn their cereals from Russia, Roumania and Bulgaria, and up to the last few months from Australia and India and from Argentina. The first three countries have been cut off since the war began. Australia and India are practically cut off from the shipping point of view, as it requires three times the tonnage of the Atlantic Seaboard. There has been a harvest failure in Argentina, and therefore an embargo. There has been a reduction of man power and some crop failure by frost among our allies. In consequence of all this they are faced with the necessity of finding, during the next year, probably over a thousand million bushels of grain, and finding it largely from North America. Normally, if we make no special effort, we should be able to supply about 400,000,000 bushels of grain, and I may mention that practically all grain in their hands today is largely interchangeable. Canada may supply 200,000,000 bushels, and therefore North America might, without effort, with the normal course of commerce, be able to supply about 60% of their necessities.

It is impossible to restrict the cereal consumption in Europe by 40% and maintain the constancy of those people in war. We can only hope to maintain their strength and constancy if we can do better than that. It should be possible, without disturbing the even course of North American life—because Canada is willing to take identical action with us—to increase our supply to Europe by another 15 or 20%. That will mean privation, but it will probably mean safety.

Therefore we have a problem in front of us of increasing the national surplus by every device, and growing out of that problem and out of our own economic conditions is another serious problem, of equal or more than equal importance, and that is the question of price regulation. If we allow our allies or the neutrals to again run free in these markets, we will again see episodes of the character we did in Chicago a short time ago, and we will see worse; possibly we will see an exhaustion of our cereals of next year before we have reached the following harvest.

Therefore we must restrict the exports from this country with one hand, and we must increase those exports by better management of our food supplies and greater economies and, incidentally, we must not allow this pressure to put the prices of the great staples of this country to a point where we will disturb our own social order.

PRESENT PRICE POSITION UNTENABLE

I doubt whether we could continue, even with the present level of prices, without a wage adjustment in this country, and consequent social disorder and loss of national efficiency. If possible we must have a lower level of prices yet high enough to stimulate the farmer to every effort, and we must maintain a greater stability of prices than during the last year. I speak of stability because my own belief is that one of the prime difficulties of the consumer today, and of the producer as well, has been the widening out of the margin between the producer and the consumer steadily since the war began. This has not been due altogether to speculation, but due to the instability of the prices and the inability of the long chain of distributive organizations to protect themselves in the face of fluctuation, without taking more than normal margins. There has been a train of illegitimate speculation as well, which has accentuated the situation. Therefore, at least as a first step, we must try to get stability.

There are a great many panaceas to effect these ends which have been tried and abandoned in Europe. Europe has been a perfect laboratory of efforts to control food prices. Many of them, which were looked upon and have been looked upon for years as solutions of the economic difficulty have been abandoned after a short period as wholly impossible. One of those panaceas that is so frequently put forward in this country is the maximum price, but which can only be properly applied when coupled with absolute control of the country. We have got to find other devices, and the most hopeful device lies in carefully considering the breaks and disruptions in our distribution chain and repairing links controlling abnormal action and even introducing into it balance wheels of some kind that will serve until normal checks and balances return to the world. Perhaps I may be more clear on that if I take one single commodity, and that is wheat. The price of wheat can be compared to a number of connected vessels; one of those vessels in Petrograd, another in Warsaw, another in Rome, another in Liverpool, another in Buenos Aires and another in Sydney, and so on throughout the world. Today all those vessels are disconnected. Therefore a sudden coincident demand, not necessarily speculative, makes a fluctuation in our prices far beyond the normal and the situation lends itself to speculative action.

The Power of Embargo

The Government has asked for the power of embargo. The power of embargo does not mean a prohibition of the export of cereals, but means export under conditions, and the conditions under which these cereals are to be exported must have a bearing on the price, and it appears to me and to the other gentlemen who have studied that question that with the embargo in our hands we can stabilize the price without necessarily entering upon a total disruption of the distributing trades.

There is also the case of sugar. In the case of sugar we are importers. We are competing in Cuba and in other sugar markets between ourselves, and with others, and a little bit of coördination would probably stabilize the price of sugar without injustice to our Cuban friends and enable us to stabilize the price over the entire year, instead of having the wildly fluctuating price that we have had ever since the war began.

If we can stabilize those prices, I think you will find the margin between producer and consumer will diminish materially without damage to the legitimate profits of the distributing trades or to necessary returns to the producers.

I only want to point those out as methods of food administration and to show you that food administration is not food dictatorship in the sense of the headlines.

Now, there are other engines in food administration. One of them is the question of national conservation of waste. There are certain types of waste that are national. There is the temperance question. I do not intend, from any ethical point of view, to discuss the quantity of grain that could be saved by the stoppage of brewing and distilling, but we may need to consider that question as a war measure in order to protect our allies and it becomes simply a question of the volume of real saving, and that can only be determined by the most careful investigation.

There are innumerable small leaks in our distributing system which can be corrected without hardship. I will mention just one, to indicate to you their character. The return of bread to bakers from their retail dealers amounts to a probably national loss of something like 2% of our flour. That is a leak that has grown up despite the effort and the will of the trades themselves. No one is so anxious to have that corrected as the baker.

Stopping up the Leaks

There are also the household leakages, and there is a large field for effort without any drastic regulations as to rationing the people. My own view is that our people should eat plenty, but they should eat wisely and without waste. There are four directions in which, if we could secure the coördinated effort of the women in this country, we could accomplish an enormous amount of saving. The first of those directions is in the nature of substitutions. If we could persuade the housewives of the country to substitute local products for those from distant fields, substitute vegetables in the summer for the staples, and to substitute the staples which we do not wish to export for those which we do wish to export, we could probably revolutionize our export balances.

There is also the question of reduction in actual eating, as our people probably have eaten an average of 40% more than they need to maintain their health. I do not know that we will ever have gained a great deal on that line, but it is still an abstract fact that it leaves a broad field for consideration. Then there is the question of household waste; the doctrine of the clean plate.

There is the question of instructions in elementary diatetics in the household. There are hundreds of avenues through which we could improve the average character of housekeeping from a war standpoint.

Now there is a good deal of fear throughout the country as to the character of the food administration. I feel general support in the country to the President's wish to set up a Food Administrator, but in some quarters a perhaps cultivated alarm that it will lead to a total disruption of commerce. It is difficult to impress anyone with the fact that in setting up an administration of that kind, in asking for unusual powers, these powers may not be used for any purpose but to accomplish solely our national objective. Our objective is to win this war, and if it is necessary in order to win this war that we should use those powers, I believe the common support of the American people will be behind us, and believe that if these powers are given to the President by Congress, it will materially contribute to winning the war and will do so through the voluntary and willing support of the people.

Since Mr. Hoover expressed his willingness to answer any questions, the following was asked:

Considering this food problem, the difficulty seems to be in getting the grain to Europe. That seems to be more important than the actual ships themselves. Does it not seem that it will be more important to protect each individual shipment, by convoying ships, so that when the grain leaves this country, it will be sure to reach our allies, and not be sent to the bottom of the ocean? It is not the ship that you want to get over there, but the cargo.

In reply, Mr. Hoover said that the question of convoying ships had been threshed out by every naval department time and again. "The difficulties of convoying ships are very great. Convoying ships means the running of a lot of vessels together, and then the speed of the entire fleet is equal to that of the slowest. Also they must load them all together, and thus congest the ports at the time of loading, and they must all be unloaded together, congesting the ports at the time of discharge. There are numerous problems of that kind connected with the convoying of ships. I do believe that we have the best naval officers, including our own and those of England, that there are in the world, and that they have done all that can be done and will do all that can be done to protect our vessels and to insure their safe arrival at their destinations.

"Another speaker pointed out that Mr. Hoover had already told something about how the press could help out, by its coöperation, and suggested a repetition at this time.

Support of the Food Administration

"Mr. Hoover explained that he had said to the press representatives of Washington that a great deal of the success of food administration revolves around the earnest support of the press of any food administration, that the personal element in administration must be eliminated. We can make no conservation of food without causing complaint from a small minority, and if the Food Administrator is to have the full benefit of every individual criticism arising from the exaggerated views of some individual sacrifice, the whole will break down in a month's time. In any food administration we are bound to secure sacrifice somewhere. The vast majority of it will be willing and voluntary. We have the right to ask for fair criticism and for support of food administration as a national institution as against the complaint of any minority individuals. Such support is to be considered essential.

"Furthermore, I have asked the press representatives not to personalize the food administration. Our people have a perfect mania for personalizing everything. Food administration is not personal, and it will be composed of probably several hundred of the best men that can be chosen in the country. It is an institution, and as an institution it can withstand shocks. An individual cannot stand all the shocks and survive. Therefore I am anxious that if the administration is set up by the President after Congressional action, my own personality shall be submerged in an institution and my own name disappear in the press—that it should be simply the Food Administration." Mr. Hoover has never favored the capitalization of his name in connection with the activities in which he is interested.

Iron and Steel in Canada

The production of iron and steel in Canada, as reported by the American Iron and Steel Asociation, showed a large increase in 1916. The make of pig iron has been as follows for three years past, in gross tons:

	1914	1915	1916
Basic	331,456	660,369	851,453
Bessemer	184,053	13,714	12,575
Foundry	174,346	125,769	181,748
All others	16,117	25,568	23,765
Total	705,972	825,420	1,069,541

The increase was almost wholly in basic pig. Bessemer iron fell off to an insignificant proportion of the total.

The total production of cast-iron gas and water pipe and fittings and cast-iron soil and plumbers' pipe and fittings in Canada in 1916 is estimated at 43,850 net tons, as compared with an estimated production in 1915 of 53,700 net tons, a decrease of 9850 tons.

The production of steel ingots and castings for three years has been, in gross tons:

	1914	1915	1916
Openhearth	556,910	884,736	1,245,488
Bessemer	186,158	22,521	10,968
Other kinds	284	5,498	30,053
Total	743,352	912,755	1,286,509

Of the total last year 1,255,196 tons were ingots and 31,313 tons direct castings. The large increase was entirely in openhearth steel. A considerable part of the increase in other kinds was in electric steel. The production of steel in 1916 exceeded that of pig iron by 216,968 tons. Some of this was due to the use of imported pig, but the greater part to the use of scrap in the openhearth furnaces.

The production of finished rolled iron and steel for three years past has been as follows, in gross tons:

	1914	1915	1916
Rails	382,344	209,752	81,497
Structural shapes and wire bars	59,050	114,829	174,490
Plates, sheets, bars, etc.	218,125	328,737	707,823
Total	659,519	653,318	963,810

Of the total ouput of finished forms last year 887,332 tons were of steel and 76,478 tons of wrought iron.

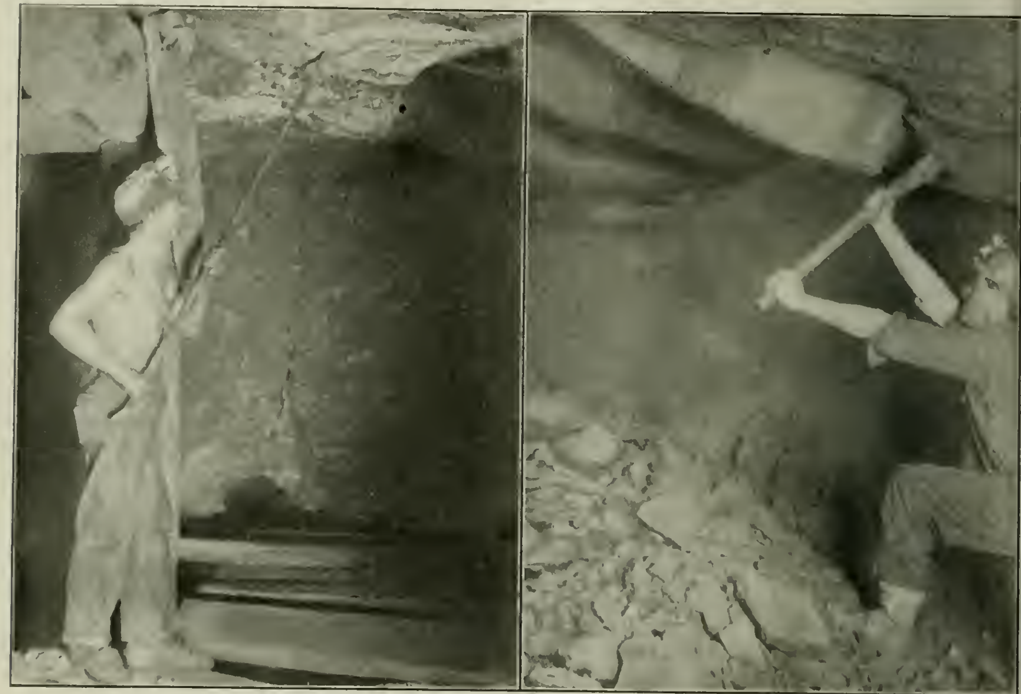
It will be noticed that rail production last year fell off heavily, due in large part to the extraordinary demand upon steel works for war steel. In 1915 Canada shipped a considerable quantity of rails into the United States. There was also a heavy decrease in new railroad building last year.

The production of iron and steel cut and wire nails in Canada in 1916 amounted to 1,757,000 kegs of 100 lb., as compared with an estimated production in 1915 of 1,636,000 kegs. Cut or wire nails were made last year by nineteen works in five provinces.

The total of finished steel was 69% of the steel ingots made, a rather low proportion which was probably due to heavy discards required on shell and other war steel.

Estimates Prepared by the lumber committee of the advisory commission of the Council of National Defense show that 2,000,000,000 ft. may be used for purposes directly connected with the war in the next 12 months. This sounds colossal, but is actually about 5% of one year's lumber production of this country. Construction of the 16 cantonments to house the new army will require about 500,000,000 ft. Second in quantity required comes the wooden shipbuilding program, now estimated at 400,000,000 feet.

Safety First in California Gold Mines

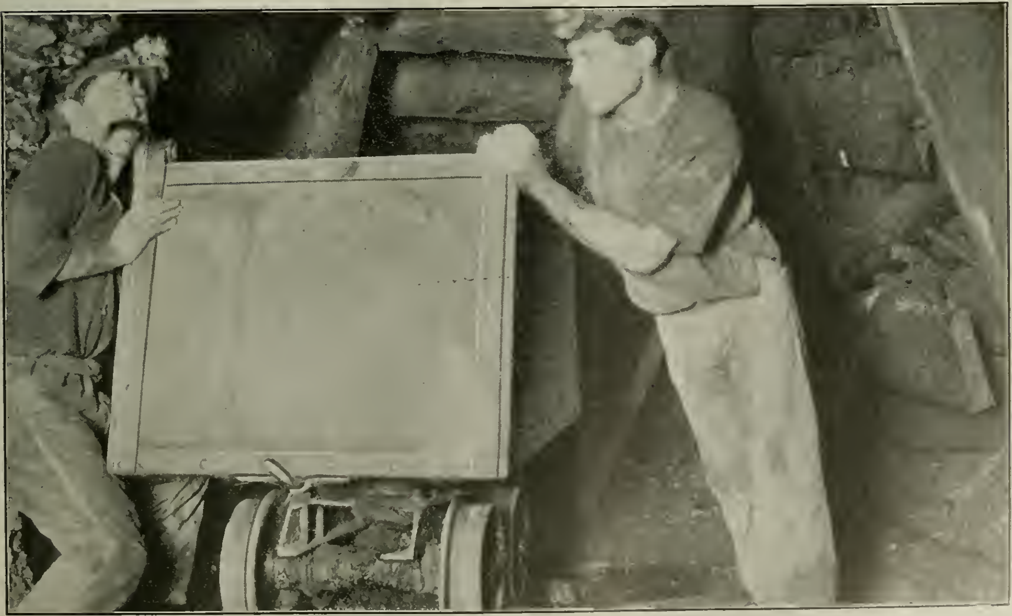


Loose rock, like a rattlesnake, is harmless only when under foot. Which man is doing the safer job?

The safest way home may be the longest way round. But he took the short cut through dangerous ground

THESE VIEWS, WITH AMPLIFIED CAPTIONS, ARE USED AS SAFETY-FIRST POSTERS IN CALIFORNIA MINES

If you must "taper off," find a safe place. Stop taking chances. Put carelessness behind you



Crushed against the wall of the drift. Because he did not use his head and step to the other side where there was plenty of room

BY EDWIN HIGGINS, SAFETY ENGINEER FOR THE CALIFORNIA METAL PRODUCERS' ASSOCIATION

The Arkansas Blue-Sky Law

By JOHN T. FULLER
Consulting Engineer, Little Rock, Ark.

The legislation commonly referred to as "Blue Sky Law," was received with bitter hostility, but since its operations have been understood, it has commanded respect and even enthusiasm.

ALTHOUGH considerable attention and a large amount of space both in the technical and daily press was devoted to the discussion of the so-called "Blue-Sky Law" passed recently by the State of Kansas and later by several other states, but little has appeared recently with regard to these laws. This lack of attention has probably been due to the fact that as a result of test cases in the courts many of these laws have been declared unconstitutional as contravening either the state or the national constitution or both.

The first law of this nature in the State of Arkansas, which has been in successful operation for three years, was approved by the state legislature on Mar. 28, 1913,[1] and was defined as "an act to provide for the regulation and supervision of investment companies and to provide a penalty for the violation thereof." Under this act every individual, corporation, copartnership or company and every association (other than national banks and corporations not organized for profit) either domestic or foreign, which sold or sought to sell any stock, contracts, bonds or securities of any kind or character other than bonds of the United States or of some municipality authorized to issue bonds of the State of Arkansas, and notes secured by mortgages on real estate situated in the State of Arkansas, or sell building stock or loan investments to any person or persons in the State of Arkansas, were obliged to obtain permission from the state bank commissioner.

I will not go specifically into the requirements of this act, for after its constitutionality had been upheld, the act was repealed and another of a similar nature, but much more specific and in clearer and more concise language, was passed by the legislature in 1915. The constitutionality of the first act was attacked by injunction proceedings in the United States District Court by the Standard Home Co., of Birmingham, Ala., on the grounds that it was a violation of the Constitution of the United States, and of the Constitution of Arkansas.

UPHOLDING THE LEGALITY OF THE ACT

In his opinion handed down Oct. 15, 1914,[2] Judge Trieber, in denying all the complaints and sustaining the act, makes the following significant statements:

> The dockets of the national courts have been crowded for the last few years with criminal prosecutions of persons charged with the use of the mails of the United States in carrying out fraudulent schemes by so-called investment companies and persons offering allurements to "get rich quick." But those courts are only clothed with jurisdiction to prosecute those who, in carrying out their fraudulent schemes, make use of the mails, and then only after the commission of the offence. This necessarily affects only a small portion of those engaged in such schemes and but rarely acts as a preventive. The state alone can provide for the prevention and punishment of all who commit frauds, although the mails are not used for their accomplishment, and enact laws to prevent the commission of these crimes. Legislation to prevent crime is of greater benefit to society than the punishment of the offender after the crime has been committed and innocent persons have been made to suffer. Statutes enacted for such purposes ought not to be declared invalid by the courts upon slight grounds even if cases can be imagined where they may work an injustice.
>
> The granting of the privilege to do business of that nature in the state by a high official is, to a certain extent, an assurance to the public that the corporation is properly managed. It is not only his privilege but duty to exercise great caution to satisfy himself that not only the scheme, but the men administering the affairs of the company, are of such character and standing and have such a financial interest in the success of the scheme as to give reasonable assurance to investors that their money will not be dishonestly dissipated or misappropriated. Nor can there be a reasonable objection to the provision of the statute that this information should be accessible to those who are inclined to invest their money in the securities of that association. There can be no better means of information than the sworn statements of the officers showing the condition of their corporation. . . . In a classification for governmental purposes there cannot be an exact exclusion or inclusion of persons and things.

The present act has never been attacked by any legal proceeding. As already stated, it is practically the same as the old act except that it is more clearly worded. Under the powers granted to him by the act, the bank commissioner has made the following requirements:

> 1. No advertisement, pamphlet, circular or other document shall be issued, circulated or delivered by any investment company, or its agent, within this state unless a copy thereof shall first have been filed with the bank commissioner of Arkansas, nor after such company has been notified of objection thereto by said bank commissioner.
>
> 2. For the purpose of promoting any investment company, or promoting the sale of securities of any such company, or the securities of any other company, no person, either as principal or agent, shall sell, or agree or attempt to sell, within this state any securities in such company, or of any other company, unless the contract of subscription or of sale shall be written or printed and contain a provision in the following language, in bold type (the per cent. to be determined by the bank commissioner):
>
> "No sum shall be used for commission, promotion and organization expenses on account of any share of stock in this company in excess of.....per cent. of the amount actually paid upon separate subscriptions for such securities. The remainder of such payments shall be held by the organizers, directors and officers of such company as bailees until the company is actually ready for business."
>
> 3. All funds coming into the hands of such organizers, directors or officers as bailees shall be deposited with any bank or trust company of this state and shall not be withdrawn until such company is actually ready for business. A sworn statement showing the financial condition of its affairs and that such company is ready for the transaction of business shall be filed with the bank commissioner before such funds, so deposited, shall be withdrawn.
>
> 4. No company or its agent shall misrepresent to any person any material matter concerning such company or its securities.
>
> The failure or refusal to comply with the requirements above enumerated shall be grounds for forfeiting all right to do business in this state, and the permission theretofore granted may be revoked.

COMPREHENSIVE FORM FILLED OUT BY APPLICANT

The applicant must also fill out a form containing complete information in regard to the name, capitalization, stock and bond issue, assets and liabilities, profit and loss account for the last year or half-year, the holdings, salary and time devoted to the work by the officers and board of directors of the company. Appended to this form are a list of the stockholders, description of physical holdings of the company, a trial-balance sheet of the company's books, and a statement of receipts and disbursements. In addition a blank stock certificate, copy of the constitution and articles of association are included, together with the form references in regard to the character, responsibility, and financial standing of each director and eight references in regard to the company itself. The form is completed with the usual signature and notaries' acknowledgements. Under section 7 of the present law the bank commissioner is empowered "to demand from any investment company seeking to come under the provisions of this act any further information other than such investment company is required to furnish under the provisions of this act which shall be necessary to properly qualify him to pass upon all questions that may come before him. He may make or have made under his direction a detailed examination of such investment company's property, business and affairs, which examination shall be at the expense of the applicant, etc."

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[1] State of Arkansas—Act No. 211, Mar. 28, 1913.

[2] Arkansas Blue Sky Law, Standard Home Co. vs. John M. Davis, state bank commissioner and State of Arkansas, et al.

Under the provisions of this section the bank commissioner requires as a condition for his permission to sell stock that all mining companies, oil companies or gas companies submit their property or holdings to the examination of a competent mining engineer or geologist of his choosing. By agreement with the commissioner the compensation fixed for these examinations is very low and most advantageous to the applicant. It will of course be understood that an exhaustive report on a mining, oil or gas property is not contemplated, but simply an assurance to the commissioner that in the judgment of the examiner the property offered gives a reasonable promise of financial success if properly managed, although the amount of stock which the commissioner will permit to be sold within the state is based fundamentally on the physical value of the property.

Results of the Act in Arkansas

Aside from the written report of the actual physical conditions, a verbal report of the examiners' impressions of, and the impressions of the people living in the immediate community of the applicants is made, which, as Judge Trieber said, is of as great weight as the physical report on the property itself.

In no case has the time required to make these examinations exceeded six days, and in the majority of cases three days including traveling time has been sufficient. This short time of course presupposes a fairly comprehensive knowledge of the mining conditions and geology of Arkansas and of the immediately adjoining states. The applications for permits of mining, oil or gas companies have thus far been confined to Arkansas, Missouri, Kansas, Oklahoma, Texas and Louisiana.

Under the law the bank commissioner has to date examined or had examined more than 200 applications for authority to sell investment securities, a majority of which have been approved. This list of course does not include many who sought to sell stock, but who, on discovering the rigid censorship to which they would have to submit, voluntarily gave up the idea of entering the state. The applications denied have refused the privilege of selling and offering for sale nearly $2,000,000 worth of holdings in Arkansas. The chief reasons for the denial of permission to sell were that the statements and declarations made by the applicants were not such as would warrant the finding that an investment in such enterprises would be either safe or profitable.

Applied to Mining and Oil Companies

In the case of mining, oil or gas companies the writer recalls but two cases where the physical valuation of the property was the determining factor for denial. One case was that of an oil company in Oklahoma, trying to sell stock to drill wells in an absolutely unproved and "wildcat" territory, and the other the case of a cement company in Arkansas that sought to place a valuation of $1,000,000 on a few acres of limestone. Neither of these succeeded.

The raw swindler and "get rich quick" promoter takes one look at the requirements and as a rule departs to other fields less carefully guarded. The general effect of the law has been that only *legitimate, or such schemes which in the honest personal opinion of the applicant are legitimate, ever attempt to get by.* The writer has frequently been able to obtain the views and the opinions on this law held by the average applicant with something legitimate to sell and, it might be added, of quite a few who had nothing to sell and who wanted to sell it badly. It has been interesting to note the gradual but definite change of opinion from that of sullen, bitter hostility, to that of enthusiastic approval after better acquaintance.

The advantages to legitimate business under this act become apparent to the approved applicant as soon as he starts to market his securities. To begin with the unscrupulous competition of the faker has been eliminated or greatly restricted. The fact that the project has been approved after a rigid investigation by the state bank commissioner (although it is stated on the permit that the security is not recommended although approved) gives the security an immediate standing with the investing public. The only trouble has been that at first the public was inclined to assume that an approval also carried a guarantee. In the case of mining, oil and gas companies, in addition to the approval of the commissioner they have the advantage of the mining engineers' report, which they are at liberty to publish.

Its Advantage to Legitimate Business

I have been told any number of times by successful applicants that when first faced with the requirements, they were inclined to feel that they were unreasonable, needlessly severe and costly, but that having successfully passed inspection, they had found that the approval of the commissioner, together with the report on their property by an engineer approved both by the state bank commissioner and the commissioner of mines, was of inestimable advantage to them not only within the state but outside and that these advantages were worth to them many times the cost and trouble entailed in obtaining the permit, even though it appeared great at first.

Milling Costs at the Inspiration and Bunker Hill Plants

The milling costs noted in the yearly reports of the Inspiration and Bunker Hill companies provide a basis for an interesting comparison of two mills operating in a different way on different materials.

A COMPARISON of the milling data and costs at the mills of the Inspiration Consolidated Copper Co. at Miami, Ariz., and the Bunker Hill & Sullivan Mining and Concentrating Co. at Kellogg, Idaho, are interesting. The former treats a copper ore of the porphyry type, while the latter is concentrating lead-zinc ores. At the Inspiration, water is scarce and means have to be taken to impound and reclaim it, while at the Bunker Hill, water is plentiful and no care need be taken in its use.

The copper in the Inspiration ore occurs principally in combination with sulphur, but partly as oxide. The sulphide is readily separated from the waste rock, by either flotation or gravity concentration, or by a combination of both. The oxide, however, gives poor recovery by either means. The ore milled in 1916 averaged 1.548% copper, and the recoveries from the sulphide copper were 90.95%, while of the copper in oxide form, only 16.60% was recovered, making an average recovery of 74.86%. Of course it is to be taken into consideration that the assay of the ore containing sulphide was 1.213% copper, while in the oxide ore the copper only averaged 0.335%.

At the Inspiration mill during 1916, according to the company's report, 5,316,350 tons was milled, making an average of 14,850 tons per day. The general tailings assayed 0.397% copper, and the copper in the general concentrates averaged 30.688%. In the flotation concentrates the copper averaged 37.5%, and in the table concentrates, 11.23%. The concentrates produced per ton of ore amounted to 0.0377 ton. The water used per ton of ore amounted to 1108 gal. The water reclaimed in tanks at the foot of the mill amounted to 354 gal., that reclaimed from ponds, 528 gal., and new water from the pumping station, 226 gal., the total being equal to the water used per ton of ore.

The cost per pound of copper derived from concentrating ores was as shown in the following table:

COST OF COPPER AT INSPIRATION

	Cents per Pound
Mining	2 702
Coarse crushing	0 125
Ore hauling	0 069
Concentrating and royalty	0 243
Concentrate hauling	0 006
Total	5 145

Smelting, freight, refining, marketing, etc., cost 3.528c., making a complete total of 8.673c. per ton of ore treated. The total amount of copper recovered was 119,431,389 tons.

BUNKER HILL & SULLIVAN

At the Bunker Hill & Sullivan plant, conditions are entirely different, and according to the company's report, costs and milling data are given in much greater detail. The following tables show the complete records of mill operations at that plant.

The concentrators were in operation for the full year, during which 10 days were lost, as follows: 22 hours on account of oiling motors; 22 hours on account screens, elevators and rolls; 57 hours on account holidays and miners' picnic; 17 hours on account pumps and power off; 2 hours on account chilean mill; 4 hours on account classifiers; 4 hours on account belts, conveyors and tables; 2 hours on account slush ice; 90 hours on account general repairs; 20 hours on account transmission rope. During the year 475.784 tons of ore was concentrated, making the average work of the concen-

DETAILS OF COST

Details of Labor, Supplies, Etc.	Average per Ton for the Year	Last Year
Superintendent and foreman	$0 014	$0 013
Shift bosses and sampler	010	009
Crushermen	003	002
Conveyormen	006	005
Machinemen	084	064
Oilers	018	015
Roustabouts	004	006
Laborers	011	007
Watchmen	006	006
Experimental labor	001	002
Repairmen		
Screens	007	005
Belts	020	010
Buckets	001	001
Roll shells	003	002
Ring dies	002	001
Huntington-mill parts	001	001
Chilean-mill parts		
Concaves	001	
Mullers	005	004
Spindles	002	
General machine parts	008	004
Pebbles	002	0
Oil and waste	005	002
Miscellaneous supplies	056	003
Pulleys	003	03
Liners	006	001
Trommel screens	007	005
Flotation supplies	004	
Machine-shop repairs	005	004
Electrical repairs	003	004
Building repairs	024	016
Mill-shop repairs	020	022
Electric power	085	083
Compressed air		005
Water and water power	010	009
Electric light	005	005
Heating	023	014
Assaying	009	006
Train service	002	001
Contingent expense	012	007
Depreciation	042	031
Administrative expense	017	012
Taxes and insurance	028	021
Free rent, light and water	001	001
Fire protection	001	002
Experimental	001	001
South mill operation	023	009
Reconcentrating expense		001
Total	$0 601	$0 425

CRUSHING AND CONVEYING

Details of Labor, Supplies, Etc	Average per Ton for the Year	Last Year
Crushermen	$0 003	$0 002
Conveyormen	006	005
Roustabouts	001	001
Laborers	006	006
Repairmen		
Screens		
Belts	014	007
Buckets	001	001
Roll shells	002	002
Roller shells		
Mullers	002	002
Spindles	002	
General machine parts	002	002
Oil and waste		001
Miscellaneous	005	
Pulleys		
Liners		
Machine-shop repairs	001	001
Electrical repairs		
Building repairs	002	002
Mill-shop repairs	003	003
Electric power	027	025
Total	$0 077	$0 061

trators 1300 tons per day, or say 1336 tons per 24 hours of actual operation, at a cost of $286,070.

JIGGING

Details of Labor, Supplies, Etc.	Average per Ton for the Year	Last Year
Machinemen	$0 024	$0 018
Oilers	009	008
Repairmen	...	...
Roustabouts	..	...
Screens	002	001
Belts	001	.001
General machine parts	001	
Oil and waste		.001
Miscellaneous	009	
Pulleys		
Liners	004	
Electrical repairs		
Building repairs	004	005
Mill-shop repairs	002	.002
Electric power	012	013
Water and water power	.005	004
Total	$0.073	$0 055

GRINDING

Details of Labor, Supplies, Etc.	Average per Ton for the Year	Last Year
Machinemen	$0 023	$0.018
Roustabouts	...	
Laborers		.....
Repairmen		.....
Screens	.00e1	....
Bets	.002	...
Roll Shells	.002	....
Ring dies	.002	.010
Huntington-mill parts	001	.. ..
Chilean-mill parts		...
Concaves	001	
Mullers	003	002
General machine parts	001	.001
Pebblea	002	.002
Miscellaneous	010	
Pulleys		
Liners	002	
Trommel screens		
Electrical repairs		
Building repairs		
Mill-shop repairs	003	003
Electric power	.024	022
Total	$0 077	$0 050

CONCENTRATING

Details of Labor, Supplies, Etc.	Average per Ton for the Year	Last Year
Machinemen	$0 024	$0.019
Oilers	.009	003
Roustabouts	001	002
Laborers	.002	
Experimental labor	.001	
Repairmen		
Belts	002	002
General machine parts	.003	001
Oil and waste	.002	
Miscellaneous	.013	
Pulleys	.001	...
Flotation supplies	.004	
Liners		001
Machine-shop repairs	.005	003
Building repairs	.002	002
Mill-shop repairs	.006	011
Electric power	.019	018
Compressed air		005
Water and water power	.004	003
Contingent expense	.001	—
Reconcentrating expense		001
Total	$0 100	$ 76

GENERAL MILLING EXPENSE

Details of Labor, Supplies, Etc.	Average per Ton for the Year	Last Year
Superintendent and foremen	$0 014	$0 013
Shift bosses and sampler	010	009
Roustabouts	001	001
Laborers	.003	.001
Watchmen	006	.006
Experimental labor		002
Repairmen		
Belts	001	
General machine parts		
Oil and waste	.002	.001
Miscellaneous	013	.002
Pulleys	.001	
Machine-shop repairs		
Electrical repairs	.002	.003
Building repairs	.012	.007
Mill-shop repairs	.001	.001
Electric power		.001
Water and water power		
Electric light	.005	.005
Heating	.023	014
Assaying	009	.006
Train service	.002	.001
Contingent expense	011	.007
Depreciation	.042	.031
Administrative expense	.017	012
Taxes and insurfance	.028	.021
Free rent	001	001
Fire protection	.001	.002
Experimental supplies	.001	001
South mill	.023	.008
Total	$0.229	$0.156

SCREENING

Details of Labor, Supplies, Etc.	Average per Ton for the Year	Last Year
Machinemen	$0 013	$0 009
Roustabouts	001	001
Repairmen		
Screena	003	002
Belts		
General machine parts		
scellaneous	007	
Pulleys	001	
Linera		
Trommel screens	007	006
Building repairs	005	
Mill-shop repairs	004	003
Electric power	003	004
Water and water power	.001	001
Total	$0 045	$0 026

SHIPPING COST

The company shipped 75,963 96 tons concentrates, at the following cost:

	Per Ton	Last Year
Labor loading	$0 158	$0 182
Representatives at smelters	031	041
Supplies	012	006
Assaying	016	021
Heating	011	008
Sampling	001	
Contingent expense	006	007
Administrative expense	012	012
Repairs	004	011
Total	$0.251	$20 88

ECONOMIC MILLING DATA

Days ran	356 10
Tons milled	475,784
Assay feed, % lead	9 7295
Assay feed, oz. silver	4 015
Contents feed, tons lead	46,291,310
Tons concentrates	76,284 12
Average assay concentrates, % lead	50 6651
Average assay concentrates, oz. silver	18 4345
Contents concentrates, tons lead	38,649 44
Extraction lead, %	83 49
Contents feed, oz. silver	1,910,281 14
Contents concentrates, oz. silver	1,406,259 97
Extraction silver, %	73 62
Value feed	$7,636,349 89
Value concentrates	$3,297,827 25
Economic extraction, %	43 18
Tons milled per 24 hours	1,336 09
Tons concentrates produced per 24 hours	214,221
Tons lead produced per 24 hours	108,535
Cost per ton milled	$0 598
Cost per ton concentrate	$3 397

The cost of screening and shipping are given, together with important milling data.

The foregoing detailed charges for concentration have been subdivided under the following headings: Crushing and Conveying, Screening, Jigging, Grinding, Concentrating and General Mill Expense.

Anaconda Accident Record

In the May issue of the *Anode*, the official organ published by the general safety committee of the Anaconda Copper Mining Co., is given a report for the year ended Mar. 31, 1917, of all accidents occurring in each of the company's mines.

The first prize, of $750, was won by H. Tonkin, foreman of the Poulin mine, and the second prize, $250, by T. J. Chope, foreman of the High Ore-Modoc mine. The High Ore-Modoc worked 269,286 man-shifts, this being considerably more than any other, and is charged with 14 accidents during the year, or 0.357 per 10,000 shifts.

T. H. Oaas, safety engineer of the general committee, has just completed a report for the first quarter of 1917, showing the following results, figures being based on one accident per 10,000 shifts: Fatal, 0.11; serious, 0.69; slight, 14.54; total, 15.34. This compares with the previous year, 1916, as follows: Fatal, 0.12; serious, 0.79; slight, 14.99; total, 15.90.

A substantial reduction in all classes of accidents from the average of the previous year is thus recorded for the first three months of 1917.

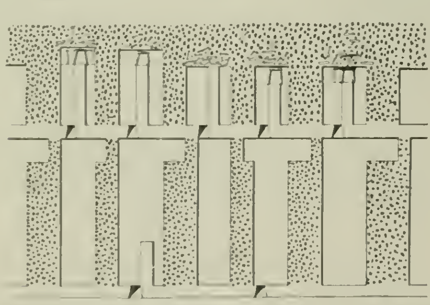
Details of Practical Mining

Room and Pillar Mining at Loretto, Mich.[*]

The main orebody at the Loretto mine, Michigan, is a vein-like deposit dipping almost vertically and averaging about 1000 ft. in length. Its average width is from 10 to 40 ft., but in places it narrows to a few feet or widens out to 100 ft. For the greater part of its length the ore came up to the overburden, which is about 25 ft. in depth. The orebody is developed to a depth of 800 feet.

The ore varies greatly both in iron content and in physical characteristics. In some sections it is lean and hard; in others, though of high iron content, it will stand up well; in others the ore is composed of uncemented grains, and though easily handled when dry, is almost impossible to hold when wet. The orebody is for the most part dry, but in places water comes in from the wall rocks and causes trouble in mining.

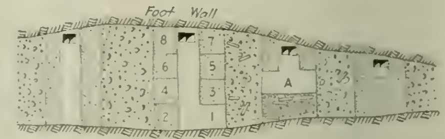
Both foot and hanging walls are weak slate-like formations with a marked cleavage with the bedding, and joints across the bedding. The wall rock breaks off first into slabs and then into small angular pieces along the joint planes.



LONGITUDINAL SECTION IN ROOM-AND-PILLAR METHOD USED AT LORETTO

When this orebody was first opened, the Sturgeon River crossed it at about the middle of its length, making necessary the supporting of the surface. The room-and-pillar method of mining was used at first, the distance between levels being 100 ft. On each level a crosscut was driven from the shaft in the foot wall to the orebody, and a drift run longitudinally in the orebody and supported with square-set timbers. Except under the river, where a large pillar of ore was left, alternate stopes and pillars were laid out; the stopes were usually two or three sets and the pillars three or four sets wide and extended from foot to hanging wall. The stopes were mined by the usual square-set method to within 20 ft. of the level above. By this method the larger portion of the ore was left in the mine to support the surface.

In 1908 the river was diverted around the orebody and the removal of the pillars by the top-slicing method commenced. All the stopes in the mine that were open were filled with rock. On each level as mining proceeds a drift is driven in the foot wall parallel to the orebody and a crosscut into each pillar. A two-compartment raise, 4 x 7 ft. in outside dimensions and built of 6-in. cribbing, is put up in each pillar, preferably on the foot wall. Mining then proceeds from the top by the usual top-slicing method. Nine slices are taken to a level, each slice thus being about 11 ft. high. In slicing, the ordinary type of drift set is used, with a post 9 ft. long and a cap 4 to 6 ft. inside the joggle to suit conditions. The timbers are from 6 to 10 in. diameter. The usual slice is 9 ft. wide.



PLAN OF PILLAR, SHOWING ORDER OF SLICING BACK

The usual procedure from the top of the raise is to crosscut to the hanging wall, drift east and west to the filled stopes, then drop back toward the foot wall by successive side slices until the floor is all removed. The ore is shoveled into ¾-ton buggies and dumped in the raises. As the ore is taken out, the bottom is covered with 1-in. hardwood boards or lagging, and whenever the timber from that portion of the slice from which the ore has been removed shows much weight, it is blasted and the back brought down. Before the sets around the raise are blasted, the slice below is opened up enough to make room for the buggy and tools. As the work advances, the ore on each slice is taken out up to the floor of the slice above; so that no ore is left to be pulled coming back.

Many variations of the method are practiced, always in accordance with the general rule that the ground around the raise is weakened as little as possible and that the mining is retreating toward the raise. As the pillars vary greatly in size, often more than one raise must be put in a pillar to keep it from lagging behind the others; in this manner the mining is kept at about the same height in all the pillars. Since many of the pillars are small, the amount of ore mined from each raise is much less than would be the case with a new orebody.

On the upper levels, the mat of timber above the back followed the mining down pretty well, and in most cases only a little lagging was needed to cover the bottom of the slice. At present, however, the pressure from the walls seems to hold the mat up and the opening left by mining fills with wall rock. If any opening is left in the back, fine rock will run until stopped; this necessitates lagging each floor very closely.

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[*] Paper presented by C. H. Baxter, superintendent Loretto Mine, Loretto, Mich., at the annual meeting of the Lake Superior Mining Institute, Birmingham, Ala., Mar. 13-16, 1917.

The amount of dead work in driving drifts and crosscuts in the foot wall is great for the amount of ore mined; but this cannot be avoided as the settling of the pillars makes it impossible to hold an opening in the orebody for more than a short time. This settling even affects the foot wall, so that in places the crosscuts to the orebody must be regraded and retimbered several times a year. The settling of the pillars and old filled stopes in mass has amounted to from 20 to 30 ft. for a considerable length of the orebody. The pillars have now been extracted down to about the fifth level; as all of ground is opened up and timbered, the extraction is practically 100%.

A Time Saver for Surveyors

By Enoch Perkins

Mine surveyor, Alaska Gold Mines Co., Juneau, Alaska.

The following description of a device for holding the candle and tracing cloth when taking backsights in underground surveying may be of value to some of your readers. This device has the following advantages over the other types with which I am familiar:

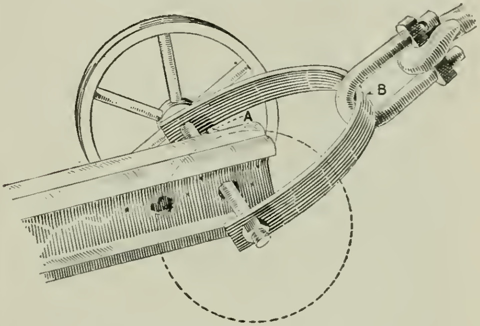
The over-all length (18 in.) is such that in almost any drift, the sight is sufficiently high above the rail to enable cars to clear without disturbing it. If the station is in a plug in the back of the drift, the pointed end may be thrust into the plug behind the spad, or should the back be low between the transit and the backsight, the point may be stuck in the floor of the drift. In timbered drifts or raises it is often an advantage to set it horizontally, as in the photograph. In this the construction shown differs slightly from the drawing.

BACKSIGHT DEVICE HELD HORIZONTALLY IN POST

Ordinary tracing cloth is used to diffuse the light from the candle, and it is surprising the distance at which this backsight is plainly visible and easily "picked up" without any other illumination of the cross-hairs. In carrying lines up raises, two of these devices are often used, one for the foresight and one for the backsight, thus leaving the assistant free to aid the instrumentman at the transit in setting up, recording angles, etc. It is light and simple of construction and can be made by any ordinary blacksmith in thirty minutes, the only requirement being ¼-in. round iron.

Method of Packing Rails

The ordinary method of packing rails on muleback, namely, that of fastening the upper ends of three or four rails on each side of the pack saddle and allowing the other ends to drag, will not work on narrow and steep mountain trails, because the dragging ends have a tendency to spread out like a fan. This results in the rails on one side falling off the trail, probably being suspended in space, if the trail is around the face of a cliff, while the rails on the other side interfere with the bank. In order to overcome this difficulty, the clevis shown in the accompanying illustration was used with success. This was made of ¼ x 1½-in. iron and with an 8-in. span (any similar dimensions will do). To transport the rails, the rod *A* is passed through the bolt holes of several rails laid close together. A chain is then passed through the clevis at *B*, and fastened to the mule. The load of rails may then be dragged over as rough and narrow a trail as the mule can travel. If the trail is not too rough, the weight of the rail may be taken up, and consequently more of them transported at a time, by using a slightly longer rod and a small iron wheel on either side of the clevis. Wheels from old wheelbarrows are just the right size for this work and will stand a great deal of hard usage. Other heavy material, such as large timbers, may also be dragged successfully with this two-wheel arrangement.



A METHOD OF RAIL TRANSPORTATION

New Drill Steel Used during 1916 by the Old Dominion Copper Mining and Smelting Co., Globe, Ariz., according to the "Old Dominion Bulletin" for March, 1917, consisted of 1.5 tons Bull Moose, 8 tons stoper, 2.5 tons plugger and 3.5 tons Leyner. One man sharpens and one man tempers all steel, averaging 455 pieces per day each during 1916. One man also sharpens and tempers all picks, averaging 20 per hour. One man grinds on an average of 16 axes and files 12 saws per day.

Correspondence and Discussion

Strike Conditions in Arizona

The amount of copper produced in the Clifton-Morenci district at the time of the calling of the present strike was approximately at the rate of 100,000,000 lb. per year, divided as follows: The Arizona Copper Co., Ltd., 5,000,000 lb. per month; Phelps-Dodge Corporation, Morenci Branch, 2,000,000 lb. and the Shannon Copper Co., 1,000,000 lb. per month. As many of your readers are aware, this district was the scene of a prolonged strike lasting from the middle of September, 1915, until the end of January, 1916, and shortly after the resumption of operations in February of last year the managers of the three operating companies met in conference with a committee elected from their employees and jointly drafted a new scale of wages and a working agreement to govern operating conditions and to provide for a full and free method of intercourse between employers and employees by means of conferences or, as the men prefer to call them, grievance committees, whose duty it is to investigate all causes for dissatisfaction, to endeavor to settle them and, if necessary, bring them to the attention of department heads and to the general manager.

Operations have been carried on under this agreement for nearly 18 months, and on the whole it has worked well. The committees appointed by the men have proved, as a rule, reasonable and conservative and it can certainly be said that grievances of every kind and description, from the most insignificant to those of importance have been brought to the attention of the committees and have been handled by them.

The rank and file of our employees are of Mexican, Spanish and Italian origin, and since the strike of 1915 have been strongly unionized. Their idea of unionism is that they must have everything their own way. It has been a difficult matter to educate them to the idea that the agreement obligates them just as well as the companies.

The principal advantage found in the working out of the agreement has been that no opportunity for hidden grievances inflaming employees can exist without the knowledge of the managers. That the agreement has effected what it was drawn for, namely, the minimizing of troubles involving strikes, is not the case. During the comparatively short period that the agreement has been in effect, the three companies operating in this district have had more strikes than during the 20 years preceding.

Since the settlement of the 1915 strike, when the companies agreed to reinstate almost without reservation all of its striking employees, the idea has prevailed among the foreign employees that they have been guaranteed their jobs in perpetuity, consequently when one of their number has been discharged for any cause, such action has in numerous cases been followed by a walkout on the part of his fellow employees in his department. These small strikes have been so numerous among the Mexicans that the term "strikitos" has become current in this district in referring to them, while several strikes involving a complete suspension of all departments, of periods from a few days to two weeks, have also occurred and usually over matters of insignificant importance to the employees generally although the principle made them all-important to the companies.

There is one case of a Mexican timberman who, until the time of the 1915 strike had been a good workman. Since his re-employment after the strike he showed a most refractory spirit and would not carry out instructions of his bosses and continually loafed.

Simon's ill temper was humored by his first boss, who took the first opportunity to have him transferred to another part of the mine. The second boss put up with him for awhile and succeeded in again passing him along to a third, and the latter to a fourth until Simon had been tried out in various parts of the mine under various bosses. Finally he was given a layoff of two weeks for flagrant breach of instructions.

He immediately took his case to the grievance committee which brought it to the attention of the superintendent who held an investigation and sustained the action of the shift boss, which decision was concurred in by the committee. The man threatened to prevent anyone from going to work in the mine unless he was immediately reinstated and paid for the time he had lost, which, of course, was denied. He made good his threat, and a strike involving the entire suspension of operation and loss of employment to about 2500 men for two weeks followed, during which time the Federal Labor Conciliator visited the district, investigated the facts, sustained the company's position and induced the men to return to work.

Another feature in the operation of the agreement has been the excessive and serious inroads into the time of the superintendents and other officials caused by the numerous investigations asked for by the grievance committees and which, under the agreement, cannot very well be delegated to others.

Conditions in the mines have become almost intolerable. I quote one of the mine superintendents, as follows: "The falling off in the efficiency of the labor since commencing operations in January, 1916, has been serious. Labor has assumed an attitude of independence amounting to arrogance which has made it exceedingly trying and exasperating to those in authority. Common operating orders are ignored or resented. Taunts of inability to dismiss are made by the men, with the veiled and sometimes open threat of consequences. Discipline is forgotten. Timbermen and shift bosses are intimidated if they attempt to give orders.

"Certain standards of work were adopted and adhered to, irrespective of conditions. Ten cars were adopted as a mucker's day's work. In one case, where the men shoveled directly into a chute, they actually installed a wholly unnecessary track and car which involved extra abor for them, but permitted them to measure the standard day's work! Work was hampered in all directions by the absurd standards adopted by the men.

"A comparison between the results obtained in other districts with those obtained here show that the efficiency here is about two-thirds only of what is obtained n other camps with the same class of labor."

Such occurrences cannot reasonablye be laid to the charge of any of the old employees in this district, but probably to some of the I. W. W. floaters whose activities have so grown since the commencement of the war.

Notwithstanding the conciliatory attitude of the companies' managers in the handling of the labor situation, and despite the conservative attitude of the grievance committees in their desire to control the men they represent and the wisdom of their advice, talk of a general strike has been rife among the rank and file for several months past. Nothing definite could be ascertained regarding the cause for this talk, except that the Mexicans have been working long enough and they want a rest, and they openly stated that since the companies could close down their works at any time for repairs, or for any other reason, that they also had as much right to close them down when it suited *them*.

A strike, such as that of 1915, appeals to the average Mexican member of the union. The show of authority, the parade with bands, the beating up of non-sympathetic fellow employees, and tin-can parties for drumming their defenceless victims out of the town, all of which were carried on openly, provided an exciting entertainment for them.

This desire for a vacation fell in very well with the plans of the union leaders, who realize that peaceful times offer no inducement to the average Mexican to keep his dues paid up, hence all possible dissatisfaction has been created and fostered. Furthermore this situation fell in admirably with the plans of the labor representatives from outside the district who have brought about simultaneous strikes throughout nearly all the mportant camps of the West.

On May 29, the Federal Department of Labor took cognizance of the strike rumors in this district and sent a representative to investigate conditions, which he spent several days in doing. At his request a meeting of the managers with the district conference committee of employees was held which lasted two days, and all the matters in any way unsatisfactory to the employees, which were brought forward by the committee, were fully discussed and as far as possible cleared up, and the Federal representative expressed the opinion that working conditions were good and there existed no reason whatever for a strike. Nevertheless, on June 19, the district committee asked for a meeting with the managers at which time they presented them with a series of demands. The managers requested 10 days for consideration, which was granted and they subsequently received a later communication from the committee, stating that a formal answer would be required on the evening of June 30. In the meantime the managers, foreseeing trouble, communicated with the Department of Labor and requested the presence of Mr. Myers, labor conciliator for this district, who at that time was engaged on a case in the East. The request was granted, but could not be immediately complied with, Mr. Myers wiring the managers to request the men to avoid a strike until he could arrive. This request was presented to the committee and through them to the men, but was turned down and a formal answer as arranged was demanded.

The answer of the Arizona Copper Co. and the Shannon Copper Co. took the position that while conditions in this district do not justify an increase in wages, which are adjusted on a sliding scale according to the price of copper, nevertheless it was their patriotic duty to go as far as possible toward averting a strike and offered 50 and 25c. per day more, conditional on its acceptance by the employees without resort to strike.

The Phelps-Dodge Corporation, Morenci Branch, replied to the minor demands in a similar manner to the other companies, but on the subject of wages took the position that a strike, being already arranged as part of a general labor program, the offer of a wage concession at this time would not avert a strike, and simply declined the demand for the Miami scale. The offer of the two companies was not accepted, but in that action the responsibility for the strike cannot be laid to lack of effort on the part of those companies to avert it.

The committee received the companies' answers, reporting it to a meeting of the Central Labor Union in waiting, and they were rejected by that body and in spite of a protest by the employees' committee a strike order was immediately signed by J. L. Donnelly, president of the Arizona State Federation of Labor, to take effect at 10 o'clock the following morning.

It will be noted that the strike was called without submitting the companies' answers or compromise to the employees generally for their approval or rejection, and no strike vote of the employees was taken; in fact, it is doubtful if 1% of the employees knew anything of the contents of the manager's answers before striking.

The employees have demanded the Miami scale of wages. It is true that the Miami scale is higher than that paid in this district, but mining conditions here are totally different and operating costs are and will always be higher here than in the Miami district. Nevertheless the average wage paid to all employees of the largest company in this district for the first five months in 1917 was $4.28 per day, and that labor in this district gets fully as fair a proportion of the values produced as elsewhere the following comparison will show:

In the month of May, 1917, there were mined by the Inspiration and Miami companies a total of 777,220 tons of ore, or 25,071 tons per day. The total number of men employed in their mining departments by these two companies was 1875, or a yield of 13.4 tons per man day.

In the Clifton-Morenci-Metcalf district, the Arizona, Phelps-Dodge and Shannon companies together mine 6710 tons per day, and employ in their mining operations 3730 men, equivalent to a yield of 1.8 tons per man per day. Making further comparison on the basis of copper produced, the Inspiration and Miami Copper companies employed a total of 3748 men in all their mining, concentrating and smelting operations for the month of May, and produced a total of 17,187,592 lb. of copper, or a yield per man per day of 147 lb. The three companies operating in the Clifton-Morenci-Metcalf district in their total mining, concentrating and smelting operations employ 5197 men and produce 7,952,000 lb. of copper per month, equivalent to a yield of 51 lb. of copper per man per day. NORMAN CARMICHAEL.

Clifton, Ariz., July 7, 1917.

McCartney's Hoist Indicator

A hoist indicator of the noncumulative type, is the invention of Alex McCartney, an employee of the Wemyss Coal Co., Ltd. One of these indicators, recently installed in the Wellsley Colliery, Fife, which embodies some distinctly original features, more particularly perhaps in regard to the method of indication of signals and the ingenious form of the time lag, a form which has enabled the inventor to do without a dashpot, is described by the *Iron and Coal Trades Review*, of London.

It will be seen that the main shaft carries two pointers, the longer—the main pointer—being immovably fixed thereon and the shorter mounted upon a loose sleeve, which is free to revolve around the main shaft. Twin ratchet wheels and drums are mounted respectively upon the main shaft and the loose sleeve, the drums carrying chains from which are suspended weights to keep the tension on the ratchet wheels. The ratchet wheel upon the main shaft is engaged by the lever *A* and pawl *B* actuated by the signal wire. The pawl working over a fixed sheath, secured to the back of the casing, clears the teeth when the lever is in the back position. The smaller pointer is furnished with a projecting pin which, when the main ratchet is advanced, is engaged by a corresponding slot in the side of the longer pointer and so moved forward step by step with this last. Spring-actuated retaining pawls *C* and *D* are placed upon the under side of the ratchet wheels.

A disk, equal in diameter to that of the dial of the apparatus, is secured to the cheek of the drum which is in front of the ratchet on the loose sleeve and immediately behind the dial. The dial itself is numbered from 1 to 11; the third position, however, is cut away, leaving a slot through which the disk on the drum is plainly seen. The third position on this disk is printed with the word "Men," the whole of the other divisions which correspond with the divisions of the indicator dial have the figure "3" printed therein, the effect being that, with the exception of the advisory signal, when as already stated the word "Men" appears, the figure "3" is always shown in the opening of the dial irrespective of the number of rings or the position of the pointers.

The method employed for effecting the automatic cancellation of the signals is distinctly ingenious, comprising a train of three gear wheels and a pinion. To the main wheel of the train is secured a second gear wheel arranged to "free wheel" when the direction of rotation is from left to right. A chain is carried over this wheel, with one end attached to the bottom end of the main actuating lever, and from the opposite end a weight is suspended. When the lever is pulled forward to transmit a signal, the weight is raised, the free wheel only moving, and immediately the lever is released, the weight begins to descend slowly, as its speed is now controlled by the train of gears, until it engages the tramplever which works on a short shaft bolted to the back of the case and under the back plate toward the right-hand side. The tramplever is pliably connected to the retaining pawl *C* of the main ratchet, so that when the lever is depressed by the weight, it pulls the retaining pawl clear and allows the pointer to be returned to the zero position by the weight-actuated drum already mentioned. The retaining pawl for the ratchet controlling the short pointer is freed from engagement through the connecting-rod *E* from the winding engine. Prov
sion, however, is made for restoring this pointer to zer
by means of a short lever *F*, which is fitted to the sha
and has a pawl *G* working loose on the side next th
front wheel, the end of which pawl engages a pin pro
jecting from the ratchet-retaining pawl and pushe
it out when the first signal is given, the loose pawl drop
ping into position when the large pointer is returne
to zero. It may be added that by hanging up the paw
G, in the case of any signal then being given, it woul
stand until the engine being started released it; fo
example, if the pawl was hung up and 3 signaled, botl
pointers would move to 3; then, after a few seconds
the large pointer would return to zero, leaving th
smaller pointer standing until released by the engine in
motion. What the inventor intended by this methoc
was that, in the event of the engineman being out of
the engine room, any signal given in his absence woulc
stand and so prevent any possibility of an accident witl
men on the cage, as it is the banksman now who gives
the back signal instead of the engineman as formerly.

From the foregoing it will be understood that wher
the signaling wire is pulled, the pointers move round
together, step by step, for a number of places, according
to the nature of the signal, the train of gears acting
as a time lag. So soon, however, as the signal is complete and the time limit has been exhausted, the mair
pointer is returned to the zero position automatically,
while the short pointer remains stationary at the las
signal transmitted and is not released until the engine
has been put over, though, when necessary, it may be
released by hand in the manner already mentioned.

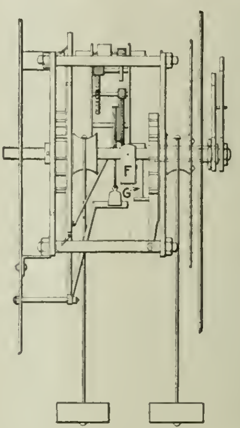


FIG. 1-Side View

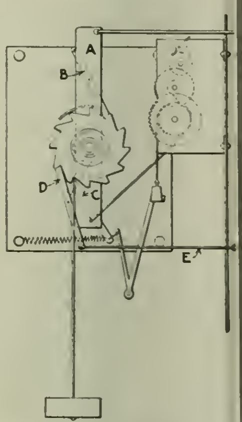


FIG. 2- Front View (Dial & Casing Removed)

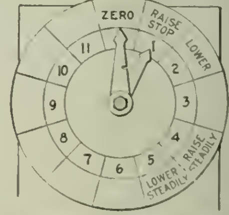
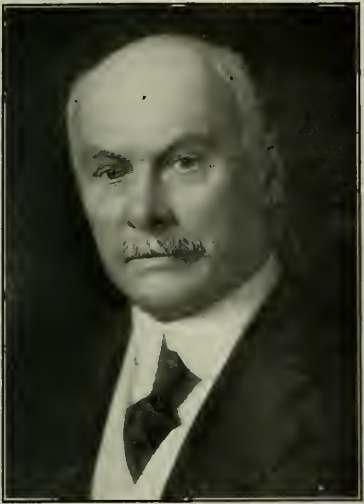
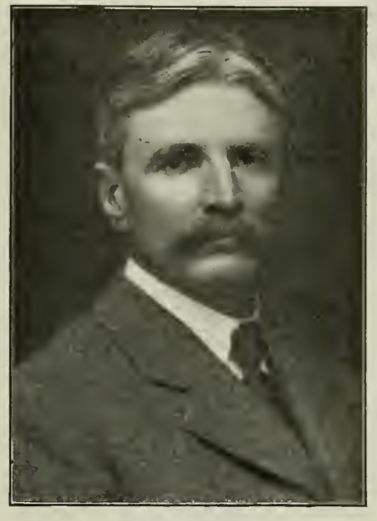


DIAGRAM OF McCARTNEY'S VISUAL INDICATOR

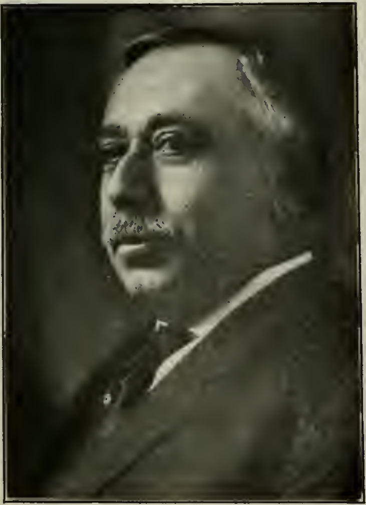
Chairmen of Subcommittees on Raw Materials Appointed by Advisory Commission to Council of National Defense



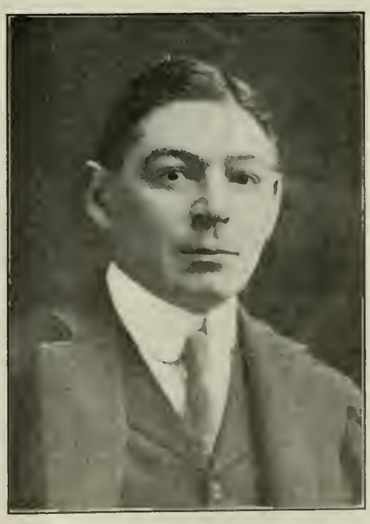
ELBERT H. GARY
Chairman of the Steel Committee



CLINTON H CRANE
Chairman of the Lead Committee



WILLIAM H. NICHOLS
Chairman of the Chemicals Committee



ARTHUR V. DAVIS
Chairman of the Aluminum Committee

Events and Economics of the War

Germany is beset with troubles. The Chancellor is out and the Reichstag talks peace in a way before unheard. In the meantime the Russians press on in Galicia. Other fronts are quiet except for occasional raids.

Several important events have quietly taken place in the United States. The export embargo has become effective. The National Guard has been mobilized in 11 states. The draft quotas have been published. The determination of cost of production has been referred to the Federal Trade Commission

The Food Bill is traveling a stormy course and the shipping row appears without solution unless someone resigns. The work of suppressing agitators has begun and the internment of Teuton agents continues.

Hoover on Perils of Delay

The experience this year in rampant speculation, extortionate profits, and the prospect of even narrower supplies than the 1916 harvest and carry over, says Herbert Hoover, must cause the deepest anxiety. It is evident that the unbearable increase in the margin between producer and consumer is due to not only rank speculation, but more largely to the wide margin of profit demanded by every link in the chain to insure them from the great hazards of trade in the widely fluctuating and dangerous price situation.

During recent months the allied governments have consolidated their buying into one hand, and as the restricted exports to neutrals are but a minor item, the export price, if not controlled, is subject to the will of the allied buyer. Furthermore, in normal circumstances United States and Canadian wheat is moved to Europe largely in the fall months. This year, owing to the shortage of shipping, the allied supplies must proceed over a large period of the year. We must, therefore, expect a glut in our interior terminals during a considerable period. The financial resources of the grain trade are probably insufficient to carry this extra load without the help of speculators. The net result is that unless some strong and efficient government action is immediately settled upon and brought into play the American producer will face a slump in wheat, the price of export wheat will be dictated by a single agency, and a large part of the essential breadstuffs will have passed into the hands of speculators.

Three facts stand out from our investigations: First, the farmer will need protection as to the price of wheat; second, large masses of people in the consuming centers are being actually undernourished today, due to the exorbitant cost of living; and these conditions, unless some remedy be found, are likely to repeat themselves in even more vicious form at this time next year; third, the speculator, legitimate or vicious, has taken a large part of the money now being paid by the consumer.

It seems to be overlooked in some quarters that the marketing of this year's wheat is surrounded with circumstances new to history and that the old distributing safeguards are torn away by isolation from the reciprocal markets abroad and the extinction of a free export market and transportation. The harvest has begun to move and the price of wheat to drop; and if the farmer is to sell his wheat either the speculator must buy and carry not only the normal flow from the farmer in excess of domestic and foreign requirements, but also the glut due to the restriction upon the outlet to the latter. He must necessarily charge his toll to the producer and the consumer, and this latter probably upon a more extensive scale than last year, as his risks will be greater. Or the government must buy the surplus wheat at some reasonable minimum price, allowing the normal domestic trade of the country to proceed with proper safeguards against speculation. The government should be able to stabilize the price of wheat without the speculator's assistance and can control the price and quantity of export wheat. We are practically helpless to safeguard either the farmer or the consumer until the pending legislation is passed.

The Government Nitrate Plant

The board of army engineers that has been investigating the availability of 270 sites for the government nitrate plant has recommended that it be located at one of the following 11 points, preference being in the order given: 1. Black Warrior river in Alabama; 2. Muscle Shoals in Alabama; 3. Near Knoxville on the Holston river; 4. New River in southwest Virginia; 5. Ohio river at Louisville; 6. Chattahoochie river in Alabama and Georgia; 7. At Cartersville, Ga.; 8. At Rome, Ga.; 9 Columbia, S. C., on Congaree river; 10. At Augusta, Ga. on Savannah river; 11. Complete steam plant for nitrate at Wheeling, W. Va.

The conclusions set out in the report are that at present no permanent plant be located and that experiments in the cyanide and synthetic processes should be conducted and that all the circumstances pointed to New River, Va., and the Upper Holston near Knoxville as places for such experiments.

It is recommended that $4,000,000 should be set aside of the available appropriation of $20,000,000 for such experiments and that the decision on the permanent location should await findings as to experiments on cost and processes. The report sets out that the center of nitrate consumption is in the southwest corner of North Carolina.

There are four methods for making nitrate, says the report, namely, electric arc system, cyanamid, cyanide and the synthetic ammonia process. It can be produced as a by-product from coke ovens.

The arc system was found objectionable as requiring immense water power and waste. Cyanamid requires considerable water power and the cost of the method is high. The cyanide process requires little power, the same being true of the synthetic ammonia process.

The cyanamid and synthetic ammonia processes are practically in the experimental stages, but have great promise and while success is assured further experiments should be made on a large scale.

Factors that entered into the selection of the locations related to proximity to center of demand of the products, the water power and expense involved in developing it, the convenience to raw material such as coal, coke and lime, also to labor and climatic conditions.

Work of the Labor Committee

Perhaps the most outstanding achievement of the Committee on Labor of the Council of National Defense has been the following resolution adopted at the meeting of its executive committee and approved by the Council and its Advisory Commission.

The defense and safety of the nation must be the first consideration of all patriotic citizens. To avoid confusion and facilitate the preparation for national defense and give a stable basis upon which the representatives of the Government may operate during the war, we recommend:

That the Council of National Defense should issue a statement to employers and employees in our industrial plants and transportation systems advising that neither employers nor employees shall endeavor to take advantage of the country's necessities to change existing standards (that is, those constituting a day's work and wages). When economic or other emergencies arise requiring changes of standards, the same should be made only after such proposed changes have been investigated and approved by the Council of National Defense.

That the Council of National Defense urge upon the legislatures of the states, as well as all administrative agencies charged with the enforcement of labor and health laws, the great duty of rigorously maintaining the existing safeguards as to the health and the welfare of workers, and that no departure from such present standards in state laws or state rulings affecting labor, should be taken without a declaration of the Council of National Defense that such a departure is essential for the effective pursuit of the national defense.

That the Council of National Defense urges upon the legislatures of the several states that before final adjournment they delegate to the governors of their respective states the power to suspend or modify restrictions contained in their labor laws when such suspension or modification shall be requested by the Council of National Defense; and such suspensions or modifications, when made shall continue for a specified period and not longer than the duration of the war.

Zeppelin motor busses are being run between London and Eastbourne. Owing to shortage of petrol a single deck motor bus is equipped with a long gas bag on top filled with coal gas to be used as a substitute for petrol for driving power.

The Government has completed tentative plans to send 1000 aviators a month to France, and the first big overseas force of airmen will be ready to embark some time in September. American manufacturers have promised to supply all training planes needed by this country and its allies.

German Torpedoes Inferior

There is reason to believe that the German torpedo supply is weakening, says a statement issued at the Navy League headquarters on July 15. The increasing frequency with which press dispatches report merchant ships as successfully dodging torpedoes, suggests to the technically trained mind that the German torpedo is deteriorating in speed and hence in accuracy of fire at long range.

The explanation of this offered by certain naval experts is that the Germans are so pressed for time in the construction of torpedoes that they can no longer maintain their speed and their accuracy of fire. It is estimated that their torpedo has lost nearly 10 knots in speed from the standard used at the outset of the war.

It takes normally six months to construct a torpedo and costs many thousand dollars. There is also a chance of Germany running short of some material essential to their manufacture. Whether this has occurred is not known, but the conclusion has been reached that the individual German torpedo is losing in efficiency.

The U-boat warfare as now being waged, it is said, was undoubtedly not thought out and prepared for by Germany before the war. Therefore the stock of torpedoes was not sufficient for the purpose. The deficiency has been made up by increasing the output of torpedoes. But with the tremendous land operations she has essayed, Germany could not have devoted a maximum of labor or materials to the making of torpedoes.

Moratoria in the United States

Some weeks ago, says the *Boston News Bureau*, there was passed a "moratorium" act in Oregon, which is understood to be similar in general terms to statutes previously existing in some other states. The Oregon act reads:

> No suit or action shall be commenced or maintained, during the period hereinafter provided for, to foreclose any mortgage upon real property, or to collect the debt secured thereby, if the land covered by the mortgage be owned, wholly or in part, by an enlisted man in the army or navy of the United States, who shall have enlisted therein in the volunteer forces or who shall have been enlisted in the National Guard of the United States and of the State of Oregon and his organization called into the service of the United States; and the lands of any such soldier or sailor shall be exempt from judicial sale for the satisfaction of any judgment during the period hereinafter provided for; provided, that this moratorium shall extend only during the period of actual service in the army or navy forces of the United States, and in no case shall begin prior to the day on which the Congress of the United States shall declare war, nor continue after 60 days subsequent to the conclusion of such war; provided, that all statutes of limitation in effect in the State of Oregon shall be suspended during the period above described, as to the mortgages, debts and judgments in this act described.

The most that such a law authorizes is postponement of interest payments for the duration of a man's military service; but the possibility of a lapse of interest for an indefinite period is not usually attractive to investors.

A joint resolution providing that the war army shall be officially known as the National Army of the United States was introduced. That is the name in use by the War Department officials now.

State Committees for Research

The National Research Council has recently considered the matter of the formation of research committees in the various states. In a letter sent to the several state councils of defense it says, "Such organizations should be determined by local needs and conditions. Local causes, such as the development or investigation of natural resources or the correlation of industries with research laboratories already existing at educational institutions, or the proper development of the use of research methods in industries may make it very desirable to organize such state research committees."

"In fact, the present emergency offers, in some respects, an unusual opportunity for improving the correlation of industry and research and it is highly desirable that those concerned should also plan for the permanent continuance of any research committee that may be formed."

"Such committees should be organized under the councils of defense of their states and should be representative of the universities and other leading educational and research institutions and also of those industries in which applied science plays the most important part."

America Must Provide Food

The Allies and the European neutrals will require a total of 971,000,000 bushels of bread and fodder grains out of the next harvest, and, in addition to that great amount, provision must be made for the grain ships destroyed by submarines, says Mr. Hoover.

Mr. Hoover presented the situation in detail for the first time, the figures representing the result of his researches while in Europe. He admitted that it would be impossible for North America to furnish all grain needed and provide for itself, but he added that the country must shoulder the major part of the burden.

Coincident with his decision to acquaint the country with all the facts in the situation, Mr. Hoover said that the task of conserving and apportioning America's grain supply would be undertaken as soon as powers were granted by Congress. Representatives of the Allies, he said, who were entering into forward contracts pending the adoption of this legislation were doing so at their own risk. As soon as the food administration was in full operation, he said, the situation would be canvassed, and, if necessary, many purchases by other countries would be canceled to serve the common cause.

Nationalization of the Railroads

For the troop movements which have already taken place and for those to come the 639 railroad companies of the United States and the lines they control have been completely nationalized, says President Willard of the Baltimore and Ohio Railroad and chairman of the committee on transportation of the Council of National Defense.

If it becomes necessary the 263,000 miles of road in America can be operated as one system. The coördination of efforts has resulted in a tremendous increase in the supply of coal cars, facilitated the transit of grain and met the needs of the Government in every respect. This has been accomplished notwithstanding the fact that in the last two months the railroads have been handling vastly more ton miles than ever before and have constantly been transporting many troops.

Huge Army Appropriations

Here are some illustrative figures, given by the *Official Bulletin*, showing the scale of Army operations at the present time:

In 1915, $450,000 was appropriated for aeronautics; this year, $47,000,000. In 1915, $9,800,000 for sustenance; this year, $133,000,000. In 1915, $10,000,000 for regular supplies; this year, almost $110,000,000. In 1915, $13,000,000 for transportation; this year, almost $222,000,000. In 1915, $6,500,000 for clothing and camp garrison equipage; this year, $231,500,000. In 1915, $300,000 for ordnance service; this year, $2,650,000. In 1915, $450,000 for manufacture of arms; this year, over $55,000,000. In 1915, $700,000 for ordnance stores and supplies; this year, $106,500,000.

Excused from Assessment Work

The Senate recently passed the Shafroth bill providing for suspension, during the war, of the requirement that not less than $100 worth of labor be performed or improvements made on each mining claim during each year for all owners who, in lieu of such assessment work, expend $100 in raising or manufacturing products necessary for the maintenance of the army, navy, or people of the United States or shall perform 25 days of labor in any beneficial occupation or pay into the treasury of the United States $100. The bill had the unanimous endorsement of the committee on Mines and Mining.

Dover—Calais Tunnel

Reports of the meeting of the Channel Tunnel Co on June 8, indicate that the British Government is about to decide whether or not the tube connecting Great Britain and France shall be built. There have been repeated rumors recently that the decision would be favorable.

At the meting Baron Derlanger declared that some move must be made soon one way or the other, for railways preparing to rebuild the portions of their line on the Channel coast must know where the tunnel would begin on the English side.

Officers for the Merchant Fleet

The United States Shipping Board has made plans in coöperation with the Department of Commerce to obtain the large number of officers to operate the great fleet of merchant ships to be provided for the war emergency. The headquarters of the recruiting campaign will be at the Boston custom house. It is estimated that 10,000 officers will be needed for the German ships taken over and for those under construction.

A Washington dispatch to the *Boston News Bureau* says that the grounds on which exemptions will be granted in the first draft for 625,000 men are: Physical incapacity; employment in vital war industries; religious beliefs opposed to war; sole support of families.

Editorials

The Matter of Prices

LAST week, in discussing the controversy about prices, we forecasted the appeal to Cæsar, but even, before our issue was off the press Cæsar had spoken, his words being that prices are to be the same to the Government, to our allies and to everyone. Yet, in his words there is something of the character of those of the Delphic oracle. They are capable of more than one understanding. Some people infer that prices are to be drastically reduced, while other understand that they are to be high enough to afford a liberal profit.

On the one hand, Mr. Daniels and Mr. Baker appear satisfied, while on the other hand many discerning men of business interpret the President's pronouncement as being favorable to business. They read him as saying that the Government must pay a just price, such a price as will maintain industry in a high state of prosperity, enable it to pay good wages and yield the maximum production that is needed.

President Wilson's address was written in a strain of patriotic exaltation. In his appeal to producers to forego ideas of large profits, when he argues that while some must give their services and their lives in the field, others must give of their resources, he takes ground that is strong both logically and sentimentally, but this is just the ground that patriotic business men of the country themselves have been taking. They have cheerfully faced requirements for tremendous taxation, they have cheerfully subscribed to the Liberty Loan and to Red Cross funds. But in order to do those things, business must have the means.

In all due humility and deference to the Presidential opinion and pronouncement, we are bound to say that the feelings of sentiment therein are stronger than the appreciation of economics. There is left at issue the disputable question of what is a just price and whether it shall be determined by the operation of natural law as old as humanity, or whether it shall be determined by Governmental ukase. If the latter be attempted, there are two inevitable corrollaries. On the one hand, the Government must be prepared to say what shall be the consumption. On the other hand, it must be prepared to finance production that is deficient. Nothing has yet been said about the American Government doing either of those things.

The Labor Difficulties

THE last week has been a dramatic one in the labor disturbances that had their foci especially among the copper-mining districts of the West. Montana has been relatively quiet. Arizona has been the scene of unusual and violent events.

In Jerome, Bisbee and other districts, but especially in Bisbee, the people rose in righteous indignation and ejected some twelve hundred members of the I. W. W. They were loaded on railway trains and dispatched for wherever they could find an abiding place, but nobody in Arizona seemed to want to receive them, and finally they had to be taken under the protection of the United States Government, lest they should starve to death.

The President himself issued a warning to people in Arizona against lawless actions, ignorant, perhaps, that he had been responsible for bringing them to a head through his unfortunate and preposterous appointment of ex-Governor Hunt as a Federal mediator. That appointment was naturally taken by the labor leaders as license to do what they wanted, with the assurance that they would have quasi governmental support. People then rose in their indignation. It is distressing that there should be such recurrences of bad appointments by the President, who, previous to the war, had a failing for selecting the wrong men.

When the labor troubles broke out at Butte, it was supposed that they were inspired by I. W. W. agitators, with German backing, for certainly labor at Butte had no just grievance against the managements of the companies operating there. However, it was supposed that the outbreak was local, but as time wore on it appeared that there was a general plot to create trouble and check copper production all over the country, while incidentally there have been sporadic attempts to interfere with the production of iron ore, lumber, wheat and other things. Events have shown that this whole business is something requiring the strong hand of the Government for control and the maintenance of the production of supplies that are needed.

The Draft

WITHIN a few days the machinery for drafting men between the ages of 21 and 30 will be in operation. In preparing for it, the exemption of many men, either for reasons of physical incapacity or for better service to the country in other ways, has been contemplated. Unfortunately, however, the regulations of the War Department put something of a cloud over the way whereby exemption is to be claimed. On the face of things it might appear as if the person desiring to be exempted must claim it, and it has been argued that some men who ought to be exempted might not claim it for fear of a stigma upon their reputations. There will be no stigma whatever when a man physically fit is exempted for the reason that he can serve the country better in the mines, in the fields or in the factories than he can in the trenches. Moreover, it is pointed out that the exemption for such persons need not be claimed by themselves, but may be claimed for them.

In this connection we desire emphatically to call attention to the needs of the mineral industry in contributing assistance in the prosecution of the war. The question has arisen as to whether the employers of mining engineers, mining geologists and miners—also of metallurgists, millmen and smelters—in this country are fully alive to the necessity of considering carefully whether or not any man in their employ who is drafted can best serve with the colors or at home in his vocational capacity. For men whose places cannot be filled without many years of preparatory work to leave such work for service in the ranks or as junior officers and become widely distributed without adequate means for recalling them—a misfortune that has been experienced by all the warring countries of Europe—would certainly be unwise in all cases where the industry abandoned by such men is essential to the prosecution of the war. President Wilson himself has pointed out that it is quite as necessary for the men best qualified to produce to remain at home as it is for the men best qualified to fight to go to the front.

This question is one that is distinctly up to the employers. They must assume that many young men who ought to be retained at industry will allow themselves to be drafted rather than to claim exemption. Their employers must claim exemption for them and must be alive and right "on the job" in doing it. It may be well for the employers in any industry in each district to get together to talk things over, decide what are the conditions prevailing as to men needed in their industry and, if it be decided that nobody can be spared, make proper and prompt representations to the district exemption boards. The machinery for this purpose has been provided, and employers must not go to sleep at the switch that has been left in their charge.

The Matter of Aluminum

IT was only to be expected that some senator would jump on the Aluminum Company of America and its president, Mr. Davis. The position of this company is peculiar. It has a practical monopoly of the aluminum business, being the only producer on this Continent. It holds that monopoly and has made a great deal of money out of it by virtue of its patents in the first place and of its knowledge of the business in the second place. If Senator Reed, in his virtuous indignation, could tomorrow exterminate Mr. Davis and all his staff, the United States would have no aluminum, for there is nobody else who knows how to make it.

Copper metallurgists, steel metallurgists, lead metallurgists are common. The literature of their arts is profuse. But who ever heard of an aluminum metallurgist outside of those who hide their lights under Mr. Davis' bushel, and who ever read any contributions to technical literature on the metallurgy of aluminum? Moreover, the inertia of the aluminum industry is greater than in any other of the major metallurgical industries. This is to say that if we had the metallurgists and if we had the immense capital that is necessary, it would be a long time before we could begin to produce aluminum. All of this is merely to make clear the peculiar situation of the aluminum producer with respect to the Government.

Similarly, the aluminum producer has maintained a peculiar position with respect to the market. The bulk of its product is sold on long-running contracts, and the price that it has made for them ever since the war began has been materially below the casual market price. The latter has been established by dealings in imported aluminum (which of course ceased with the war) and by dealings in remelted scrap. The Aluminum Company of America has participated in that market; that is, the buyer who went to it for a few tons of the metal was asked and paid the price fluctuating from day to day. There have therefore been two prices for aluminum, the open market price and the contract price, the bulk of the production being sold at the latter.

In its contract price the Aluminum Company of America has exhibited great moderation. In 1915 the open market price was from 19c. at the beginning of the year to 60c. toward the end, while the contract price ranged from 20c. to 31c. In 1916 the open market price averaged 60.7c., having been as high as 65c. during two months, but early in the year the producer sold nearly all of its output at 31@37c. During 1917 the open market price for aluminum has been around 60c. This will, we hope, explain the following interesting report from Washington:

> While the policy of Secretary Daniels to get bargain prices was being discussed today, his attention was called to the charge of a senator that Arthur V. Davis, head of the Aluminum Company of America, was providing the Navy Department with aluminum and was also on the committee of the Council of National Defense, which regulated the price. The price agreed on was 27½c. per lb. for 143,100 pounds.
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> Secretary Daniels indicated this was exorbitant and asked to know what was the last price he had paid for aluminum. By consulting the record he found that the market price was 60c. "I don't want the market price; I want the price I paid," he said to the officer who had brought the records.
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> "Sixty-three cents a pound," was the reply, whereupon Secretary Daniels announced that he would at once make an effort to get at the cost of aluminum production. He admitted, however, that the price of 27½c. agreed upon by the Council of National Defense was a bargain compared to 63 cents.

We do not know to what extent the cost of producing aluminum has increased during the last two years, but we fancy it has increased materially along with other things. We do know, however, that for many years before the war the price for aluminum hung steadily around 20c. per lb. When, therefore, Mr. Davis made a price of 27½c. to the Government, he was not engaging in any unpatriotic profiteering, nor does it look as if his position as chairman of the aluminum committee influenced him in any way other than to be generous.

Congress and Cotton

WHY is it that Congress is so eager to throw monkey wrenches into the gears of the copper, steel and other industries, but becomes furious when there is a proposal to extend the same legislation to cotton?

Why is that Mr. Daniels and Mr. Baker spend so much time in negotiating with the (in their eyes) nefarious coal producers and give no thought to the cotton planters?

Is it a fact that cotton has experienced no enhancement in price commensurate with the rise in other commodities?

Is it a fact that cotton is in no way a war material? That copper is used for making cartridge cases, but that cotton is not used in making the explosives that go in those cases?

Has the Federal Trade Commission been instructed to look into the cost of producing cotton?

Has Mr. Daniels talked to the cotton planters about cost plus a reasonable profit?

Is it true that it makes a great difference whether one hundred million pounds of a commodity is produced by 20,000 stockholders or 20,000 planters?

Is there not a lot of piffle in politics?

BY THE WAY

In *The Anode*, the organ of the Bureau of Safety of the Anaconda Copper Mining Co., is chronicled an accident that seems unusual. A miner accidentally got some carbide inside his underwear and received a bad burn when he took a bath without undressing. To remove the danger of a repetition of such a calamity, we suggest that *The Anode* consider the possibility of arranging for the separate washing of underwear and bodies.

The tremendous mine explosions which opened the British attack on Wytschaete Bend, June 7, were heard by David Lloyd George, the British Premier, who was staying for the night at his residence, Walton Heath, according to the New York *Times*. The plans for the attack had been long maturing, and when the preparations were perfected, the Premier was acquainted with the exact hour that it was intended to open it. Accordingly, on retiring Lloyd George gave orders to be called at 3 o'clock in the morning, on the chance of being able to hear the explosions. The Premier and other members of the household clearly heard the tremendous detonations, as also did persons in the Premier's official residence in London, who supposed that they were the sounds of heavy guns until they learned later from dispatches that they came from the explosions of mines. From London to the region where the British mines were exploded along the German front the distance is 130 to 140 miles.

In an article entitled "The Most Wonderful Man I Ever Knew," in the *American Magazine* for July, John Hays Hammond gives the following interesting anecdote about the inception of deep-level mining on the Rand by Cecil Rhodes:

A revelation of the methods by which Mr. Rhodes's mind operated is shown in his championship of deep-level mining—his starting project to risk millions of dollars in sinking shafts several thousand feet into the earth on the chance of finding gold there. All mining on the Rand hitherto had been of the "outcrop" species. To sink unprecedently deep shafts with the idea of intersecting a gold reef in the bowels of the earth was a most daring proposal. This is the story of the start of his undertaking:

Mr. Rhodes, Dr. Jameson and I, together with some of my engineers, were camping out one night in a wild part of Rhodesia, where the lions were roaring around us and had to be constantly frightened away by a wall of fire and the firing of guns. It was not uncommon in these regions for lions to dart in and snatch our donkeys or even to carry off a negro boy occasionally.

As we sat about the fire, Rhodes began to discuss the future. He wanted to know how long the Rand reef would last. I told him that geologically there was no reason why it should not last many more years—that there was no reasonable limit, from an engineering point of view, to the depth mining could be carried. Then I went on to explain that, whereas outcrop claims were selling anywhere from $10,000 to $100,000 per acre, we could pick up all the other land for deep-level mining at $50 or $100 per acre, provided no one discovered what we were trying to do. I figured out that, allowing for the cost of sinking shafts to a depth of 3000 ft., his profits would be 20 or 30 times as great as those yielded by the enormously costly outcrop lands.

"Why would it not be good business to sell the outcrop company holdings," Rhodes asked, "and quietly buy all the ground along the deep levels for 10 or 12 miles, and start mining at 2000 to 5000 ft.?"

"I recommended that to Barnato," I said, "but he was too busy with other things to bother about it."

"Let's send a cablegram to London at once!" Rhodes exclaimed.

About 2 o'clock in the morning my secretary—now Lord Saye and Sele, a fearless adventurer, a D. S. O. man and a crack shot—started, with only a couple of natives, on a 500-mile ride across dangerous country to the nearest railroad station at Mafeking, with a cable to the London directors of the Consolidated Gold Fields. The cable was briefly this: "Have decided best policy for company should be sell out our entire holdings in outcropping companies. Do this at once. Cable reply."

It took over a month for our representative to cover the land journey, receive the reply and rejoin us near the Zambesi, a total ride of over 1000 miles. And this was the wording of the directors' reply: "We don't understand your cablegram. Do you wish us to liquidate company? This cannot be done without full explanation to directors."

Rhodes was furious. He was not in the habit of having his explicit instruction fail to be carried out. He sent back this cablegram: "Do exactly what I instructed you to do at once without asking questions. I take full responsibility. C. J. R."

This time the London agents obeyed. When we got back to Johannesburg, several million dollars' worth of shares had been turned into cash at very high prices, the market being then in the thick of a boom. We immediately set machinery in motion to acquire all the land we wanted, and though there was infinite haggling by some of the parties in interest, we finally got nearly all we were after, and the whole deep-level plan of mining was mapped out and started. We had to spend millions before we reached a trace of gold, and more millions before we won a single ounce of metal. But within two years we had made $10,000,000 profit on the transaction. Had it not been for deep-level mining, the Rand would have been nearly exhausted by now.

Personals

A. H. Rogers has returned from California.

Robert Sticht is now at Pasadena, Calif. We expect that he will visit the East ere long.

George D. Van Arsdale has returned to New York from a protracted visit to the Arizona copper camps.

E. B. Hopkins, geologist, has gone to Mexico for the Associated Geological Engineers.

Robert Hadfield, chairman and managing director of Hadfields, Ltd., Sheffield, England, has had a baronetcy conferred upon him.

Henry M. Adkinson has returned to Salt Lake City from New York, where he has been engaged in professional work since April.

H. J. Stebli, captain in the First Engineer Regiment, has been assigned to Colonel McKinstry's staff, and is now at Fort Totten.

Stuart Rawlings arrived in Peru last month to take the position of assistant general manager of the Cerro de Pasco Mining Company.

A. O. Gates, Salt Lake sales engineer for the Dodge Sales and Engineering Co., has been ordered to active duty as lieutenant in the United States Naval Reserve.

C. Edwin Clarke, formerly master mechanic of the Cambria Steel Co., Johnstown, Penn., is now chief engineer of the Wilmington Steel Co., Wilmington, Delaware.

J. C. Dick and **C. T. Van Winkle** announce that they have opened offices for the practice of mining and metallurgical engineering at 505-6 Scott Building, Salt Lake City, Utah.

Clifford B. Langstroth, supervisor of the heat-treating and drop-forge departments of the Ross Rifle Co., Quebec, has been appointed metallurgist with the Link-Belt Co., Indianapolis.

R. A. Bull, for the past year connected with the Chicago Steel Foundry Co., has been elected vice president and general manager of the Duquesne Steel Foundry Co., Coraopolis, Penn.

George E. Burton, assistant director of the Oklahoma Geological Survey, is using his month's vacation for consulting work in petroleum geology, mining and mine geology outside the State of Oklahoma.

Carl R. Davis, general manager of Brakpan Mines, Ltd., Brakpan, Transvaal, will spend the months of August, September and October in the United States. He will probably be in New York in September.

E. L. Larison has resigned as superintendent of the Anaconda Copper Mining Co.'s acid department at Anaconda to take a similar position with the Garfield Chemical and Manufacturing Corporation at Garfield, Utah.

Herbert W. Gepp, who has many friends in this country, has been appointed general manager of the Electrolytic Zinc Co. of Australia, Prop., David Meredith succeeding him as general manager of the Amalgamated Zinc Co.

M. M. Duncan, vice president and general manager of the Cleveland-Cliffs Iron Co., has been reappointed a member of the board of control of the Michigan College of Mines by Governor Sleeper. Mr. Duncan has served on the board for several terms.

J. D. Collier, director of L. J. Healing & Co., Ltd., Tokyo, Japan, engineers and contractors, is visiting America on a short business trip and expects to arrive in New York the first week in August. His address is c o W. J. Sparks, Inc., 17 Battery Place, New York.

Orrin M. Sackett, for 25 years tramway superintendent for the Smuggler Union Mining Co., Telluride, Colo., has resigned to take charge of tramway construction at the Sunnyside mine, Silverton, Colo., for the United States Smelting, Refining and Mining Company.

John G. Kirchen, general manager of the Tonopah Extension Mining Co. and allied interests, will remove to Reno, Nev. He will retain his position with the company. Allene Case, until recently with the West Tonopah company, will become general superintendent under Mr. Kirchen.

Dr. A. R. McCallum, of Ottawa, Dr. D. F. Adams and Dr. R. F. Ruttan, both of McGill University, Montreal, members of the Canadian Advisory Council on Scientific and Industrial Research, are visiting the principal cities of western Canada and conferring with the local technical committees, appointed to coöperate with the Advisory Council.

Charles J. Barr, who resigned last year as general superintendent of the Ensley Works of the Tennessee Coal, Iron and Railroad Co. to become general manager of the Algoma Steel Co., Sault Ste. Marie, Ont., will return to the service of the Tennessee company. It is expected that Mr. Barr will have charge of the extensive construction program which, as recently announced, the Steel Corporation will carry out at Fairfield, Alabama.

John D. Ryan, president of the Anaconda Copper Mining Co., has joined the group of prominent industrial executives volunteering to serve the Red Cross during the war without compensation, and has been assigned as director general of military relief. He will be in charge of all of the relief work for the fighting forces, succeeding Col. Jefferson R. Kean, who has been ordered to take command of the 160 United States army ambulance sections in the war theater. Mr. Ryan will devote virtually all of his time to the vast problem of maintaining base hospitals abroad and at the home cantonments and camps, and of keeping at its maximum the personnel and material reserves that back up this service.

Obituary

Charles A. Williams, said to be a mining engineer from South Africa, was lost overboard recently, while en route from England to the United States.

Edward W. Ansted died at Connersville, Ind., June 19, aged 65 years. He had been engaged in manufacturing for many years, and for over 25 years had been president of the Connersville Blower Co. and several other industrial companies.

William C. Scofield died in Cleveland, Ohio, July 6, aged 95 years. After working in that city for a number of years, he acquired control of the old Otis Iron Co., afterward sold to the Republic Iron and Steel Co. Later, he organized the Lake Erie Iron Co., of which he was president for many years.

Charles W. Drysdale, of the Canadian Geological Survey, who was in charge of a Survey party working in British Columbia, was drowned on July 11. In company with his assistant, William J. Gray, of Vancouver, an aviation student, he attempted to cross the Kootenay River near Cross River, on a raft, when they were thrown into the water by the raft upsetting and carried off by the current. The bodies had not been recovered at last account. Mr. Drysdale, who was about 32 years of age, left a wife and three children.

Casimir von Philp died at Ocean City, N. J., July 5, aged 61 years. He was born in Sweden and came to this country when a young man. He was an engineer of unusual ability and originality. For a long time he was chief engineer of the Bethlehem Steel Co. and in recent years was in charge of the machinery department. His inventions included improvements in rolling mills and special features of heavy forging equipment produced at the Bethlehem works. He was a member of the American Society of Mechanical Engineers and of the Engineers' Club, New York.

Edouard Maneuvrier, assistant director general of the Société des Mines et Fonderies de Zinc de la Vieille-Montagne, died on Apr. 16, at Guéthary, France. M. Maneuvrier was a distinguished figure in the mining and metallurgical industry of France and Belgium. A graduate of the Ecole Normale, he early became connected with the Vieille-Montagne, and most of his active career was passed in the high administration of its affairs. He was president of the French Chamber of Metal Mines, a member of the Comité des Houillieres, president of the Société des Houillieres d'Epinac and a member of the Council of the Société Le Nickel.

Frank Firmstone died at Glendon, Penn., June 27, aged 71 years. For many years he was one of the prominent figures among blast furnace operators in the East. He graduated in 1865 from the Polytechnic College of Pennsylvania as a mining engineer. For 21 years he was connected with the Glendon Iron Co., at the death of his father in 1875 becoming general manager. He gave up the business in 1887 and later became associated with the Cranberry Iron and Coal Co., Cranberry, N. C., being president of that company for a number of years and a director in its subsidiary companies until his death. He was a director of the Longdale Iron Co., Longdale, Va., from its organization in 1870 until its dissolution in 1911 and in that period had intimate contact with blast-furnace operations in Virginia. In the eighties and nineties he was an active participant in the meetings and discussions of the American Institute of Mining Engineers. He was a member, also, among other organizations, of the American Society for Testing Materials, the American Society of Civil Engineers, the American Society of Mechanical Engineers and the Engineers' Club of New York.

Societies

Mining and Metallurgical Society, New York Section, will hold its meeting on Wednesday, July 25, instead of July 18, as previously announced. It will take place at the Engineers' Club, 32 W. 40th St., at 8 p.m., preceded by an informal dinner at 6:30 p.m. The change is made in order to bring the section meeting, which is important, on the same date as that of the meeting of the national society.

Arizona State Bureau of Mines will give an intensive course in first aid on Aug. 6, 7 and 8 at the University of Arizona at Tucson. It is open to all men over 18 years of age, and there are no requirements except the ability to understand English. The course is free, and special rates will probably be made at Tucson hotels and rooming houses for those wishing to take it. The work will be under the direction of S. C. Dickinson, safety engineer of the bureau. Further particulars can be obtained from Charles F. Willis, director of the Bureau of Mines at Tucson.

New Patents

Filter-Press. Charles Marshall Saeger, Jr., Palmerton, Penn. (U. S. No. 1,232,611; July 10, 1917.)

Filtration—Art of Filtration. William M. Jewell, Chicago, Ill., assignor to Jewell Engineering Company, Chicago, Ill. (U. S. No. 1,232,805; July 10, 1917.)

Flotation—Method of and Means for Recovering Metalliferous Minerals by Flotation. George Crerar, Spokane, Wash., assignor of sixty one-hundredths to James L. Boyle, Los Angeles, Calif. (U. S. No. 1,232,772; July 10, 1917.)

Lamp—Miner's Carbide-Lamp. Ronchi Lazare, Portage, Penn. (U. S. No. 1,232,572; July 10, 1917.)

Ore-Concentrating Table. Enos A. Wall, Salt Lake City, Utah. (U. S. No. 1,233,149; July 10, 1917.)

Ore-Grinding Mill. Peter A. MacEachern and Nolen O'Daniel, Douglas, Ariz. (U. S. No. 1,233,086; July 10, 1917.)

Rock Drill. Michael Smith, Bisbee, Ariz. (U. S. No. 1,232,111; July 3, 1917.)

Slimes Treatment—Dewatering, Replacing and Thickening Apparatus and Process. George Moore, Joplin, Mo. (U. S. Nos. 1,231,409, 1,231,410; 1,231,411; June 26, 1917.)

Smelting — Improvements Relating to Drying or Roasting Apparatus of the Rotary Chamber Type. Oswald Elsworth, Newcastle-on-Tyne, England. (Brit. No. 101,939.)

Steel—Metallurgical Process for Converting Steel Scrap into Cast Iron. Joseph E. Johnson, Jr., New York, N. Y. (U. S. No. 1,231,269; June 26, 1917.)

Steel Ingots—Improvements in Casting Steel Ingots. W. G. Armstrong Whitworth, Ltd., Newcastle-on-Tyne, England. (Brit. No. 105,617.)

Tilting Furnaces—Improvements in and Relating to Tilting Furnaces. Samuel William Price, London, W. C., England. (Brit. No. 105,381.)

Timbering—Improvements in Miner's Timber Measuring Rods or Gages. Daniel Sandbrook Nicholas, Cardiff, England. (Brit. No. 105,129.)

Zinc—Apparatus for Producing Zinc and Other Similar Metals. Heinrich Speckéter, Griesheim-on-the-Main, Germany. (U. S. No. 1,231,084; June 26, 1917.)

Zinc—Process for the Electrolytic Disposition of Zinc on Metallic Surfaces. Pascal Marino, London, W. C., England. (Brit. No. 105,255.)

Editorial Correspondence

SAN FRANCISCO—July 14

Fifty Years Freedom from labor strikes on the Comstock Lode is unique in the history of mine labor in the United States and probably in the whole of North America. The miners on the Comstock celebrated on July 3 and 4 the 50th anniversary of the organization of the Virginia City Miners Union. The celebration was participated in by the Gold Hill Union and the Silver City Union. The history of these unions is that the Gold Hill miners organized in December, 1866, and the Virginia City organization was formed on July 3 and 4, 1867. Prior to the formation of the unions there had been some demands made by the miners for a minimum wage and certain conditions favorable to the miners. In some of the mines the demands were quickly recognized. In others the men were met by a spirit of complete disregard for their rights either to fair compensation or fair treatement. Ultimately the men won their demand for $4 a day minimum wage underground and 8-hour shifts. Then the organizations of the unions were effected and a satisfactory relation established between the miners and the operators and that relation has never been disturbed nor threatened in the 50 years that have followed. When an outsider goes to the Comstock to work he is asked to join the union; if he refuses he is reported to the superintendent who advises him to comply with the request of the men. If he still refuses to become a member of the union his services are dispensed with instantly. The result of this relation between the unions and mine operators is that the union labor agitator finds no opportunity for the exercise of his gifts of disturbing industry and creating riots. A further result is that the unions have had the time and disposition to protect their members against possible injustice on the part of superintendents and bosses and in turn to protect the superintendents and bosses against possible unfairness on the part of miners. In addition to the establishment of these ideal relations and maintaining them for 50 years the Virginia City union has paid in benefits to men injured in mines and men who are ill or otherwise in need of assistance, a total sum of $400,000 or an average of $8000 a year; and not a dollar expended in labor strikes. While the situation and relation of the miners to the mine owners and operators are unique and happly the conditions underground are by no means ideal. The lower levels are hot, requiring great physical exertion and resulting in much physical exhaustion. At the same time underground miners in the extremely hot levels are incapable of accomplishing as much labor per shift as could be done under more favorable conditions. But there is no complaint on the part of the superintendents. Whatever complaint may result from any condition is easily and promptly settled by the union and the superintendent. It is probable that the organizations of the Comstock miners were the initial labor unions in the United States. At any rate it is not probable any other labor union in the United States can boast of 50 years peaceable relation with employers and expenditure of $400,000 in support and protection of members without paying strike dues. The Silver City union was of later organization as was the Mechanics Union. But both of these organizations have established and maintained the same ideal and unique relations with their employers and maintained also a high wage scale. Further, it is probable that the celebration on the Fourth of July on the Comstock is the only one in the country that was participated in by state, county and fraternal organizations and patriotic demonstrations by the schools. The governor and the lieutenant-governor and their wives were in line; the two ladies occupying positions in the drum corps of the Custer Relief Corps of Carson. The school girls of Virginia City carried the flags of the United States Army and their allies and were guarded by Boy Scouts.

BUTTE—July 16

Strike Situation in Butte has resulted in power company granting all demands of the electricians and other trades giving assurance their grievances will be considered if they return to work. Situation with the miners is serious as majority refuse to return and thousands are leaving the district. Production is almost nil, and even if things are settled soon it will be many months before anything like normal conditions will return.

Annual Reports of the different mining companies of the Butte district have been turned in to the county assessor of Silver Bow County showing the net proceeds of the mines of the district for year ended July 1, 1917. According to these reports the net earnings of all the mines of the county for the past year amounted to $44,282,500 compared with earnings the year previous of $27,656,126 and the year before that of $9,932,880. The gain of $16,626,374 was due entirely to the splendid showing of the Anaconda Copper Mining Co. The latter showed a gain in net earning for the year just ended over the year previous of $21,646,661 or $5,000,000 more than the net gain for entire county. The big loss was that of the Butte and Superior company which on account of the great increase in cost of materials, supplies and labor showed a net gain that was less than the net gain of the year previous by $6,555,324. The smaller companies all showed substantial gains over the year before, but the aggregate gains of all of them amounted to comparatively little by the side of the earnings of the Anaconda company. The latter company had a gain of more than 150% over the year previous. This of course was due to the uniformly high price of copper that prevailed during the year and the large production. During the year a number of companies in the district had a net profit for the first time in their history. This was true of the Butte Copper and Zinc Co. and of some of the very small companies. The Elm Orlu, the East Butte and the North Butte companies all showed a satisfactory increase in net earnings. The Elm Orlu company increased its earnings over those of the year previous by $371,576 or a gain of nearly 80%. The East Butte Mining Co. showed a gain of $187,144 or an increase of about 20% in its earnings. The North Butte Mining Co. showed a gain in the net profits for the year of $821,533 or an increase of between 65 and 70% in the profits over the year before.

DENVER—July 14

Tie-up of Leadville mines arranged to have taken place today was postponed for 7 days, it was announced after a meeting of miners which lasted until 2 o'clock this morning. The Leadville strike situation has been a leading topic in the state for the past two weeks. From day to day, action has been taken to defer the actual walkout of the miners and smeltermen and, at this writing, hopes are entertained that the calamity will be indefinitely postponed. At first, there were rumors that the I. W. W. was involved in this affair but it is now generally agreed that this corrupt organization has not invaded the district. Gov. Gunter, July 7, issued a proclamation appealing to "the patience and patriotism of all those employed in and about the metal mines of the state" and urgently requested "that they continue in their present employment and use every effort to increase production until Congress and the legislature of this state can carry out their plans for controlling the cost of living." The governor has called an extra session of the legislature which should be organized in shape to undertake regular functions within two weeks. Despite his request, however, the executive committee of the Leadville Miners' Union decided the strike become effective Saturday, July 14. It is estimated that the strike will affect 2300 union and non-union men in and around the mines and will seriously jeopardize the future of the district. The situation has become so critical that both state and national aid has been sought to bring about a settlement. Trouble between the union and the operators at Leadville has been existing since May, 1916, when a voluntary increase in wages of 10% forestalled a demand on the part of the miners which probably would have resulted in a situation similar to the one now confronting them. In December, the operators again made a voluntary increase in wages, bringing the scale of pay up to $3.50 per day, the present basis. Early in the present year, the union renewed its appeal to the Industrial Commission, asking for a hearing and amending its demands originally made for an increase of 75c. on the old $3.00 basis to $1.00 on the new $3.50 basis or a demand for $4.50 a day. The Commission heard the demands of the union and the evidence of both employers and employees in Leadville late in May. They decided that the union demands were not justified and refused to recommend an increase in pay.

SALT LAKE CITY—July 11

Itinerary of Mine-Rescue Car No. 1 from July 1 to Oct. 13, 1917, will be as follows: July 1-10, Salt Lake City; July 11-25, Park City; July 26-Aug. 11, Bingham; Aug. 12-18, Milford; Aug. 19-Sept. 1, Eureka; Sept. 2-15, Sandy; Sept. 16-22, Scofield; Sept. 23-29, Castlegate; Sept. 30-Oct. 6, Hiawatha; Oct. 7-13, Sunnyside. The first six are metal-mining camps, the remainder coal. In case of mine disaster the car can be reached indirectly through University of Nevada (headquarters); A. J. Stinson, Nevada state mine inspector, Carson City, Nev.; Henry M. Rives, secretary Nevada Mine Operators Association, Reno, Nev.; P. A. Thatcher, Utah Industrial Accident Commission, State Capitol, Salt Lake City, Utah; A. C. Mackenzie, secretary, Utah Chapter, American Mining Congress, and representative of the Coal and Metal Producers Association of Utah, Boston Building, Salt Lake City, Utah; H. M. Wolflin, California Industrial Accident Commission, Underwood Building, San Francisco, Calif. and Robert I. Kerr, secretary, California Metal Producers Association, Merchants National Bank Building, San Francisco, Calif.

WALLACE, IDAHO—July 11

I. W. W. Menace is still a matter of considerable anxiety throughout the Cœur d'Alene district. The success of the outlaw organization in tying up the lumber industry in adjoining counties to the West and the serious trouble it has stirred up at Butte to the East, the presence of one or two advance emissaries of the organization, the coming of many new men of unknown affiliation attracted by the resumption of work at the Tamarack & Custer, and the distribution of anarchistic bills in certain sections of the district, have caused mining companies and citizens generally to adopt measures to cope with the situation in the event drastic action is deemed necessary The favorable reports of an early settlement of the trouble in Butte, however, and the assurance of the war department that troops will be sent to protect the lumbermen of north Idaho and the farmers of eastern Washington, have had a most reassuring effect, and it is not believed now that the I. W. W. will be able to enlist sufficient following to make serious trouble It is not believed that there are many actual members of the I. W W in the mines here, or those who are in sympathy with its lawless purposes. The success of an attempt to close the mines by a strike would depend upon intimidation and violence, just as has been the case in all other places where the I W W. has achieved temporary success. For this reason the improved situation at Butte and the prospect of military protection are having a strong influence in counteracting the work of the I W W. While it is not an agreeable subject to the management of some of the mining companies, it is a fact nevertheless that the company boarding house and store create and keep alive a feeling of resentment among employees which renders them responsive to the specious propaganda of the I. W W A man with a grievance is often easily induced to become identified with a cause he knows is wrong and which he would spurn, acting upon the assumption that he is justified in that course as a means of retaliation, and thus committing a greater wrong than the one to which he is subjected. The feeling toward the company boarding house was considerably intensified a few months ago when an advance of 25c. per day in wages was immediately followed by an equal advance in the rate of board Outside of this feature, which has nothing to do with [illegible] trouble at this time, there is nothing to justify an attempt to cause a strike

Bunker Hill & Sullivan Co.'s first of three furnaces was blown in at Kellogg, Ida., on July 5. The first molten metal to come from the furnace was cast into small ingots bearing the initials "B. H. S." as souvenirs of the occasion and distributed among the spectators. The first one was taken by Stanley A. Easton, manager of the Bunker Hill & Sullivan company, and the second by Jules Labarthe, of San Francisco, designer of the plant. It is expected that a formal celebration on an elaborate scale will be held in August in commemoration of the completion of the smeltery, after the plant has settled down to steady operation.

JOPLIN, MO.—July 14

Sheet Ground Mines of this district will have to close down in near future unless price of ore goes up or price of supplies come down. At operators' meeting at Webb City, Thursday, some prominent operators declared land owners should cancel all royalty charges for present in the hope that by this relief mine owners would be willing to continue to lose money for a while and not close down and move mills to richer ground. A number of larger mills already have been moved to Oklahoma field, and others will be moved. The Ramage and Curtis, Cosden and Aitken interests, which are among largest in district, are planning doing this. The Ramage No. 6 mill, best in the Joplin camp, will be moved within next two months, cleanup at mine now under way. Charles T. Orr of Webb City and W. B. Shackelford of Carthage, left today for Washington to confer with Edgar Palmer, head of the government zinc committee. Mr. Orr is member of committee, but it is understood is not going in this capacity on this trip. It is presumed conference will have to do with problem of keeping sheet ground mines open in order that full zinc output may be had for government. It is believed that where mills are moved from sheet ground at present it will be long before they are replaced, on account of heavy increase in building costs. An added trouble just now is the difficulty in getting machinery supplies. The vice president of a manufacturing company from St. Louis was in Joplin during the week and advised operators that there is no reason to hope for betterment along this line in the near future. He said some makers of tubular goods have their production sold for as much as 18 months ahead. While the local demand for second-hand machinery is not quite as heavy as it was, it is still much above normal on account of the continued development in the Oklahoma and Waco-Lawton fields.

WASHINGTON—July 9

Cyanide Situation shows improvement due to increases of capacity and betterments in processes. Information being gathered by the Government indicates that an adequate supply of cyanide will be available in the near future. The manufacturers have increased their capacity decidedly and a number of new concerns are getting into the field. Unless there should be a radical improvement in the manufacturing process, which is rumored as a possibility, there will be no material changes in prices. There will be an evening up, it is anticipated, in which the large users of cyanide will be compelled to pay a higher rate, but the price to the small consumer is expected to decrease considerably. With all raw materials higher and with the cost of equipment and labor at a much higher level, there is no probability of pre-war prices being even approximated.

CALUMET, MICH.—July 14

Trouble with I. W. W. Agitators and their following is now seriously feared in the Michigan copper country and residents of the district, principally the men working in the mines, mills and smelteries, are taking measures to protect themselves, their homes and the industries here. During the strike of 1913, when the Western Federation of Miners tied up this camp for 8 months, a Citizens' Alliance was organized for home protection because of murders laid at the doors of imported agitators. This organization is now being revived to get action before the suspected I. W. W. forces become too menacing. During the past week activities of the agitators, who have their headquarters in Kansankoti hall, socialist headquarters in Hancock, have become alarming. A great quantity of socialist and strike literature has been brought into the district lately and is secreted in the hall, detectives claim, and efforts to flood the district with it have been made but were stopped through prompt action of informal vigilance committees. The civilian or Home Guard troop of cavalry at Calumet has twice patrolled the district, once during the day and once at night, to prevent holding of I. W. W. meetings and circulation of the literature. Despite these efforts, however, the organizers have for some time been making a house to house canvass in parts of the district in the interests of the I. W. W. The shortage of labor in the mines has helped the agitators in their work to a considerable extent, many of the men employed elsewhere and brought here by the companies found to be active members of the I. W. W. There are about twenty thousand men employed in the mining industry of Houghton, Keweenaw and Ontonagon counties. As fast as I. W. W. members are "spotted" among the mine crews they are discharged but few, it is declared, have left the district.

TORONTO—July 14

A Deposit of Graphite has been discovered in the neighborhood of St. Remi d'Amherst, Que. It is stated to be similar in grade to Ceylon graphite, regarded as the best quality, and tests of samples submitted to analysis are reported to show a high percentage of graphite. Hitherto the known deposits in Canada have been mainly in the Laurentians and usually of too flaky a character to be commercially available. The present find is considered by engineers sufficiently rich and extensive to warrant development on a considerable scale.

The Mining News

ALASKA

SHIPMENTS OF COPPER ORE, matte, etc., to United States amounted to 12,529 tons containing 7,714,928 lb. copper.

KENNECOTT COPPER PRODUCTION for June, 5,848,000 lb. comparing with 7,208,000 lb. in May and 10,500,000 lb. in June, 1916.

ARIZONA

Cochise County

STRIKE SITUATION in Bisbee has improved. Citizens refuse to permit return of agitators and say they want no more industrial disturbance during period of the war. More than 1000 I. W. W. agitators were deported.

CALUMET & ARIZONA (Bisbee)—Production of fine copper for June was 4,928,000 lb., comparing with 5,688,000 lb. in May.

SHATTUCK ARIZONA (Bisbee)—June production of copper 956,396 lb., lead, 190,393 lb., silver, 11,213 oz.; gold, 146 oz. June, 1916, copper production, 1,166,080 lb.; lead, 61,889 lb., silver, 21,536 oz.; gold, 367 oz. Production six months ended June 30, copper, 8,160,889 lb., lead, 1,652,392 lb.; silver, 109,356 oz.; gold, 1091 oz. Decrease in June, 1917, due to unsettled labor conditions.

Mohave County

MIDDLE GOLCONDA (Kingman)—Silver ore struck on upper level, 600 ft. distant from point where silver vein was struck by lower level. Body of silver ore on upper level is larger but not as rich. Property worked heretofore principally for zinc. C. N. Bell, general manager.

Pinal County

LABOR SITUATION in Ray-Hayden district shows improvement; no disturbances reported. A troop of cavalry dismounted, was expected to reach Ray as a precautionary measure in response to Gov. Campbell's request that troops be sent to every mining camp in the state.

Yavapai County

LABOR SITUATION in Jerome is much improved. Citizens assisted by score of union miners drove I. W. W.'s out of town in box cars over narrow-gage railroad. Do not expect them to return and they have been told it will go hard with them if they do.

JEROME VERDE (Jerome)—Compressor has been burned out and therefore unable to use full force of men.

COPPER LODE (Cherry)—Lane Mill, near Cherry, overhauled to treat ores from Copper Lode mine.

ARIZONA-BINGHAMTON (Stoddard)—New ball mill installed. With other additions, capacity is nearly doubled.

UNITED VERDE (Jerome)—Full force of men at mine and smeltery. Efforts will be made to get July production up to 8,000,000 lb. of copper.

ARIZONA MOLYBDENUM (Wickenburg)—New 50-ton mill in Blue Tanks district, nine miles northwest of Wickenburg, is in operation. L. E. Huber, in charge.

ARIZONA CENTRAL MINING AND PROSPECTING (Skull Valley)—Optioned Bryant and Finch groups of 11 claims in Copper Basin district. Molybdenite found in neighboring Copper Hill group by A. L. Garford.

Yuma County

BEACH REEF COPPER CO. (Wendon)—Began work July, 1916. Straightened 80-ft. inclined shaft, installed 26-ft. headframe, 15-hp. Fairbanks-Morse hoist, 50-hp. F. M. engine, 12 x 12 F. M. compressor, 1 circulating tanks, and one air receiver. Depth of shaft 310 ft., making 1 ft. per day, using two jackhamers. Drifted at 80-ft. depth; 35 ft. west, 45 ft. east; at 170 ft., 45 ft. west and 130 ft. east, vein holds width of 4 ft. in all workings. Company incorporated in Arizona for $250,000.

ARKANSAS

Chambers County

BONANZA (Buffalo)—Putting in small sludge mill over which to run tailings from regular concentrating plant.

LION HILL (Buffalo)—A 100-ton concentrating plant nearing completion. Building commissary and boarding house. Expect to be running by middle of August.

Marion County

LONNIE BOY (Rush)—Third tunnel penetrates good orebody. Two others in ore. Preparing for erection of 100-ton concentrating plant. Operators: Zimmermann and Scholield.

J. C. SHEPHERD (Rush)—Production from Shepherd group jumped from 90 tons zinc carbonate to 120.

GLASS SAND (Guin)—W. C. Ball, G. W. Ball, W. T. Gunning and J. G. Wilbur of Webb City, take lease on glass-sand deposit. Will build $20,000 plant to crush and dry.

Searcy County

DENVER MINING AND MILLING CO. (Yellville)—Foundations in for this new dry-process custom mill.

COPPER (Buffalo)—On Buffalo River, A. F. S. Cooper is installing tram from mine to mill on O'Meara property. Ore, carbonate of zinc.

BIG HURRICANE (Pindall)—Making 90 tons zinc-carbonate concentrates a week. J. C. Shepherd, operator, has installed crane to remove waste from pit.

CALIFORNIA

Amador County

FREMONT (Drytown)—Mine boarding house destroyed by fire, June 24; 40 inmates narrowly escaping death. Building and most of contents wholly destroyed. Second destruction of boarding house by fire in 9 years.

OLD EUREKA (Sutter Creek)—New electric equipment, ordered more than year, arrived and being installed. Shaft below 1600 level has been widened to 2 compartments and retimbering of old workings nearly completed.

PLYMOUTH CONSOLIDATED (Plymouth)—Main shaft is vertical for about 1600 ft. and inclined to 2600-ft. level, is to be sunk 150 ft. further this year. Developments upon lower levels are good, but discovery of orebodies by lateral exploration from old upper levels, has placed in sight sufficient tonnage as to render unnecessary rapid downward development.

Calaveras County

GOLD CLIFF (Angels Camp)—Ray Sonora killed by fall of rock in 1700-ft. level on June 29. About 75 tons of rock fell; necessary to blast to recover body.

MOKELUMNE HILL district active. Hector, Lucas, Maypole and others under development and extraction. Mokelumne Hill mine to run 2 shifts of mill. Buffalo Gravel mine installing electric pump; will sink to bedrock.

GARIBALDI (Mokelumne Hill)—Sold to W. M. Stiver and associates of San Francisco. Operations 25 years ago developed high-grade ore in 95-ft. shaft. Prospecting and development in progress.

Del Norte County

COPPER AND CHROME deposits north of Crescent City under development and operation. Gravlin chrome mine, 25 miles northeast operated by M. A. Delano of Grants Pass, Ore., is producing some platinum. Tysen chrome mine 18 miles north making large shipments of chrome. Lucky Boy copper deposit being examined with view of development. Britten & Wilson developing copper ore.

El Dorado County

CINCINNATI (Placerville)—Installing a 5, 1000-lb. stamp mill, operated by distillate-oil engine. Burr Evans, consulting engineer, reports that 10,000 tons, free-milling, friable ore, assaying about $3.50 gold, blocked out; no rock breaker or concentrator required. Ore to be mined by auger boring, picked and conveyed by gravity through 250-ft. tunnel to mill. Milling cost estimated at 54c. and cost of extraction and tramming at about 26c. per ton. Berkeley and San Francisco capital interested.

EL DORADO DEVELOPMENT CO. (Placerville)—Test run to be made on 20 tons gold quartz from Teddy Bear and Hot Spur claims in Grant Busick's 5-stamp mill. J. W. Cover, in charge.

BALD MOUNTAIN CHROME DEPOSIT produced over 250 tons high-grade ore. Deposit 23 miles northeast of Placerville. William Vaughn of Georgetown made recent shipment of 2½ tons.

Placer County

CHROME ORE shipments continue from the Iowa Hill and the Newcastle districts. Shipments from Iowa Hill are hauled to Colfax for direct rail shipment to Eastern points. Colfax is also the main line shipping point for Nevada County chrome ores, which are initially shipped over the Nevada County narrow-gage railway. Newcastle ore is hauled by motor trucks to Newcastle. Surface improvements are still in progress at the Newcastle mine; all ore running over 36% is shipped to the Eastern mills; all under 36% is crushed and concentrated for shipment.

Sierra County

ORIENTAL (Alleghany)—This former bonanza producer, on serpentine belt, to be reöpened by Croesus Gold Mining Co., owners, in conjunction with operations at the Croesus. D. F. Sheahan, of Salt Lake City, Utah, has been placed in charge of both properties, vice W. B. Pearson, resigned.

COLORADO

Boulder County

LULA B (Ward)—Being unwatered.

NATIONAL TUNGSTEN MILLING CO. (Ward)—New mill will be completed soon.

SNOWBOUND (Ward)—Shaft house and hoisting plant at Oronogo shaft being moved to property east of Gold Hill.

Clear Creek County

JACKSON MILL (Idaho Springs)—Plant sold recently to Argo Reduction & Ore Purchasing Co. Ball mill and flotation unit similar to one in operation at Argo mill will be installed. Plant will continue to run as custom mill under management of J. A. Pearce, superintendent of Argo mill.

Gilpin County

TWO FORTY MINE (Central City)—Will be unwatered at once. Milling plant will resume treating ore from Frontenac mine.

PHILADELPHIA (Apex)—Fire completely detroyed shaft house and machinery on night of July 4; timbers at shaft collar also burned, causing shaft to cave badly. Fire started by explosion of dynamite; workman capping fuses inadvertently touched one to steam pipe causing it to explode and thereby detonating some powder near-by. Man blown out of building and severely burned, but will recover. Shaft house will be rebuilt and new machinery installed.

Hinsdale County

GOLDEN FLEECE (Lake City)—Worked by Colorado-Utah Operating Co Milling plant being remodeled and capacity increased to 100 tons daily; ball mill and flotation process will be installed. Mine development work under way.

Lake County

STRIKE SITUATION at Leadville still smoulders. Executive board of local miners' union, authorized to call strike, has not yet done so. Miners' demands are for wage of $4.50 and recognition of union. Union miners in district do not constitute over one-third of total. Mine owners declare no concessions will be made as profits do not permit higher wages. About 90 to 95% of miners returned to work after Fourth of July celebration.

San Juan County

CRATER (Animas Forks)—Active development started under direction of H. E. Kingsley.

BIG 5 (Ward)—Ball mill being installed and improvements made to increase capacity of mill.

EMPIRE STATE (Silverton)—Being developed by Fred Kunz and William Akers. Payable ore opened and a trial shipment will be made in near future.

NORTH STAR MILL (Silverton)—Operations resumed after temporary shutdown on account of railroad-bridge washout. Mill treating ore from Colorado-Detroit mine operated by S. D. & C. Co.

BEN BUTLER (Mineral Point)—Being reopened under management of Frank M. Jackson, who recently organized a company to undertake active development. Preliminary work now under way.

NEBRASKA (Silverton) — Considerable development work is being done on this property by Neal & O'Driscoll. Nebraska tunnel has been advanced 500 ft. Promising lead-silver ore opened. Work will soon be resumed in the Clara M. tunnel.

BULLION KING (Red Mountain)—Secured under lease by Baptiste Matties and associates. Active development work will be resumed. At Bullion King vein opened by about 2000 ft. of drifts, raises and winzes. Several pockets of payable ore containing silver, lead and zinc have been opened.

IOWA-TIGER (Silverton) — Tramway was recently damaged by fire, and operations will be delayed about two weeks. Terminal tower on the cliff near mine was set on fire, presumably by friction of cable against wood following an accident which caused cable to leave the rollers.

San Miguel County

CARRIBEAU MILL (Ophir)—Flotation process being installed.

BLACK BEAR (Telluride)—Daily production, 150 tons mixed sulphide ore; being treated at mill of Smuggler-Union.

JUNE CONCENTRATE SHIPMENTS from Telluride: Smuggler-Union and Black Bear, 58 cars; Tomboy, 51 cars; Liberty Bell, 12 cars; Ballard lease, 1 car; Inama & Perino Leasing Co., 2 cars; total, 124 cars.

Teller County

EXCELSIOR (Cripple Creek)—Shaft now 300 ft. deep will be sunk to 600-ft. and levels driven at 500 and 600 ft. to connect with Golden Cycle workings.

ROOSEVELT TUNNEL (Cripple Creek) —June advance, 153 ft., with one machine shift per day. Water flow about 5000 gal per min., lowest since cutting C. K. & N watercourse.

CRESSON (Cripple Creek)—Oreshoot opened in new vein on 14 level, drifted on for 40 ft., shows width of 4 to 5 ft. of ore, with core a few inches wide of rich ore. Working to open this shoot on 13 and 15 levels.

GOLD DOLLAR (Cripple Creek)—Shaft house, ore bins, head frame and powder magazine destroyed by fire on afternoon of July 7. All men escaped from workings. Ton of powder in magazine burned without exploding. Catherine Gold Mining Co., working property under lease, had recently installed $15,000 plant. Lightning caused fire.

IDAHO

Shoshone County

TAMARACK & CUSTER (Wallace)—Resumed operations after shut down since middle of last March. Employs from 250 to 300 men. Mill running full time, 500 tons capacity. First ore shipments to Northport, but report persists that product will be diverted to Bunker Hill smeltery on account of inability of Northport to handle it.

HYPOTHEEK (Wallace)—Management announce closed contract with diamond drill company to prospect ground for two parallel veins north and south of old vein; also ground below 1200 level to locate ore shoot. Mill of 200 tons capacity, running two shifts.

BIG CREEK (Wallace)—Located on Big Creek, six miles from Wallace, has shoot of gray copper ore in upper tunnel 18 in. wide with high silver and 8% copper. Leasers shipped 17 carloads during last two years, though not as rich as present shoot. Company has taken over ground and has carload ready for shipment. Crosscut 2500 ft. long being run to gain 560 ft additional depth. About 600 ft. to go and expect to reach vein by Oct. 1.

HUNTER (Mullan)—Large ore shoot recently struck on level of main working tunnel in ground supposed to have been worked out. Twelve or 14 ft. of lead ore, 3 ft. of which is shipping grade. Strike adds many years to life of mine. Sinking from 1200 level to reach ore shoot located by diamond drill.

MICHIGAN

Iron

HOLMES (Ishpeming)—Shipping steadily. A few drifts are in ore. Output will be gradually increased. Both soft and hard hematites being mined.

VIRGIL (Iron River)—Diamond drilling for new ore bodies. Results to date not encouraging. If better showing is not made operations will be suspended.

ZIMMERMAN (Iron River)—Sold by Spring Valley Mining Co. to Miami Metals Co., recently organized in Chicago. Mine in operation since 1908. Non-bessemer ores mined.

OLIVER IRON MINING CO. (Ironwood) —New shaft at Aurora mine completed in April. Will start hoisting as soon as electrical machinery is installed. New Pabst shaft will be commenced when equipment arrives.

PLYMOUTH (Wakefield)—Will be heavy shipper this year. Took out over 300,000 tons last year, the first year of shipping. Over 2,000,000 cu.yd. of overburden, averaging 75 ft. in thickness, has been stripped. Will be one of the largest pit mines in Michigan. Adjoins Wakefield pit mine.

CLEVELAND-CLIFFS (Ishpeming) — New hydro-electric plant to be built on Dead River. Will develop about 10,000 hp. Company now has small plant on same river and another on Carp River. When plant is completed, company will be able to supply about 20,000 hp. to its mines and furnace at Marquette. Sufficient to allow all machinery to be electrified. Work already started on the new plant. New hospital to be erected for miners of the Ishpeming district. Oliver company will assist with upkeep.

MINNESOTA

Mesabi Range

SPRUCE-ADAMS (Eveleth)—About 800,000 cu.yd. of stripping removed to date. Contractors asking 30c. a cu.yd. Former price was about 20c.

PEARSON (Nashwauk)—Washing plant about completed. Most of machinery is on the ground. Mine is ready to supply ore when concentrator is finished.

COLERAINE—Big washing plant at Trout Lake being operated to capacity on ore from Holman and Canisteo pits. Wash ores in great demand this year by furnaces.

MAJORCA (Grand Rapids)—New pit mine on western Mesabi. Tract of 160 acres. Stripping under way. Shipments of ore to start about Aug. 1. Ore proved up by diamond drills.

OLIVER IRON MINING CO. (Virginia) —Permission granted to mining company to erect concrete trestle, to cost $100,000, on Second Ave., near Gilbert Rd. Trestle for purpose of affording traffic outlet when Mesaba Mountain mine pits are extended.

GREAT NORTHERN ORE PROPERTIES leased by M. A. Hanna Co., Cleveland, Ohio, include old Steel Corp. [illegible]; Harold, Leonard, Mississippi, North Uno, South Uno, and Thorne; other properties are Fay. Wabigon, Dale and Feigh. Tonnage involved between 40,000,000 and 50,000,000. New company will be Hanna Ore Mining Co. J D Ireland, formerly in charge of Hanna mines at Duluth, will be general manager, and E E Hunter of Arthur Iron Mining Co., the Hill mining organization, assistant general manager Reported that period of lease is 10 years on royalty basis Also three bulk freighters, one already launched and two under construction taken over Jones & Laughlin and Inland Steel recently leased on this property and Tod Stambaugh Co., Butler Bros. and others negotiated previous leases. Hill interests said to retain only 15% original holdings.

MISSOURI

Joplin District

C. H. & M. (Duenweg)—Operating new 150-ton mill on Malloy lease, just south of town. Heavy water and peculiar formation caused loss of one of two shafts recently, but another is being sunk.

RED BIRD (Webb City)—Clean-up now under way with probability that mill will be moved to one of Curtis, Cosden and Aitken leases near Century, Okla.

McDONALD BROS. (Webb City)—Sinking second shaft at new mine on Connor land to 200 ft. First shaft only 160 ft., but drifting showed this to be above main ore run.

WACO (Joplin) — Completed shaft on lease at Waco, Mo., and begun drifting. Will start erection of mill soon. Also drilling on several other tracts; reported to have discovered rich run of sheet ground ore at 300 ft. P. B. Butler, Joplin, manager.

LUCKY ELEVEN (Carthage)—Sold to Austin Brothers and associates during past week for $30,000. A. Barlow and associates of Carthage were owners. Mine developed in recent months and planning new mill.

MIAMI ZINC SYNDICATE (Baxter, Kan.) — Purchased two gasoline-driven drills to solve problem of drill scarcity. Has seven other drills working on leases west of Baxter, and good strikes are rumored. Nothing given out by company, which presumably is subsidiary of Butte & Superior.

F C. WALLOWER (Joplin)—Moving Number 2 Cumberland mill from location south of Carterville to 40-acre lease just west of Tar River, Okla. Will be ready for operations in fortnight. Later this year Number 2 Cumberland mill now located at Prosperity likely to be moved to same lease.

O. W SPARKS (Galena) — Is making more than car of ore weekly with only three hand jigs from new mine on East Fifteenth St., in Joplin. Product exceptionally high grade, averaging over 64% metallic zinc for 4 cars.

JOPLIN-COLUMBUS (Joplin)—Resumed operations at mine on Phoebus land north of Galena after protracted shut-down. Operating at 130 ft. with good output. Is one of older mines of district.

MONTANA

Lewis and Clark County

HELENA MINE (Helena)—Drifting and stoping on 300 level Silver, lead and iron. Last car load went $42 55 gross.

VALLEY FORGE (Rimini)—Thirty car loads sent to New York-Montana works in June Eight car loads of concentrate.

LOOBY (Helena)—Drifting east, west and north at 150 level Silver-lead ore from north drift

PEERLESS JENNIE (Rimini)—Property under bond and lease to Chicago people Begin work August first Shaft 350 ft deep Location five miles above Rimini

ROCK ROSE (Helena)—Shaft 250 ft deep In hornstone, vertical Good ore in 100 and 200 drifts Drifts to be run at bottom of 300-ft shaft

ST LOUIS CO (Marysville)—Twenty-five stamp mill reducing 100 tons a day of gold ore, by cyanide treatment Electric power Ore from Maskeline tunnel of old Drum Lummon mine

STANTON MINE (Rimini)—Lead and zinc ore to New York-Montana Testing and Engineering Works, Helena Mineral separated at works and concentrates sent to smeltery

BARNES-KING (Butte)—Development work on 600-ft level of Shannon mine reported to have struck good ore in drift for 150 ft Width of vein not known Ore from Shannon and Piegan-Gloster properties being treated at Lone mill near Gloster

Silver Bow County

EAST BUTTE (Butte)—June output of copper was 1,519,230 lb; silver, 14,621 oz., comparing with May copper production of [illegible] lb Repairs to mine and smeltery being made during present shutdown due to strike conditions.

BUTTE DETROIT (Butte) — Mill will handle 200 to 400 tons manganese ore per day before Aug 1 Changes being made in crushers and jigs by large force of carpenters and other men during last two weeks. Machinists, electricians and blacksmiths now at work. Reported that electricians' strike, which has been on for last month, will soon be ended and then rest of work will be rushed. Mill will handle Davis-Daly and other companies' manganese ores.

NEVADA

Esmeralda County

CUPRITE SULPHUR CORPORATION (Goldfield)—Purchased sulphur property at Cuprite. Operating mine and shipping ore to Pacific Coast, and Pennsylvania Expect to increase output to 1000 tons per week. Retorting plant to be installed. J. E. Bowman of Greenwich, Conn., president; F. S. Taggart, vice president New York office, 50 East 42 Street

Nye County

RED TOP (Manhattan)—Pump station being cut, and foundations in place for installation of compressor. Cross cut to east continued and 25 ft. from shaft change in dip of formation encountered; drift face shows considerable increase in richness of ore.

MANHATTAN-MORNING GLORY (Manhattan)—Operations reported during week continue to develop ore in both working shafts. No 3 shaft from which drifts are being extended shows ore in west drift, carrying gold contents. In addition to low-grade ore in No 1 main working shaft, new orebody is being developed near south boundary of claim.

UNION AMALGAMATED (Manhattan)—East drift encountered lime shale at 390-ft. point, and for 25 ft. ground has been timbered Face of the drift is now in silicified shale and should not give any further trouble from caving. No. 2 crosscut west is following break to pick up ore cut in No. 2 raise. No. 6 crosscut is showing ore in face indicating proximity of ore shoot. West drift is in a low-grade quartz.

TONOPAH ORE PRODUCTION, for week ended July 7 was 6923 tons, valued at $121,151, comparing with 9283 tons for the previous week, falling off being due to holidays on July 3 and 4. Producers were: Tonopah Belmont, 1939 tons; Tonopah Mining, 1450 tons; Tonopah Extension, 1700 tons; Jim Butler, 700 tons; West End, 698 tons; Rescue, 251 tons; Midway, 132 tons.

Storey County

COMSTOCK MINES reports for week generally showed repairs in progress and advancing drifts. Third and Fourth of July work generally suspended owing to the celebration of 50th anniversary of organization of Virginia City Miners Union, owing to long continued satisfactory relations between unions and mine superintendents.

CON VIRGINIA (Virginia)—Extracted 84 cars of ore from 2700 level; 77 cars of this ore assayed $12 08 per ton; 17 cars from winze assayed $21 21 per ton; 65 cars were sent to Mexican mill and 19 cars to C & C ore bins

White Pine County

FORT SCHELLBOURNE MINING & MILLING (Schellbourne)—Operating McMahon mines which produced $200,000 in silver and gold in early 60's Now running tunnel to intersect quartz vein in depth, which at surface and in upper workings is about 20 ft wide and averages $1 gold and 12 oz. silver per ton If intersection occurs, expect to develop about 2 million tons.

OREGON

Josephine County

QUEEN OF BRONZE (Takilma)—This copper mine has 80 men employed and increasing force John Hampshire, manager

THE BOSWELL (Holland)—This gold mine installed gas engine to be used in operating recently installed Huntington mill Boswell and Son, managers

WALDO (Takilma)—This copper mine leased for past few months by DeWitt Van-Ostrand of Phillips, Wis and A H Gunnell of Grants Pass, Ore Repairing concentrator and putting new track in tunnel No 4

UTAH

Juab County

TINTIC PRODUCTION for June was 1026 cars, and production for first six months, 6363 cars, or about 250,000 tons

Salt Lake County

OHIO COPPER CO (Bingham Canyon)—Company's statement says May production of copper was about 600,000 lb due partially to flotation methods Alfred Frank, general manager and F E Turner, mine superintendent estimate blocked-out ore 520,000 tons of 1%; 100,000 tons better than 0.81%, other deposits, 5,000,000 tons better than 0.75%; 10,000,000 better than 0.75% and large part over 1%. About 3,000,000 tons tailings running 10 lb. to ton remain from past operations

CANADA

British Columbia

GRANITE-POORMAN MINE (Nelson)—New compressor plant, capacity 1500 cu.ft. of air and 300-hp. electric motor being installed. Will give power enough to treble output. Also 4 new concentrating tables put in giving 100 tons per day concentrating capacity. Amalgamation and stamp end will be improved later. Now employing 35 men. A. G. Larson of Spokane, consulting engineer; F. H. Skeels, superintendent.

Ontario

MILLER LAKE-O'BRIEN (Gowganda)—During June shipped 105,000 lb. of high-grade ore.

ALEXO (Porquis Junction)—Nickel ore shipments during June amounted to 846,000 pounds.

CROESUS (Monroe Township)—Water seam encountered and lower levels reported to be flooded. Additional pumping equipment installed The 50-ton mill is running at nearly full capacity.

TRETHEWEY (Cobalt)—Has taken over group known as Quesnel-Demarse claims in Cane Township, Montreal River district, comprising about 120 acres Employing 18 men on surface work preparatory to exploration.

McINTYRE (Porcupine) — Production during June was $141,208, from treatment of 14,455 tons of ore averaging $10.24 per ton. Expect that station will be cut at 1000-ft. level in Jupiter shaft within two months Drift at 100-ft. level of McIntyre entered Jupiter property where vein widened to 65 ft.

KIRKLAND LAKE (Kirkland Lake)—Ball mill with capacity of 150 tons per day will be installed and concrete foundations laid this autumn. Estimated that 50,000 tons of ore on dump, averaging about $12, which with ore blocked out will keep mill operating to capacity for about 11 months.

GREEN-MEEHAN (Cobalt)—Shaft dewatered to 200-ft level; sampling being done. Several hundred tons of ore on dump will be treated at customs mill

ADANAC (Cobalt)—A 2-in. vein of good ore reported at 310-ft level has widened to 8 in.

NIPPISSING—During June estimated value of ore mined was $269,469; shipped bullion and residue from Nipissing and customs ore estimated at $475,320. Development and exploration work resulted in discovery of number of small veins, one of which might produce small amount of high-grade ore

TEMISKAMING (Cobalt) — Production during first six months of year amounted to 389,317 oz of silver Bullion in storage, due from smelters and ore bagged at mine aggregated 320,667 oz. and cash in hand was $343,135 Report states that development work discovered nothing since new big vein was found in 1914 Little ore remains in place, and about 8100 tons is mined and ready for hoisting, including 20 tons of high grade

Yukon Territory

YUKON GOLD (Dawson)—Strike of steam-point and hydraulic men begun in June Did not affect dredge crews at start About 200 out of 400 men went out

COSTA RICA

COSTA RICA MANGANESE AND MINING CO (Playnreal)—Landed second 1000-ton shipment of ore (54% Mn, 7% SiO_2) June 16 Expect to ship at rate of 2000 tons per month Capacity will be increased to 5000 tons per month when pier and harbor construction work completed Shipping to American Manganese Manufacturing Co's furnaces at Dunbar Pennsylvania

CUBA

HOLGUIN EXPLORATION CO (Holguin)—New decantation cyanide plant put in operation May 15, a mill using amalgamation and flotation equipment will be ready soon; C A Randall in charge New York office, 25 Madison Ave

CHILE

BRADEN (Sewell)—Output of copper for June, 5,002,000 lb, comparing with 6,760,000 lb in May and 2,258,000 in June, 1916

SOUTH AFRICA

TRANSVAAL GOLD OUTPUT in May was 779,385 oz, an increase of 36,607 oz over April For the five months ended May 31 the total was 80,004,311 in 1915, and 78,828,353 in 1916, a decrease of 1,175,958 Number of negro laborers in May was, gold mines, 180,168; coal mines, 11,432, diamond mines, 5805; total, 197,405, a decrease of 6319 from April

The Market Report

Metal Markets

SILVER AND STERLING EXCHANGE

July	Sterling Exchange	Silver New York, Cents	Silver London, Pence	July	Sterling, Exchange	Silver New York, Cents	Silver London, Pence
12	4 7563	80¼	40¾	16	4 7563	81¼	41¼
13	4 7575	80¾	41	17	4 7550	80⅝	40 15/16
14	4.7560	79⅜	40¼	18	4.7550	80¼	40¾

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

DAILY PRICES OF METALS IN NEW YORK

July	Copper Electrolytic	Tin Spot.	Lead N. Y.	Lead St. L.	Zinc St. L.
12	27@28	62¾	10¾@11	10¾@10.90	8⅜@8⅝
13	27@28	62¼	10½@11	10.50@10.90	8⅜@8⅝
14	26½@27½	62¼	10½@11	10.50@10.90	8¼@8½
16	25@26	62	10¼@11	10¼@10¾	8¼@8½
17	24½@25½	62¼	10⅛@11	10¼@10¾	8⅛@8⅜
18	24@25	62½	10@11	10¼@10¾	8@8¼

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

The quotations for electrolytic copper are for cakes; ingots and wirebars. Electrolytic copper is commonly sold on "regular terms" (r.t.), including freight to the buyer's works and is subject to a discount for cash. The difference between the price delivered and the New York cash equivalent is at present about 0.25c. on domestic business. The price of electrolytic cathodes is 0.05 to 0.10c. below that of electrolytic. Quotations for spelter are for ordinary Prime Western brands. We quote New York price at 17c. per 100 lb. above St. Louis.

Some current freight rates on metals per 100 lb. are: St. Louis-New York 17c.; St. Louis-Chicago, 6.3c.; St. Louis-Pittsburgh, 13.1 cents.

LONDON

July	Copper Standard Spot	Copper Standard 3 Mos.	Copper Electrolytic	Tin Spot	Tin 3 Mos.	Lead Spot	Zinc Spot
12	130	129½	142	244	239	30½	54
13	130	129½	142	237	234¾	30½	54
14	...	.	.	.	.	..	...
16	130	129½	142	237½	234¾	30½	54
17	130	129½	142	239	236¼	30½	54
18	130	129½	142	239½	236½	30½	54

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2,240 lb. For convenience in comparison of London prices, in pounds sterling per 2,240 lb., with American prices in cents per pound the following approximate ratios are given, reckoning exchange at 4.80. £15 = 3.21c.; £20 = 4.29c.; £30 = 6.43c.; £40 = 8.57c.; £60 = 12.85c. Variations, £1 = 0.21⅜c.

NEW YORK—July 18, 1917

All of the markets exhibited decided weakness right through the week. This was due to the disinclination of buyers to take anything, their attitude being influenced over uncertainties as to the policy in Washington, and, moreover, by the fact that prices had previously become so high as to be strangling consumption. The latter factor in the present situation has probably been underestimated.

Copper, Tin, Lead and Zinc

Copper—Copper was offered down from day to day. In the latter part of the last calendar week, there were some important foreign inquiries, for which there was rather sharp competition among the producers, which resulted in the consummation of transactions of considerable magnitude. After that, there was stagnation in buying, the immediate foreign demand having been satisfied and domestic consumers not being desirous of taking anything. On the other hand, there were agencies who were strongly desirous of selling and the market was offered down sharply, with real pressure.

Copper Sheets are quoted at 39@40c. per lb. for hot rolled, and 1c. higher for cold rolled. Wire is quoted at 35c. per lb., f.o.b. mill.

Tin—The dullness continued, transactions being relatively few and of no particular moment. There was no material change in the price for Straits tin. Banka tin became relatively weaker, the quotation for that grade at the close being 59@60c., showing a discount of about 3c. per lb. from the price for Straits tin against about 2c. in the previous week.

Lead—Transactions were only moderate in volume. The A. S. & R. Co., maintained its price at 11c., New York, and sold at the price, while other interests—not so much producers as agencies and brokers—sold at lower prices. However, it is probable that certain producers would meet those prices if they could get business. The situation was just the opposite from what it was a little while ago, when outside interests were realizing prices higher than that of the A. S. & R. Co. The tone of the market was distinctly weak, there being offers that were apparently in part of lead held speculatively and in part of lead offered by manufacturers for resale through brokers. At the close, lead was offered at 10c., New York.

The weakness in lead was the more noteworthy in view of the bad situation at the mines in southeastern Missouri. The native miners in that district refuse to permit foreigners to work, and that has brought mining practically to a standstill. The smelteries are still running on reserve stocks of ore, but they will be obliged to shut down within a few days unless the situation in the mines is promptly changed for the better.

Zinc—This metal was under steady pressure right from the beginning of the week. On the decline a fair tonnage was placed, but nothing to brag about. On the 18th, a round lot was sold at 8¼c. in the morning, and immediately afterward the metal was offered at 8.15c., with 8.05c. the best bid. Toward the close, offers as low as 8c. were reported.

The situation in zinc is simple enough. At present production is in excess of the demand and the market is being sold down to check production rather than to let stocks accumulate further.

Zinc Sheets—Price of zinc sheets has not been changed. Market is still at $19 per 100 lb. f.o.b. Peru, Ill., less 8% discount.

Other Metals

Aluminum—The aluminum market continues extremely quiet. Quotations are somewhat lower, quick delivery being offered at 55@57c. per lb. for No. 1 ingots at New York; futures slightly lower.

Antimony—This market is in about the same situation as the major metals. Demand is light and on the other hand there are sellers who seem to be anxious to realize on holdings. Consequently, there was a further decline in price. We quote spot at 15@16c., and August shipments from China at 14@14½c., c.i.f., in bond.

Bismuth—Quoted at $3.50 per lb.

Cadmium—Quoted at $1.40@1.75 per lb.

Cobalt—Quoted at $1.70 per lb.

Magnesium—Ingot is quoted at $2.50.

Nickel—Steady at 50@55c. per lb., with premium of 5c. per lb. for electrolytic.

Quicksilver—The market is somewhat stronger than reported last week. The stocks in New York are light, and quotations are made here at $105@110. San Francisco reports by telegraph $100, firm.

Gold, Silver and Platinum

Gold—Coin to the amount of $2,500,000 has been withdrawn from the New York subtreasury for shipment to Spain. Telegraphic transfer of $2,638,000 to San Francisco was made by New York subtreasury, representing an equal gold export to Japan.

Silver—The silver market experienced some violent fluctuations in London the past week, selling at 41 pence on the 13th, at 40¼ on the 14th and at 41¼ on the 16th, due to special orders to buy or sell coming on a narrow market. Shipments from New York to London continue very small as the Oriental banks are diverting shipments to China and India for shipment via Frisco and the Pacific and on account of the difference in cost for freight and insurance via the Pacific are able to pay a higher price than London bids.

Total exports from San Francisco for month of June amounted to 6,812,000 oz. silver. Silver market closes steady at 40¾ pence bid in London.

On July 16, silver sold at 41¼d. in London, the highest figure since 1892. The price rose in spite of the Indian Government's prohibition of silver imports except under license. This prohibition is expected to divert to the London market silver otherwise exported from San Francisco to India.

Mexican dollars at New York: July 11, 62⅞c.; 12, 63c.; 13, 63⅜c.; 14, 63⅜c.; 16, 63⅞c.; 17, 63¼c.

Platinum—Quoted at $102@105, market quiet.

Palladium—Unchanged at $110@115.

Zinc and Lead Ore Markets

Platteville, Wis., July 14—Blende, basis 60% Zn, $75 for premium ore down to $70 for medium grade. Lead ore, basis 80% lead, $120 per ton. Buyers were inactive and a number of operators were unable to get bids on zinc ore. Shipments reported for the week are 2681 tons of zinc ore, 228 tons of lead ore, and 934 tons of sulphur ore. For the year to date the figures are: 75,288 tons of zinc ore, 3526 tons of lead ore and 15,783 tons of sulphur ore. Shipped during the week to separating plants, 3479 tons of zinc ore.

Joplin, Mo., July 14—Blende per ton, high $78; basis 60% Zn, premium ore $75; medium to low, $70@65; calamine per ton, basis 40% Zn, $42@40; average selling price, all grades of zinc, $71.20 per ton.

Lead, high $125.35; basis 80% Pb, $120@115; average selling price all grades of lead, $121.05 per ton.

Shipments the week: Blende, 8809 tons; calamine, 346 tons; lead, 1031 tons. Value, all ores the week, $767,090.

Twenty-nine mills in the sheet ground area of Webb City are preparing to close down or are already out of commission. In several cases, rather than throw out of employment miners owning their homes, arrangements have been made to lease the mines to them. Several mills have been removed to Oklahoma and others are to be removed.

Midweek it seemed almost a certainty prices would be lowered on blende, but a demand for premium ore by a smelting company not usually taking this grade of ore, held it unchanged. Lead prices sagged $5 at the week end.

Other Ores

Chrome Ore—Business has been done for delivery during the remainder of the year on the following scale of prices:

30@35%— 80c. a unit, net ton, California
35@40%— 85c. a " " " "
40@44%— 90c. a " " " "
44@47%—$1.00 a " " " "

While 50% material is said to have brought in excess of $1 a unit. The market remains firm at the above figures.

Iron Ore—Prices, delivered lower Lake ports are for old-range bessemer, $5.95; old-range nonbessemer, $5.20; Mesabi bessemer, $5.70 and Mesabi nonbessemer, $5.05.

Manganese Ore—This is in steady demand and prices have risen further. Sellers are now asking $1.20 per unit for high grade metallurgical ore. Chemical ore is quoted at 5@7c. per lb., according to grade.

Magnesium Ore—Burnt magnesite in bulk is quoted at $40 per 2000 lb., f.o.b. California.

Molybdenum Ore — Small transactions, mainly of foreign ore, at $2.10@2.25 per lb. of molybdenum sulphide in concentrates assaying 90%.

Pyrites—Spanish lump quoted at 15½c. per unit on basis of 10s. ocean freight, buyer to pay war risk, excess freight and any duty. Ocean freights are 42s. 6d. from Huelva to southern ports.

Tungsten Ore—Demand is still strong and supplies short. Wolframite is quoted at $22@23, and scheelite at $26.

Iron Trade Review

NEW YORK—July 18

Announcement of the result of the conference at Washington last week, says "Iron Age," between Government heads and the committee of steel manufacturers gave an abrupt check to business in iron and steel on any large scale. The vague ideas the trade has entertained for some weeks of possible readjustments that would have far reaching effects were sharpened into real prospects by the President's message to business calling for the same prices to the public as those fixed by the Government.

Steel producers have expected to accept special prices from the Government and to have its requirements take up an increasing share of their output; but Chairman Gary in his address to the Iron and Steel Institute late in May said that they also expected that as costs of production were advancing the Government would be willing to increase its purchasing prices accordingly.

PITTSBURGH—July 17

The iron and steel markets have come to practically a complete standstill. The cause commonly assigned is the expectation that there will be regulation of prices by the Government, directly or indirectly, which, of course, would be at much lower levels than lately obtaining. There is, however, nothing approaching definite information as to what is likely to be done, there being simply the statement of the Secretary of War, last Thursday, that steel for the Government would be priced at a level insuring reasonable profits to the steel makers, with allowance for the need of the industry to expand, and the plea of the President, as to materials in general, that there should be one price to the private buyer and to the Government. This is hardly tangible enough to stop business and there is room for assuming that one cause of the market reaching its present standstill is that buyers find they cannot afford to pay present market prices. The steel market always becomes quiet when prices stop advancing, for price advances are the chief stimulus to activity. The ordinary consumer can hardly afford to pay present prices, seeing that they are about double the prices being paid on deliveries now being made, against old contracts. The market for finished wares has not been adjusted to a cost of material so much higher.

Pig Iron—Apart from some small sales of prompt iron at former prices, and rumors of cut prices on larger tonnages, wholly unconfirmed, there is nothing new, the pig iron market simply marking time. We continue to quote: Bessemer, $56@57.50; basic, $54@55; foundry and malleable, $63@56, f.o.b. valley furnaces, 95c. higher delivered Pittsburgh.

Steel—There have been no transactions of the least moment in billets or sheet bars within the past fortnight and there is no prospect of business being done. Former quotations may be repeated, but they have become practically nominal. Billets, $95@100; sheet bars, $105@110.

Ferroalloys

Ferromanganese—The market is easier, offerings being light but demand still lighter. All the statistics and computations thus far have indicated that up to date supplies have been ample, in imports of ore or alloy, provided there has been any economy at all in the consumption, and some authorities estimate that the average consumption, per ton of steel made, has been curtailed one-third. With ferromanganese selling at ten times its price before the war the strength can be attributed only to a prospective shortage and buyers are becoming dubious as to that. We quote spot at $400@450, second half at $425@450 and first half at $375 or a shade less.

Ferrosilicon—The 50% material is variable and sales have been made at prices varying from $225 to $300 per ton at furnace, depending on quality and delivery. Bessemer ferrosilicon is unchanged at $90 for 10% up to $135 for 16% material.

Spiegeleisen—Quoted at $80@85 at furnace.

STOCK QUOTATIONS

N. Y. EXCH.†	July 17
Alaska Gold M.	5
Alaska Juneau	4
Am.Sm.& Ref.,com.	103
Am. Sm. & Ref., pf	112
Am. Sm. Sec., pf., A	98
Am. Sm. Sec., pf B	92
Am. Zinc	23
Am. Zinc, pf	61
Anaconda	78
Batopilas Min	1
Bethlehem Steel.	129
Bethlehem Steel, pf	115
Butte & Superior.	36
Cerro de Pasco.	34
Chile Cop	20
Chino	52
Colo.Fuel & Iron	48
Crucible Steel	81
Dome Mines.	11
Federal M. & S	‡20
Federal M. & S., pf	40
Great Nor., ore ctf.	33
Greene Cananea	41
Gulf States Steel	117
Homestake	100
Inspiration Con	55
International Nickel	39
Kennecott	42
Lackawanna Steel	91
Miami Copper.	40
Nat'l Lead, com.	55
National Lead, pf	110
Nev. Consol	21
Ontario Min	5
Quicksilver	1
Quicksilver, pf.	1
Ray Con	26
Republic I.&S.,com.	87
Republic I. & S., pf	102
Sloss-Sheffield.	53
Tennessee C. & C.	17
U. S. Steel, com	121
U. S. Steel, pf	118
Utah Copper	103
Va. Iron C. & C	65

N. Y. CURB†	July 17
Big Ledge.	2
Butte & N. Y.	1
Butte C. & Z.	10
Caledonia	.64
Calumet & Jerome.	1
Can. Cop. Corpn	2
Carlisle	4
Cashboy	07
Con. Ariz. Sm.	2
Con. Coppermines	5
Con. Nev.-Utah	07
Emma Con	[illegible]
Ferber.	‡ 60
First Nat. Cop.	3
Goldfield Con.	52
Goldfield Merger.	06
Greenmonster.	[illegible]
Hecla Min	8
Howe Sound	5
Jerome Verde	1
Kerr Lake	4
Magma	46
Majestic	40
McKinley-Dar-Sa	54
Mohican	[illegible]
Mother Lode	27
N. Y. & Hond	12
Nipissing Mines.	7
Ohio Cop	1
Ray Hercules.	3
Richmond	56
Rochester Mines	49
St. Joseph Lead.	18
Standard S. L.	[illegible]
Stewart	[illegible]
Success	30
Tonopah.	6
Tonopah Ex	2
Tribullion	25
Troy Arizona	24
United Cop	75
United Verde Ext	36
United Zinc	4
Utica Mines	21
White Knob, pf.	1
White Oaks	‡2
Yukon Gold	1

SAN FRAN.*	July 17
Alta	03
Andes	13
Best & Belcher.	02
Bullion	01
Caledonia	08
Challenge Con	01
Confidence	05
Con. Virginia	34
Gould & Curry	02
Hale & Norcross	02
Jacket-Cr. Pt	08
Mexican	12
Occidental	‡ 65
Ophir	09
Overman	02
Savage	07
Seg Belcher	01
Sierra Nevada	10
Union Con	18
Utah Con	01
Belmont	4 20
Jim Butler	70
MacNamara	17
Midway	09
Mont.-Tonopah	20
North Star	10
Rescue Eula	21
West End Con	66
Atlanta	10
Booth	07
Comb. Frac	01
D'field Daisy	01
Florence	18
Jumbo Extension	31
Kewanas	13
Nevada Hills	[illegible]
Nevada Packard	‡ 32
Round Mountain	‡ 35
Silver Pick	10
White Caps	1 30
Big Jim	‡ 70
United Eastern	4 25

BOSTON EXCH.*	July 17
Adventure	2
Ahmeek	98
Algomah	75
Allouez	60
Ariz. Com., ctfs	12
Arnold	25
Bonanza	20
Butte-Balaklava.	55
Calumet & Ariz	76
Calumet & Hecla.	533
Centennial	17
Copper Range	59
Daly West	1
Davis-Daly	6
East Butte	12
Franklin	‡6
Granby	80
Hancock	14
Hedley	16
Helvetia	‡ 26
Indiana	2
Isle Royale	30
Keweenaw	2
Lake	11
La Salle	3
Mason Valley	6
Mass	12
Mayflower.	2
Michigan	2
Mohawk	80
New Arcadian.	3
New Idria	14
North Butte	17
North Lake.	1
Ojibway.	1
Old Dominion	55
Osceola.	83
Quincy	84
St. Mary's M. L.	76
Santa Fe	1
Seneca Mines.	10
Shannon	8
Shattuck-Ariz.	23
So. Lake.	3
So. Utah.	20
Superior	8
Superior & Bost.	4
Trinity	7
Tuolumne	1
U. S. Smelting	58
U. S. Smelt'g, pf	49
Utah Apex	2
Utah Con	15
Utah Metal.	4
Victoria.	3
Winona	3
Wolverine	44
Wyandot.	.45

BOSTON CURB*	July 17
Alaska Mines Corp.	62
Bingham Mines	12
Boston Ely	40
Boston & Mont	60
Butte & Lon'n Dev	13
Calaveras	3
Calumet-Corbin.	01
Chief Con.	2
Cortez	20
Crown Reserve.	27
Crystal Cop	1
Eagle & Blue Bell.	2
Houghton Copper	75
Intermountain	1
Iron Cap, Com	16
Iron Cap Cop., pf	15
Mexican Metals	.27
Mines of America	1
Mojave Tungsten	68
Nat. Zinc & Lead.	.65
Nevada-Douglas.	1
New Baltic	1
New Cornelia	18
Oneco.	‡ 50
Pacific Mines	30
Rex Cons	26

SALT LAKE*	July 17
Bannack	1 00
Big Four	24
Black Jack	06
Cardiff	5 50
Colorado Mining	20
Daly-Judge	8 00
Empire Copper.	1 25
Gold Chain	16
Grand Central	68
Grand Gulch	19
Iron Blossom	85
Lower Mammoth.	03
May Day	05
Moscow	12
Prince Con	1 12
Silver-King Coal'n	3 00
Silver King Con.	3 80
Sioux Con	10
So. Hecla	1 10
Uncle Sam	02
Wilbert	15
Yankee	07

TORONTO*	July 17
Bailey	‡ 03
Beaver Con	32
Buffalo Mines	1 25
Chambers Ferland	13
Coniagas	4 25
La Rose	47
Peterson Lake	11
Right of Way	05
T. & Hudson Bay	‡58 00
Temiskaming	33
Wettlaufer-Lor	05
Dome Exten	18
Dome Lake	17
Foley O'Brien	60
Hollinger	4 50
Jupiter	‡ 08
McIntyre	1 56
Newray	54
Porcu. Crown	48
Schumacher	46
Vipond	30
West Dome	18

STOCK QUOTATIONS—Continued

COLO. SPRINGS	July 17
Cresson Con.	5.87
Doctor Jack Pot.	.04
Elkton Con.	.06
El Paso	.30
Gold Sovereign.	.04
Golden Cycle	2 12
Granite	.53
Isabella	10
Mary McKinney.	.16
Portland	1 48
United Gold M.	22
Vindicator	75

LONDON	June 28		
Alaska Mexican	£0	10s	0d
Alaska Tre'dwell	1	0	0
Burma Corp.	4	4	4
Cam & Motor	0	8	0
Camp Bird.	0	6	9
El Oro	0	10	0
Esperanza	0	9	6
Mexican Mines	4	3	9
Nechi. pfd	0	12	6
Oroville	0	16	6
Santa Gert'dis	0	10	6
Tomboy.	0	19	6

* Bid prices. † Closing prices. ‡ Last Quotations.

MONTHLY AVERAGE PRICES OF METALS

Silver	New York			London		
	1915	1916	1917	1915	1916	1917
January	48.855	56.775	75.630	22.731	26.960	36.682
February	48.477	56.755	77.585	22.753	26.975	37.742
March	50.241	57.935	73.861	23.708	27.597	36.410
April	50.250	64.415	73.875	23.709	30.662	36.963
May	49.915	74.269	74.745	23.570	35.477	37.940
June	49.034	65.024	76.971	23.267	31.060	39.065
July	47.519	62.940	....	22.597	30.000	
August	47.163	66.083	.....	22.780	31.498	
September	48.680	68.515	....	23.591	32.584	
October	49.385	67.855	....	23.925	32.361	..
November	51.714	71.604	..	25.094	34.192	..
December	54.971	75.765		26.373	36.410	..
Year	49.684	65.661		23.675	31.315	..

New York quotations cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Copper	New York		London			
	Electrolytic		Standard		Electrolytic	
	1916	1917	1916	1917	1916	1917
Jan	24.008	28.673	88.083	131.921	116.167	142.895
Feb.	26.440	31.750	102.667	137.895	133.167	148.100
Mar	26.310	31.481	107.714	136.750	136.000	151.000
April	27.895	27.935	124.319	133.842	137.389	147.158
May	28.625	28.788	135.457	130.000	152.522	142.000
June	26.601	29.962	112.432	130.000	137.455	142.000
July	23.865	....	95.119	..	125.500	.
Aug	26.120	.....	110.283	.	126.304	.
Sept	26.855	...	113.905	.	134.071	.
Oct	27.193		122.750	.	142.523	..
Nov	30.625		134.659	.	155.432	..
Dec.	31.890		145.316	.	162.842	.
Year	27.202		116.059	....	138.281	.

Tin	New York		London	
	1916	1917	1916	1917
January	41.825	44.175	175.548	185.813
February	42.717	51.420	181.107	198.974
March	50.741	54.388	193.609	207.443
April	51.230	55.910	199.736	220.171
May	49.125	63.173	196.511	245.114
June	42.231	62.053	179.466	242.083
July	38.510		168.357	
August	38.565		169.870	
September	38.830		171.345	
October	41.241	.	179.307	.
November	44.109		186.932	
December	42.635		183.368	
Av. year	43.480	.	182.096	

Lead	New York		St. Louis		London	
	1916	1917	1916	1917	1916	1917
January	5.921	7.626	5.826	7.530	31.167	30.500
February	6.246	8.636	6.164	8.595	31.988	30.500
March	7.136	9.199	7.375	9.120	34.440	30.500
April	7.630	9.288	7.655	9.158	34.368	30.500
May	7.463	10.207	7.332	10.202	32.967	30.500
June	6.936	11.171	6.749	11.123	31.011	30.500
July	6.352	..	6.185		28.137	
August	6.244		6.088	.	29.734	
September	6.810		6.699		30.786	
October	7.000		6.898		30.716	
November	7.042		6.945		30.500	
December	7.513		7.405		30.500	
Year	6.853		6.777		31.359	

Spelter	New York		St. Louis		London	
	1916	1917	1916	1917	1916	1917
Jan	16.915	9.619	16.745	9.449	89.810	48.329
Feb	18.420	10.045	18.260	9.875	97.762	47.000
Mar	16.846	10.300	16.676	10.130	95.048	47.000
April	16.695	9.459	16.525	9.289	99.036	54.632
May	14.276	9.362	14.106	9.192	94.217	54.000
June	11.752	9.371	11.582	9.201	68.591	54.000
July	8.925	..	8.755		50.750	
Aug	8.730	..	8.560		51.587	
Sept	8.990		8.820		52.095	
Oct	9.829		9.659		51.159	
Nov	11.592		11.422		56.023	
Dec	10.665		10.495		55.842	
Year	12.804		12.634		72.071	

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton. ‖ Not reported.

Pig Iron, Pitts.	Bessemer‡		Basic‡		No. 2 Foundry	
	1916	1917	1916	1917	1916	1917
January	$21.60	$35.95	$18.78	$30.95	$19.70	$30.95
February	21.16	30.37	18.93	30.95	19.51	30.95
March	21.81	37.37	19.20	33.49	19.45	35.91
April	21.65	42.23	18.95	38.90	19.45	40.06
May	21.78	46.04	19.11	42.84	19.58	41.60
June	21.95	54.22	18.95	50.05	19.34	50.14
July	21.95		18.95		19.20	.
August	21.95		18.95		19.22	
September	22.88		19.58		19.53	
October	24.61		21.26		21.51	
November	30.07		28.18		26.55	
December	35.10		30.95		30.79	
Year	[illegible]		$20.98		$21.15	

‡ As reported by W. P. Snyder & Co.

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A Florida Rare-Mineral Deposit

BY DONALD M. LIDDELL
Consulting Metallurgical Engineer, New York

Ilmenite, zircon, rutile and monazite sand are found in a beach sand near Jacksonville, Fla. The deposit is being worked by a suction dredge, the sand being table-concentrated and the concentrate dried. Ilmenite is then removed by magnets, and the tailings from the magnetic concentrator are again tabled to separate the monazite sand, zircon and rutile.

ON THE East Coast of Florida, a little below the mouth of the St. Johns River, lies a beach-sand deposit from which most of the present production of ilmenite and monazite sand in the United States is being derived. The discovery of this deposit is due to H. H. Buckman and G. A. Pritchard, its present owners and workers, and was the outcome of an exhaustive investigation of the resources of Florida in fireclays, glass sand, infusorial earths, etc., originally undertaken for some of their friends. The presence of ilmenite in a sample of sand was observed, and study of the deposit convinced them it was present in commercial quantity.

However, to make sure they were not going into a business that was capable of unlimited competition they made a survey of the beach sands from Savannah to the southern tip of Florida and up the west coast as far as Tampa, where the beach becomes calcareous, and it was believed that no further investigation was necessary. The deposit taken up by them was the only one found.

It lies between the mouths of the St. Johns River and North River, at Jacksonville and St. Augustine respectively. The beach is a little over 22 miles long, of which about 10 appears to be workable, and of which 17 miles is held by Buckman & Pritchard. To the north the resorts of Atlantic Beach and Pablo Beach appear to mark the limits of workability, as the surface improvements are worth more than the underlying minerals; to the south the sand gradually grows poorer until only traces of the valuable minerals are met with in the low-lying sand spit that terminates the beach, from which one looks across to Anastasia Island and the towers of St. Augustine.

AN EXCAVATION ON THE FLORIDA BEACH, SHOWING THE FRIENDSHIP VEIN

The coast at the Buckman & Pritchard property consists of a gently sloping beach, about 520 ft. wide at low tide, a series of dunes about 200 ft. wide and rising to a mean height of about 12 ft. above high water, behind which is a valley paralleling the coast. This valley is, for about 13 miles, occupied by the Guano River, which flows south to the North River. The Guano rises a little to the south of the Buckman & Pritchard mill, which is itself about 4¾ miles south of Pablo Beach. To the north the valley forms part of the "hammock," the local name for a bad lands of sand, scrub palmetto and snakes, that two or three miles inland give way to pine woods. The deposit appears to be a natural concentration by wave action, and the maximum richness occurs near the mill.

The workable portions of the deposit are the dunes themselves, which appear to be payable for 50 ft. below mean high-water level, and a concentration along their base, known as the "Friendship vein." This is about 70 ft. wide and has an average thickness of about 9 ft., besides which about 8 ft. of lower grade below this seems to be workable. This concentration is very remarkable. Sand taken from any portion of the property (in the 15 miles of greatest richness) will show the ilmenite readily by either blowing or washing, but in the Friendship bed the black stands out in the material as mined, as shown in the accompanying illustration.

Of the rich Friendship bed there seems to be about 1,025,000 tons, and of the low-grade beach sand about 31,750,000 tons clearly profitable and perhaps 10,000,000 tons more that may prove workable. The fineness of the deposit is astonishing. Of 2500 lb. taken as a sample, about 4 oz. of it, chiefly shells, would not pass a 12-mesh screen. From small amounts of material tested the results are about the same on a 40-mesh screen.

The fineness of the deposit renders mining the simple problem of taking up the beach and dunes with a suction dredge, putting the sand over a concentrating table and using the tailings to fill up the valley spoken of as lying behind the dunes. Ultimately it is planned to put the roughing tables on the dredge and convey only the concentrates to the mill, but at the time of my visit the roughing tables were in the mill and everything was sent to it.

At present the capacity of the dredge is not great enough to give the mill sufficient tonnage to turn out the amount of ilmenite being shipped, so mining is being conducted on the Friendship bed and the material sent to the mill by freight car. The dredge is kept in a pond, partly because the richer material is back from the ocean, partly to avoid losing the dredge or the connecting pipes in a storm. This pond, as well as the mill, is supplied from an artesian well that gives about 2,800,000 gal. of water per day when allowed to flow freely under its natural pressure of 31 lb. per sq.in. This, it may be remarked in passing, is much larger than the famous wells of New Zealand. The water is, like most of the Florida East Coast waters, strongly impregnated with sulphureted hydrogen, but on standing it becomes palatable as well as good for boiler use.

A GENERAL VIEW OF THE BEACH AND APPROACH AND A CLOSER VIEW OF THE PLANT

A mineralogical study of this deposit was made by D. H. Newland, of the New York State Geological Survey. He states that in order of abundance the minerals occur as follows: Quartz, ilmenite, zircon, epidote, rutile, staurolite, monazite, cyanite, spinel, garnet, corundum, tourmaline, pyroxene, amphibole, feldspar, xenotime, pyrochlore and magnetite. Platinum is present, but neither gold nor silver has been identified. The "epidote" seems open to question, as the mineral apparently so identified by Newland appears to contain about 15% of titanium. However, this is a minor matter.

ABOUT 33,000,000 TONS WORKABLE MATERIAL

The deposit has also been examined by Prof. Charles E. Locke, of Boston, who ran several mill tests on large quantities of the sand. His average results on the Friendship bed were as follows: Ilmenite, 5.43%; rutile, 0.59; monazite, 0.08; zircon, 1.96%. On the dune sand he obtained: Ilmenite, 1.065%; rutile, 0.12; monazite, 0.015, and zircon, 0.46%.

In regard to the results on the dune sand, however, the per cent. of ilmenite is low according both to operating results obtained by Buckman & Pritchard and to a mill run made by me. In justice to Professor Locke I was told that he was more interested in the monazite content and did not try to make high ilmenite recovery:

WET CONCENTRATION FOLLOWED BY MAGNETS

As stated, the first process is a simple wet concentration. The concentrates are then completely dried. Up to date driers of the type used for foundry sand have been employed, but a Ruggles drier is being installed. The dried concentrates are then put through Ding's magnetic concentrators working at 15 amp., thus removing the ilmenite. The magnetic tailings are then put back over the tables (five-deck tables are to be used in the future for this).

On this second tabling the display of colors in the bands on the deck is very pretty. Along the top edge of the table is a dark-brown streak of some unknown mineral, carrying about 1½ oz. Pt per ton of streak, then comes a dirty yellow band of monazite sand, a white band of zircon, a red one of rutile, and finally a broad greenish-yellow belt of staurolite and epidote (?) fading off into a chemical miscellany in which white silica predominates.

So far the commercial products are ilmenite (the concentrate carrying about 52% Ti), zircon and monazite sand, although rutile and garnet should easily be produced commercially. The zircon is at present being ground before shipment, an interesting feature of this being that toward the last of the grinding operation the zircon suddenly swells greatly, disengaging large quantities of helium as it does so.

The products are shipped out and supplies received over a private railroad about 4½ miles long, connecting with the Florida East Coast Ry. near Pablo.

As to the origin of the deposit, there seems to be no evident explanation. The cerium-thorium ratio of the monazite sand is unlike that of any of the known Carolina monazites, and also unlike the known South American sands. We probably must postulate an ancient river with its mouth near the site of the present mill, deriving this material from pegmatite in some mountains to the north, but it is just about as easy as it is to accept this, to believe the explanation that it is part of the coast of the lost Atlantis.

DREDGE FOR RECOVERING THE MINERAL

Along this line, however, a portion of an abstract from the *Journal* of the Society of Chemical Industry of an article in the *Bulletin* of the Imperial Institute, p. 321, 1916, may be of interest:

> The work of the Mineral Survey of Ceylon during 1911-15 was devoted mainly to searching for thorium-bearing minerals on the west and south coasts and in various inland districts. Along the coast, most of which is bordered by shallow water, "nambu"—a natural concentrate of heavy minerals (mainly ilmenite and magnesite associated with monazite, garnet, zircon, rutile, etc.) varying from a film to several feet in thickness and from a foot to several yards in width—was found at many points. From Colombo to Dutch Bay Point and from Puttalam to Kudremalai the monazite content of these deposits was generally under 3%; but nambus containing 7, 9 and 12% resepectively were found at the mouth of the Maha Oya, near Marawila, and near Welaboda, while a similar deposit near Kudremalai contained 22%. Between Colombo and Hambantota the nambus were black or red according as ilmeite or garnet predominated; although nearly always present in the former, monazite was seldom found in the latter. . . . On the Moon Plains in the Nuwara Eliya district, the source of a nambu rich in monazite, xenotime, corundum and zircon (the first two containing uranium) was traced to a pegmatite dike the richer parts of which were found to contain 310 grams of monazite per metric ton. An acid rock of the granulite type, containing a small proportion (20 grams per ton) of monazite, was also found in this district; and it is considered probable that the granular monazite so widely distributed in the alluvial gravels of Ceylon is derived from similar rocks of the granulite series and not from the pegmatite intrusions.

The question of origin of this Florida deposit will probably be an interesting source of discussion for some time. In conclusion, I wish to thank the Chapin-Buckman Publicity Co., of Jacksonville, Fla., for furnishing the photographs from which the accompanying illustrations are made.

The Pittsburg-Dolores Mill

By E. J. SCHRADER

Manager for the Pittsburg-Dolores Mining Co.

During the 18 months of operation of the Pittsburg-Dolores mill, at Rockland, Nev., there was milled 23,326 tons of rock from the mine, 2052 tons from dumps and 1890 tons of tailings, having a total value of about $230,370, the value being in the gold content of the ore. During that time the quantity of tailings discharged had an average value per ton of $0.814. The extraction was 90.4%. The average cost of milling was $2.75, but in this connection it is well to note that the costs were reduced from $3.20, during first six months, to $2.28 during last six months, notwithstanding continual increase in the price of supplies. This was brought about by mechanical improvements and metallurgical saving. It was also caused by the increase in the ratio of gold to silver in the ore, which enables us to make a better extraction and also materially decreases the period of treatment. Bullion is now worth $3.52 per oz. In January, 1916, we were receiving only $2.15 per oz. Only a small portion of the increase is caused by the present high value of silver.

The average ore milled per day was 49 tons. This was increased to 60 during last year. Assaying, office and general expenses averaged 73c. per ton. Supplies increased in cost from 12%, for some minor items, to as high as 220% during the period. The increase is estimated at 68c. per ton for the period over the prices that prevailed when operations were started in the summer of 1915.

At present two sets of rolls are used and the treatment of a larger tonnage with satisfactory results being impossible with these, the purchase of a ball mill to replace rolls, screens and elevator is recommended. It is estimated that a saving of $1200 per month can be made on the basis of 80 tons milled per day, and even better results may be obtained by careful work.

Molybdenite in New South Wales

The Sydney *Daily Sun* reports the discovery of a large deposit of molybdenite ore near Bathurst, New South Wales. A company with capital of $900,000 has been registered in New Zealand to exploit the mines.

The article points out that the ore has been tested by drilling and that on every part of the property the deposit has been tapped. It claims that the average molybdenum in the ore is 1.7%. The company proposes to put up a mill capable of treating 40 tons of ore a day, and to use electric drills, which would indicate a possible market for American manufacturers.

Drill Bits and Drill Steel for Metal Mining

By GEORGE H. GILMAN*

Explanations and further details of manner of sharpening and of tempering drill bits. Description of method of severing rock particles from the mass; reaming qualities of bits; angle of cutting edge; width, thickness and taper of the wings, with some suggestions to operators of drilling machines.

THE various letters and communications that have been received by me from mining men in different parts of the country, relative to my article of the same title which was published in the May 12 issue of the *Journal* indicate that there exists in the minds of some readers a misconception of the facts that I attempted to set forth especially with respect to the essential qualifications of the rock-drill bit; and on the strength of requests for more detailed information on several phases of the subject that were generalized upon in the article referred to, kindly permit me to elaborate on several points that apparently were not made sufficiently clear.

The essential qualifications of the rock-drill bit, regardless of the conditions under which it is used, are as follows:

Distribution of Work Throughout the Entire Length of the Cutting Edge

It is desirable to have the bit so made that the load is evenly distributed throughout the entire length of the cutting edge. In other words, the shape of the cutting edge and the manner in which it is applied to the work should be such that when dulled by natural wear, the flattened surface will be approximately uniform throughout the entire length of the cutting edge. As an illustration, if we were to so proportion a single-cutting-edge chisel or bull bit as to have it meet this requirement, it would assume a scroll shape corresponding to the letter S (as shown by Fig. 1*A*) with the length of the cutting edge per unit of distance from the axis of the bit increasing with the square of the diameter. Such a bit is obviously impractical, but by making a bit with four wings instead of two, it is practical to secure the desired result (with a shape as shown by Fig. 3*A*) without increasing the total length of the cutting edge but slightly more than that of a drill bit having a length of cutting edge double the diameter of the drill hole, which has been found to be desirable for average conditions of ground.

It should be so made that the cutting edge may be tempered uniformly throughout its entire length by a practical method. This may be accomplished by equalizing the area of conductivity throughout the entire length of the cutting edge, to insure a uniform distribution of the heat from the massive portion of the bit rearward of the cutting edge, for drawing the temper. In the previous article the double-arc bit (Fig. 12) and the chisel bull bit (Fig. 5) illustrate typical examples of drill bits possessing this qualification. The cross-bit (Fig. 8) is of the type which provides for a very uneven distribution of heat from the massive portion to the cutting edge.

The bit should be so formed that the depressions made by the cutting edge as it is rotated axially in the drill hole cross each other at a slight angle, thus causing the rock to be broken in diamond-shaped chunks from the bottom of the drill hole, instead of chipping or crushing it radially, which is the result secured with the cross, chisel, rose and other types of radial-cutting-edge bits. The methods of fracturing the rock with the double-chisel bit (Fig. 10), the "H" bit (Fig. 11), the double-cross bit (Fig. 9) and the double-arc bit (Fig. 12), as shown by the diagrammatic drawings, indicate the manner by which this may be accomplished.

Method of Severing Rock Particles from Mass

The extremeties of the wings of the bit adjacent the terminals of the cutting edge should be formed with either a reaming edge or a reaming surface. Under no circumstances is a reaming point desirable.

A reaming point is secured when a rock-drill bit is made in the form of a true cone, resulting from the practice of finishing the forging operation in a cone die of the drill sharpener (see Fig. 2*A*). A reaming edge is secured when the outer edge of the forward extremities of the wings are made radial from the axis of the bit and clearance is provided by tapering the wings rearwardly at a fixed angle from all points along the radial reaming edge (see Fig. 3*A*). A reaming surface is secured when the outer edges of the forward extremities of the wings are made radial from the axis for a fixed distance rearward of the cutting edge (see Fig. 4*A*).

A reaming surface may be employed to advantage only when the rock conditions are such that the natural transverse whipping action of the drill bit when struck by the hammer will cause it to cut a clearance for itself. The effect of this action is emphasized in ground of a granular nature in which the rock particles are readily disintegrated from the side walls by the natural crushing or chattering action of the bit, under which conditions it will cut a round hole of greater diameter than the maximum diameter of the bit. Inasmuch as such reaming qualities, dependent upon the area of the surface in contact, provide for wear-resisting qualities, it is advisable to employ as great a reaming surface as the conditions of the ground will permit without imposing undue duty upon the rotating mechanism of the drill.

For all conditions of ground where a reaming surface is not permissible, it is recommended that the reaming qualities of the bit be determined by a reaming edge the clearance angle of which should be as slight as the conditions of the rock will stand. A clearance angle for the reaming edge of 5° should be employed in preference to an angle of 7° unless the greater clearance is essential to secure the required freedom of rotation, for the smaller the amount of reaming clearance the less will be the reduction in gage diameter by wear of the bit in service.

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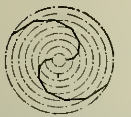
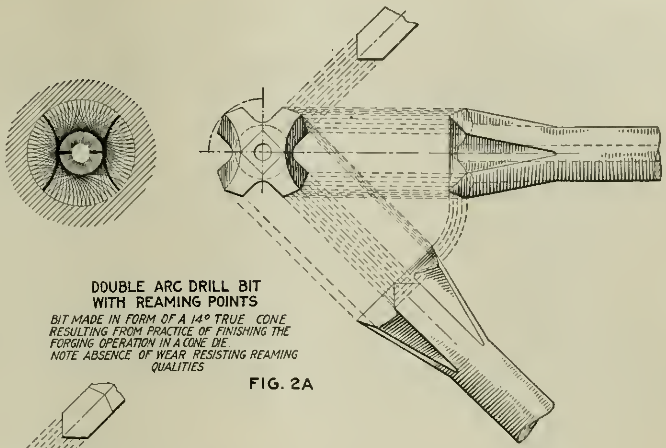
*With Sullivan Machinery Co., Claremont, N. H.



METHOD OF DEVELOPING A SINGLE CUTTING EDGE DRILL BIT OF SUCH SHAPE THAT THE WORK IS EVENLY DISTRIBUTED THROUGHOUT THE ENTIRE LENGTH OF THE CUTTING EDGE

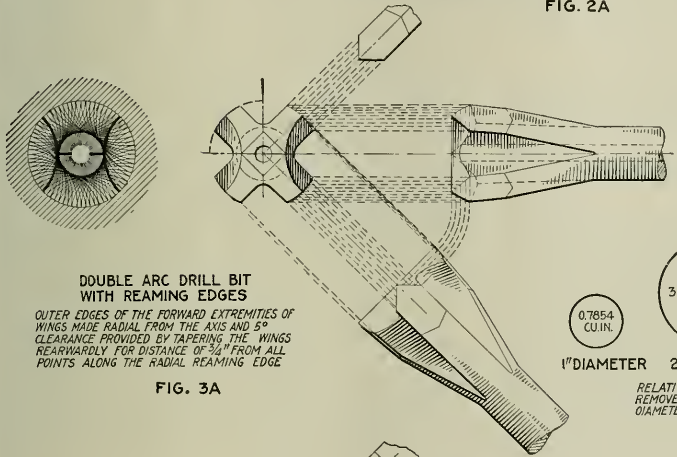
FIG. 1A



DOUBLE ARC DRILL BIT WITH REAMING POINTS

BIT MADE IN FORM OF A 14° TRUE CONE RESULTING FROM PRACTICE OF FINISHING THE FORGING OPERATION IN A CONE DIE. NOTE ABSENCE OF WEAR RESISTING REAMING QUALITIES

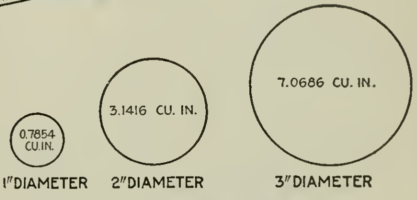
FIG. 2A



DOUBLE ARC DRILL BIT WITH REAMING EDGES

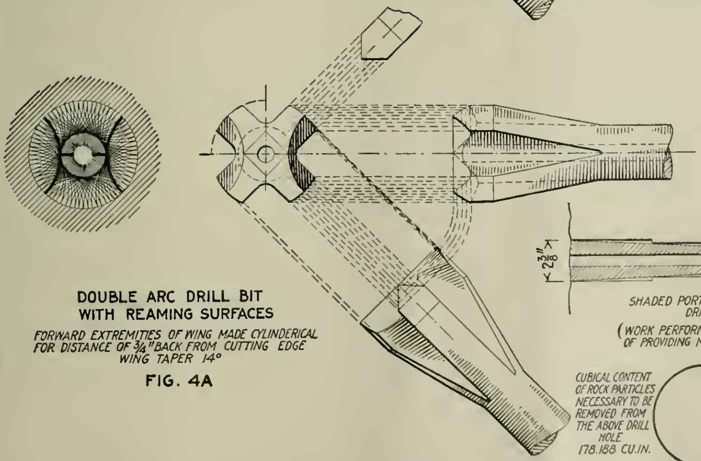
OUTER EDGES OF THE FORWARD EXTREMITIES OF WINGS MADE RADIAL FROM THE AXIS AND 5° CLEARANCE PROVIDED BY TAPERING THE WINGS REARWARDLY FOR DISTANCE OF 3/4" FROM ALL POINTS ALONG THE RADIAL REAMING EDGE

FIG. 3A



RELATIVE AMOUNT OF ROCK PARTICLES REMOVED FROM DRILL HOLES OF DIFFERENT DIAMETER PER LINEAR INCH OF ADVANCE

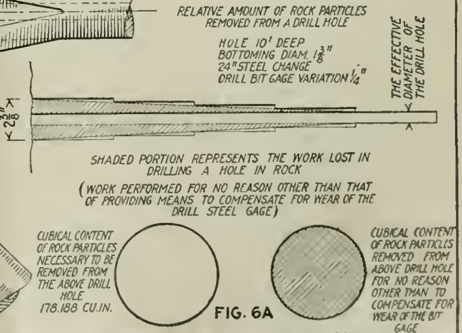
FIG. 5A



DOUBLE ARC DRILL BIT WITH REAMING SURFACES

FORWARD EXTREMITIES OF WING MADE CYLINDERICAL FOR DISTANCE OF 3/4" BACK FROM CUTTING EDGE WING TAPER 14°

FIG. 4A


RELATIVE AMOUNT OF ROCK PARTICLES REMOVED FROM A DRILL HOLE
HOLE 10' DEEP
BOTTOMING DIAM. 1 3/8"
24" STEEL CHANGE
DRILL BIT GAGE VARIATION 1/4"
THE EFFECTIVE DIAMETER OF THE DRILL HOLE
2 3/8"
CUBICAL CONTENT OF ROCK PARTICLES NECESSARY TO BE REMOVED FROM THE ABOVE DRILL HOLE 178.188 CU.IN.
CUBICAL CONTENT OF ROCK PARTICLES REMOVED FROM ABOVE DRILL HOLE FOR NO REASON OTHER THAN TO COMPENSATE FOR WEAR OF THE BIT GAGE 141.369 CU.IN.
NECESSARY WORK
LOST WORK

SHADED PORTION REPRESENTS THE WORK LOST IN DRILLING A HOLE IN ROCK

(WORK PERFORMED FOR NO REASON OTHER THAN THAT OF PROVIDING MEANS TO COMPENSATE FOR WEAR OF THE DRILL STEEL GAGE)

FIG. 6A

DRILL STEEL AND DRILL BITS FOR METAL MINES

For average conditions of ground a cutting-edge angle of 90° is recommended. For soft ground a more acute angle than 90° may be employed to advantage, depending somewhat on the abrasive qualities of the rock, while for hard, brittle ground a greater angle than 90° may be employed. In ground of a flinty nature, which shatters readily, a cutting angle of 120° is permissible.

The width or thickness of the wings should be great enough to withstand without undue breakage the hardness of the ground to be drilled. The thicker the wings the less will be the available clearance for the ejection of the rock cuttings, but as the thickness of the wings may be increased in proportion to the hardness of the ground, the clearance space for the ejectment of the rock cuttings will decrease inversely in direct proportion, so that the requirements of the ground are automatically met by making a change in either direction. The degree of taper for the wings in blending the bit into the steel body should be such that the reaming and cutting edges are properly supported. For average conditions a wing taper of 14° gives the desired results.

BEST TYPES OF EQUIPMENT

When determining the best type of rock-drilling equipment for any fixed set of conditions, it should be remembered

That the rock-drill bit is the business end of nearly every rock-excavating proposition.

That the logical way to drill holes in rock is by first determining the requirements of the ground and then providing drilling equipment to meet the requirements to the very best advantage. That this may be done only after you have decided upon the depth and the size of drill hole at its bottom diameter that will be required to handle the burden you are to impose upon it.

That when this is determined, the less the variation in size between the bottoming diameter of the drill hole and its mouth, the greater will be the rate of penetration throughout the entire length of the drill hole.

That the duty of a rock-drill bit is to disintegrate the rock particles from the bottom of the drill hole and also from the side walls.

That there is a wide distinction to be drawn between drilling a round hole in rock and in removing a corresponding amount of rock particles from the mass, under conditions where the rock may be disintegrated by chipping to a free face.

That by increasing the size of the drill hole from 1 in. to 2 in. diameter, the work that the rock-drill bit has to do is increased four times, and that when drilling a 3-in. diameter hole the drill bit has a duty to perform nine times as great as when drilling a hole 1 in. in diameter (see Fig. 5*A*).

That drilling speed in rock varies approximately with the square of the diameter of the drill hole; or in other words, the rate of penetration varies inversely with the amount of rock removed from the drill hole.

That the difference in area of the drill hole between its bottom diameter and its mouth represents work performed for no other reason than that of compensating for wear of the gage of the drill steel (see Fig. 6*A*).

That it is possible to so make the reaming qualities of a rock-drill bit that wear will be slight and that under present-day conditions, if a ¼-in. variation in gage is employed it is practical to reduce this to $\frac{1}{32}$ in. variation.

That under average present-day conditions rock drills weighing 150 lb. are employed for no other reason than that of securing a force of blow sufficient to cut rock with the large-gage bits that are used as starters, and that the use of drill steel of 1¼ in. diameter is required only to support the cutting end of large-gage bits.

That with the hammer drill the absorption of energy of the blow in transmission to the rock increases with the weight of the rock-drill steel.

That vibratory shock is an important factor in the many causes that result in fatigue of rock-drill steel and that within reasonable limits a light, rapid blow produces more fatigue that a slower heavier blow.

That a heavy, slow blow does not wear the gage of rock-drill bits in service as rapidly as a light, fast blow.

That you put life into rock-drill bits by hammering during the forging operation, which has the effect of refining the grain and removing forging strains that would otherwise exist. That when tempering drill steel, the one important essential is to quench the heated bits at the critical point.

That automatic quenching and tempering of drill steel is desirable.

That bits should be equipped with a reaming edge or a reaming surface—*never* with a reaming point.

That the cutting edge of a rock-drill bit should be so made that the work is approximately evenly distributed throughout its entire length. It is impossible to secure this result with a radial cutting-edge bit.

That the reaming qualities, the angle of the cutting edge and the thickness of the wings are the only variables required to adapt a bit to all kinds of ground.

DULL STEEL INDUCES BREAKAGE

That dulled drill bits are conducive to breakage of drill steel and drill parts, as breakage is largely determined by a lack of cushioning effect due to penetration.

That inspection of the finished steel before it leaves the smithshop and that such inspection of the bit and shank ends be made with ring limit gages is recommended.

That under average present-day conditions an additional expenditure of $10 in the drill-sharpening shop should mean a saving of $200 underground.

That the one important point to strive for is to minimize the personal equation in the smithshop and also as applied to the operation of the drill underground.

That proper care in the selection and working of rock-drill steel will under present standard practice result in the use of lighter rock drills and mountings, dispensing with the "two-man" rock drill except under special conditions; lighter and smaller air hose; lower air consumption, smaller drill steel, higher rate of penetration, less wear of drill bits per unit of depth of drill hole, better cleaning of drill holes due to reduction in size of drill hole, less drill steel, less breakage of drill steel, fewer stuck drill steels and less ill temper on the part of the drill operator.

STEEL PRODUCTION OF AUSTRIA-HUNGARY in 1916 was: Bessemer, 343,714; openhearth, 2,893,409; crucible, 34,033; electric, 47,247; forgings, 18,204; total, 3,336,607 metric tons, which was an increase of 650,381 tons over 1915. Of the total Austria produced 2,501.070 tons; Hungary, 813,433 tons; Bosnia, 22,104 tons.

North American Flotation Plants

The accompanying list covers, as nearly as possible the plants in North America making use of flotation in some form and upon some scale. It is expected that it will be found incomplete, since it has been very difficult to find all those using the process, and there are probably some duplications, due to the various sources of information.

Some of the firms listed were using flotation only experimentally, and it follows that some of them may have ceased its use after a period of investigation. The list is, however, representative of considerable work, and it is to be hoped that it will prove of some value.

FLOTATION PLANTS OF NORTH AMERICA

Name of Company	Situation of Works
Alaska Gold Mines Co.	Juneau, Alaska
Alhambra Mining Co., Ltd.	Office, Empire State Building, Spokane, Wash.
Allgrove Mining and Milling Co.	Nederland, Boulder Co., Colo.
Amalgamated Pioche Mines and Smelters Corporation	Pioche, Nev.
American Metal Producing Co.	Black Hawk, Colo.
American Smelting and Refining Co.	Denver, Colo.
Argo Reduction and Ore Purchasing Co.	Idaho Springs, Colo.
American Zinc, Lead and Smelting Co.	Mascot, Tenn.
Algonkian Mines Co.	Groom Creek, Ariz.
Amador Mine Co.	Iron Mountain, Mont.
Antelope Star Mining Co.	Milford, Utah
Afterthought Copper Co.	Ingot, Shasta Co., Calif.
Ajax Gold Mining Co.	Victor, Colo.
Alaska Copper Corporation	Strelna, Alaska
American Molybdenum Co.	Kingman, Ariz.
Apex Copper Co.	Hayman, Park Co., Colo.
Arizona Butte Mines Co.	Kingman, Ariz.
Arizona Empire Copper Mines Co.	Parker, Ariz.
Arizona Hercules Copper Co.	Ray, Ariz.
Arizona Mine	Humboldt, Ariz.
Ash Peak Mines Co.	Duncan, Greenlee Co., Ariz.
Aspen Mines	Silverton, Colo.
Atlanta Mines Co.	Goldfield, Nev.
American Ore Flotation Co.	Silverton, Colo.
Amparo Mining Co.	Etzatlan, Jalisco, Mexico
Anaconda Copper Mining Co.	Anaconda, Mont.
Arizona Copper Co., Ltd.	Clifton, Ariz.
Atlas Mining and Milling Co.	Sneffles, Colo.
Atwater, M. W.	Basin, Mont.
Butte & Superior Mining Co.	Butte, Mont.
Buster Consolidated Mines Co.	Jarbidge, Elko Co., Nev.
Butte-Duluth Mining Co.	Butte, Mont.
Bingham-New Haven Copper and Gold Mining Co.	Bingham Canyon, Salt Lake Co., Utah
Borealis Cons. Mines Co.	Auburn, Placer Co., Calif.
Broderick Mining Co.	Freeland, Colo.
Black Cloud Mining Co.	Salina, Boulder Co., Colo.
Boise-Rochester Mining Co.	Atlanta, Elmore Co., Idaho
Bon Ton Mining and Leasing Co.	Pitkin, Colo.
Bully Hill Copper Mining and Smelting Co.	Winthrop, Shasta Co., Calif.
Bunker Hill Mines Co.	Tombstone, Ariz.
Bunker Hill & Sullivan Mining and Concentrating Co.	Kellogg, Idaho
Battle Mountain Mining and Development Co.	Battle Mountain, Nev.
Ben Harrison Mines	Whitney, Ore.
Big Four Exploration Co.	Atkinson, Utah
Big Giant Leasing Co.	Silverton, Colo.
Bingham Mines Co.	Bingham, Utah
Bluestone Mining and Smelting Co.	Yerington, Lyon Co., Nev.
Bluebird Mining and Refining Co.	Office, 501 C. of C. Building, Spokane, Wash.
Boston & Corbin Mining Co.	Corbin, Jefferson Co., Mont.
Bradshaw Reduction Co.	Crown King, Ariz.
Brooklyn Mining Co.	Maxville, Mont.
Beaver Consolidated Mining Co.	Cobalt, Ont., Canada
British Columbia Copper Co., Ltd.	Greenwood, B.C., Canada
Britannia Mining and Smelting Co., Ltd.	Britannia Beach, B. C., Canada
Broadwater Mills Co.	Park City, Utah
Brockmann & Co.	Magdalena District, Sonora, Mexico
Butte Central Mining and Milling Co.	Butte, Mont.
Canada Copper Corp., Ltd	Greenwood, B.C., Canada
Castle Copper Co.	Prescott, Ariz.
Consolidated Copper Mines Co.	Eureka, Juab Co., Utah
Caldo Mining Co.	Frisco, Utah
Chino Copper Co.	Hurley, Grant Co., N. M.
Cash Mine Co.	Prescott, Ariz.
Contact Copper Co.	Contact, Nev.
Copper Hill Mining Co.	La Plata, Colo.
Columbus Mines Co.	La Plata, Colo.
Caledonia Mining Co.	Wardner, Shoshone Co., Idaho
Chicago-Boston Mining Co.	Wallace, Idaho
Commack Mining Co.	Breckenridge, Colo.
Comet Mining and Milling Co.	Whitefish, Flathead Co., Mont.
Consolidated Nevada-Utah Corp.	Pioche, Lincoln Co., Nev.
Consolidated Mines and Reduction Co.	412 E. Bennett Ave., Cripple Creek, Colo.
Copper Giant Mine	Jerome, Yavapai Co., Ariz.
Copper Queen Consolidated Mining Co.	Douglas, Ariz.
Copper Queen Gold Mining Co.	Stoddard, Ariz.
Curlew Mine	Victor, Ravalli Co., Mont.
Calumet & Arizona Mining Co.	Warren, Ariz.
Caribou Mines and Mills Co.	Cardinal, Boulder Co., Colo.
Carlisle Mines Co.	Steeple Rock, Grant Co., N. M.
C. & O. Mining and Milling Co.	Pinos Altos, Grant Co., N. M.
Cia. Mineral Chontalpan y Anexas, S. A.	Mexico
Cœur d'Alene Antimony Mining Co.	Kellogg, Idaho
Chicago Copper Refining Co.	Red Bluff, Tehama Co., Calif.
Childers Leasing Co.	Midvale, Utah
Chloride Mines Co.	Chloride, Ariz.
Colorado Central Mining Co.	Georgetown, Colo.
Consolidated Copper Mines Co.	Kimberly, Nev., and Ely, Nev.
C. O. D. Consolidated Mining Co.	Goldfield, Nev.
Calumet & Jerome Copper Co.	Jerome, Yavapai Co., Ariz.
Conigas Mines, Ltd.	Thorold, Ont., Canada
Cork-Province Mines	Kaslo, B. C., Canada
Calaveras Copper Co.	Copperopolis, Calif.
Calumet & Hecla Mining Co.	Calumet, Mich.
Ceylon Co.	Mount Olive, Ala.
Chichagoff Mining Co.	Chichagoff Isl., Alaska
Clark, Senator W. A.	Butte, Mont.
Consolidated Arizona Smelting Co.	Mayer, Yavapai Co., Ariz.
Consolidated Interstate-Callahan Mining Co.	Wallace, Idaho
Consolidated Mining and Smelting Co. of Canada, Ltd.	Trail, B. C., Canada
Cuba Copper Co.	El Cobre, Santiago de Cuba
Cusi Mining Co.	Cusihuiriachic, Chihuahua, Mexico
Duquesne Mining and Reduction Co.	Duquesne, Ariz.
Daly West Mining Co.	Park City, Summit Co., Utah
Davis Daly Copper Co.	Butte, Mont.
Daly-Judge Extension Mining Co.	Park City, Utah
Diamondfield Black Butte Mining Co.	Goldfield, Esmeralda Co., Nev.
Dunkirk & Poverty Mines	Prescott, Ariz.
Duplex Mining Co.	Searchlight, Clark Co., Nev.
Detroit Copper Mining Co. of Arizona	Morenci, Ariz.
Denver Mining and Milling Co.	Wortman, Colo.

Name of Company	Situation of Works
Dominion Reduction Co., Ltd.	Cobalt, Ont., Canada
Desloge Consolidated Lead Co.	Desloge, St. Francois Co., Mo.
Doe Run Lead Co.	St. Francois Co., Mo.
Dutch Sweeney Mining Co.	Quartz, Tuolumne Co., Calif.
Ducktown Sulphur, Copper and Iron Co., Ltd.	Isabella, Polk Co., Tenn.
Ellamar Mining Co.	Ellamar, Alaska
Elkhart Mines Co.	Chloride, Ariz.
Emma Mine	Fierro, Grant Co., N. M.
Empire Zinc Co. of Colorado	Tucson, Ariz.
Encinitas Copper Co.	Encinitas, Calif.
Estelle Mining Co.	Keeler, Calif.
Evergreen Mines Co.	Apex, Gilpin Co., Colo.
East Butte Copper Mining Co.	Butte, Silverbow Co., Mont.
Eighty-Five Mining Co.	Lordsburg, N. M.
Empire Mining Co.	Cananea, Sonora, Mexico
Empire Zinc Co. of Colorado	Arizona, Colo.
Eustis Mining Co.	Eustis, Que., Canada
Ely Copperfield Associates	West Fairlee, Vt.
Engels Copper Mining Co.	Keddie, Plumas Co., Calif.
Federal Lead Co.	Flat River, Mo.
Federal Mining and Smelting Co.	Wallace, Idaho
Florence Goldfield Mining Co.	Goldfield, Nev.
Forbestown Consolidated Gold Mines	Forbestown, Calif.
Frisco Tunnel Co.	Office, 241 Oliver Building, Pittsburgh, Penn.
Florence Silver Mining Co.	Ainsworth, B.C., Canada
Flint Mines, Ltd.	Owyhee Co., Idaho
Gold Hill Mining Co.	Jerseyville, Ill.
Golconda Consolidated Mines Co.	Golconda, Ariz.
Gold Crown Mining and Reduction Co.	Ouray, Colo.
Golden Age Mining Co.	Office, 1st National Bank Bldg., Denver, Colo.
Gold Hunter Mining and Smelting Co.	Mullan, Idaho
Gibson Copper Co.	Bellevue, Gila Co., Ariz.
Gold Bank Mine	Forbestown, Calif.
Gold King Mine	Gladstone, Colo.
Great Bend Mine	Goldfield, Nev.
Green Mountain Mine	Howardsville, Colo.
Genesee Mine	Ironton, Colo.
Giroux Consolidated Mines Co.	Kimberly, Nev.
Gold Ore Mining Co.	Oatman, Ariz.
Granby Consolidated Mining, Smelting and Power Co., Ltd.	Phœnix, Boundary District, B. C., Canada
Goldfield Consolidated Mines Co.	Goldfield, Esmeralda Co., Nev.
Greene-Cananea Copper Co.	Cananea, Sonora, Mexico
Hammond Mining Co.	Excelsior, Wash.
Hecla Consolidated Mines Co.	Hecla, Larmie Co., Wyo.
Home Lode Mining Co.	Silver City, S. D.
Hunter Mining Co.	Mullan, Idaho
Hudson Mill	Idaho Springs, Colo.
Hercules Mining Co.	Burke, Idaho
H. E. M. Mining Co.	Wallace, Idaho
Hahn's Peak Gold Mining and Milling Co.	Hahn's Peak, Routt Co., Colo.
Hamlet Mining and Milling Co.	Howardsville, San Juan Co., Colo.
Hecla Mining Co.	Wallace, Idaho
Highland Surprise Consolidated Mining Co.	Kellogg, Idaho
Hill City Tungsten Production Co.	Hill City, S. D.
Homestead Iron Dyke Mines Co., Inc.	Homestead, Baker Co., Ore.
Horn Silver Mine Co.	Frisco, Beaver Co., Utah
Humboldt Mines Co.	Telluride, Colo.
Hypotheek Mining and Milling Co.	Kingston, Shoshone Co., Idaho
Humphreys Mill	Office, Suite 217, Coronado Building, Denver, Colo.
Highland Valley Mining and Development Co.	Ashcroft, B. C., Canada
Ironside Mine	Butte, Mont.
Ideal Copper Mining Co.	Luning, Nev.
Iowa-Tiger Mining Co.	Silverton, Colo.
Iron City Mill	Gilpin Co., Colo.
Inter-Mountain Copper Mining Co.	Iron Mountain, Mont.
Idora Mining Co., Ltd.	Wallace, Idaho
International Nickel Co.	Sudbury, Ont., Canada
International Molybdenum Co.	Renfrew, Ont., Canada
Inspiration Consolidated Copper Co.	Miami, Ariz.
Judge Mining and Smelting Co.	Park City, Utah
Jumbo Extension Mining Co.	Goldfield, Nev.
Kennedy Mining and Milling Co.	Jackson, Amador Co., Calif.
Keystone Consolidated Mining Co.	Park City, Utah
Kennecott Copper Corporation	Kennecott, Alaska
Keystone Mining and Reduction Co.	Chloride, Ariz.
Keystone Copper Mining Co.	Johnson, Cochise Co., Ariz.
Kittimac Mine and Mill Co.	Silverton, Colo.
King Edward Mines Co.	Cobalt, Ont., Canada
Liberty Bell Gold Mine Co.	Telluride, San Miguel Co., Colo.
Lincoln Mine	Crown King, Ariz.
Last Chance Mine	Cable Cove, Baker Co., Ore.
Lost Packer Mining Co.	Ivers, Custer Co., Idaho
Leviathan Mines Co.	Kingman, Ariz.
Little Giant Gold Mining and Milling Co.	Lawson, Colo.
La Blanca Mines Co.	Pachuca, Hidalgo, Mex.
Mary Murphy Gold Mining Co.	Rawley, Colo.
Mascot Mining and Milling Co.	Office, 212 Brooks Arcade, Salt Lake City, Utah
Miami Copper Co.	Miami, Gila Co., Ariz.
Mickey-Breene Mines	Silverton, Colo.
Midvale Minerals Co.	Midvale, Utah
Montana Illinois Copper Mining Co.	Jefferson Island, Madison Co., Mont.
Mammoth Copper Mining Co.	Milford, Utah
Marsh Mines Consolidated Co.	Wallace, Idaho
McKeen Mine	Callahan, Calif.
Mears & Wilfley Mining and Milling Co.	Silverton, Colo.
Mid-Colorado Mines Co.	Georgetown, Colo.
Mine La Motte Co.	La Motte, Mo.
Miller Mountain Mining Co.	Candelaria, Nev.
Mogollon Mines Co.	Mogollon, Socorro Co., N. M.
Morning Mine	Mullan, Idaho
Magma Copper Co.	Superior, Pinal Co., Ariz.
Marion Mine and Mills Co.	Rye, Colo.
Mayflower Mine	Silverton, Colo.
Missouri Cobalt Co.	Fredericktown, Mo.
Moho Mining Co.	Sodaville, Nev.
Monitor-Belmont Mining Co.	Belmont, Nye Co., Nev.
Montezuma Mines and Mills Co.	Montezuma, Colo.
Moctezuma Copper Co.	Nacozari, Moctezuma, Sonora, Mexico
McAlpine Mines Co.	Coulterville, Mariposa Co., Calif.
McKinley-Darragh Savage Mines Co.	Cobalt, Ont., Canada
Mineral Recovery Co.	Joplin, Mo.
Mond Nickel Co., Ltd.	Victoria Mines, Algoma, Ont., Canada
Mountain Copper Co., Ltd.	Keswick, Shasta Co., Calif.
McDonald & Noble	Leadville, Colo.
North Pole Mine	Bourne, Ore.
National Copper Mining Co.	Mullan, Idaho
Nevada Consolidated Copper Co.	Ruth, White Pine Co., Nev.
Nevada Metals Extraction Co.	Goldfield, Nev.
North Star Triumph Mining Co.	Haily, Idaho
N. W. Mines Consolidated Co.	Maxville, Mont.
Nevada Copper Mining, Milling and Power Co.	Contact, Elko Co., Nev.
Nevada Star Mining Co., Ltd.	Cherry Creek, Nev.
New Puritan Mining Co.	Galena, S. D.
Norman Mines Co.	Northport, Wash.
North Butte Mining Co.	Butte, Mont.
Nenzel Crown Point Mining Co.	Rochester, Humboldt Co., Nev.
National Lead Co.	Office, New York City
Nipissing Mining Co., Ltd.	Cobalt, Ont., Canada
Napoleon Mine	Copperopolis, Calaveras Co., Calif.

Name of Company	Situation of Works
North Star Mine	Silverton, Colo.
North Star Mines Co.	Grass Valley, Calif.
Oro Del Norte Co.	Office, 22 William St., New York
Oat Hill Mine	Middleton, Lake Co., Calif.
Old Eureka Mining Co.	Office, 42 Broadway, New York City
Onetal Mines Co.	Office, Room 2028, 10 Wall St., New York
Ouray Smelting and Refining Co.	Ouray, Colo.
Ozark Smelting and Mining Co.	Magdalena, Socorro Co., N. M.
Oneida Stagg Mining Co.	Idaho Springs, Colo.
Oro Grande Mining Co.	Wickenburg, Maricopa Co., Ariz.
Old Dominion Copper Mining and Smelting Co.	Globe, Gila Co., Ariz.
Park City Mines Co.	Park City, Utah
Pasquale Copper Co.	Bellevue, Ariz.
Pay Roll Mine	Chloride, Ariz.
Penn Mining Co.	Campo Seco, Calaveras Co., Calif.
Pioneer Consolidated Co.	Pioneer, Nev.
Polar Star Mines Co.	Black Hawk, Colo.
Pride of the West Mine	Silverton, Colo.
Pacific Mineral Products Co.	Office, 301 North Ave., 19, Los Angeles, Calif.
Pingrey Mines and Ore Reduction Co.	Leadville, Colo.
Pilgrim Mining Co.	Basin, Mont.
Prince Consolidated Mining Co.	Office, McCormick Bldg., Salt Lake City, Utah
Penn-Canadian Mines, Ltd.	Cobalt, Ont., Canada
Pacific Ore Testing Co.	Los Angeles, Calif.
Pike Hill Mines	Corinth, Orange Co., Vt.
Phelps Dodge Corporation	Globe, Gila Co., Ariz.
Portland Gold Mining Co.	Victor, Colo.
Quadmetal Mines Co.	Frisco, Utah
Quatsino Copper Co.	Quatsino, Vancouver Island, B. C., Canada
Ruby Silver Mining and Development Co.	Office, 15 Broad St., New York
Red Monarch Consolidated Mining Co.	Office, 417 Hutton Building, Spokane, Wash.
Rex Consolidated Mining Co.	Office, 120 Broadway, New York
R. R. R. Mining Co.	Patagonia, Ariz
Rupert Mine	Patagonia, Ariz.
Ray Consolidated Copper Co.	Ray, Pinal Co., Ariz.
Ray-Jefferson Mining Co.	Wallace, Idaho
Ray Hercules Copper Mining Co.	Ray, Ariz.
Reindeer Queen Mining Co.	Mullan, Idaho
Rico Argentine Mining and Milling Co.	Rico, Dolores Co., Colo.
Royal Basin Mining Co.	Maxville, Granite Co., Mont.
Royal Gold Mines Co.	Hodson, Calaveras Co., Calif.
Rochester Combined Mines Co.	Rochester, Nev.
Reward Gold Mines Co.	Manzanar, Inyo Co., Calif.
Silver Plume Reduction Co.	Silver Plume, Colo.
Silver Bell Mine	Ophir, Colo.
Snowstorm Mines Consolidated	Kellogg, Idaho
Smuggler Union Mining Co.	Telluride, Colo.
Stewart Mining Co.	Kellogg, Idaho
Socorro Mining Co.	Mogollon, N. M.
Spanish Belt Silver Mines	Tonopah, Nev.
St. Louis Smelting and Refining Co.	Office, 111 Broadway, New York
St. Johns Mines, Ltd.	Montezuma, Colo.
Superstition Consolidated Mining Co.	Phœnix, Ariz.
Standard Gold-Copper Mining and Milling Co.	Salida, Colo.
Salisbury Copper Co.	Gold Hill, Rowan Co., N. C.
Santa Fe Gold and Copper Mining Co.	San Pedro, N. M.
Schuykill Mining Co.	Office, 345 Rialto Bldg., San Francisco, Calif.
Shannon Copper Co.	Metcalf, Greenlee Co., Ariz.
Shattuck Arizona Copper Co.	Bisbee, Ariz.
Sheldon Mining Co.	Walker, Ariz.
Silver Lake Custom Mill	Silverton, Colo.
Silver Cable Mining Co.	Mullan, Idaho
Silverado Mining Co.	Office, Old National Bank Bldg., Spokane, Wash.
Silver King Consolidated Mining Co. of Utah	Park City, Utah
Silver King Coalition Mines Co.	Park City, Utah
Standard Mine	Idaho Springs, Colo.
Success Mining Co., Ltd.	Wallace, Idaho
Sunnyside Mines	Eureka, San Juan Co., Colo.
Simonds & Lathan	Melones, Calaveras Co., Calif.
Sable River Copper Mines Co.	Massev. Ont., Canada
Silver Hoard Mining Co., Ltd.	Ainsworth, B.C., Canada
Slocan Star Mines, Ltd.	Silverton, B. C., Canada
Silverton Mines, Ltd.	Silverton, B. C., Canada
Standard Silver Lead Mining Co.	Silverton, B. C., Canada
St. Joseph Lead Co.	Bonne Terre, Mo.
Surprise Mine	Sandon, B. C., Canada
Telluride Chief Mining Co.	Kingman, Ariz.
Tennessee Copper Co.	Copper Hill, Polk Co., Tenn.
Tarbox Mining Co.	Saltese, Mont.
Terrible Dunderberg Mining and Power Co.	Silver Plume, Colo.
Texas Graphite Co.	Burnet, Tex.
Tintic Milling Co.	Silver City, Utah
Tonopah Extension Mining Co.	Tonopah, Nev.
Tomboy Gold Mines Co., Ltd.	Telluride, Colo.
Trethewey Silver Cobalt Mine, Ltd.	Cobalt, Ont., Canada
Utah Copper Co.	Garfield, Utah
Utah Metal and Tunnel Co.	Bingham, Utah
Utah Apex Mining Co.	Bingham Canyon, Utah
United States Exploration Co.	Office, 618 Pacific Bldg., San Francisco, Calif.
Union Copper Mine	Milton, Calif.
Underwriters' Land Co.	Joplin, Mo.
United Copper Mining Co.	Chewelah, Stevens Co., Wash.
Union Basin Mining Co.	Golconda, Ariz.
United States Smelting, Refining and Mining Co.	Needles, Calif.
Utah Consolidated Mining Co.	Bingham Canyon, Utah
Utah Leasing Co.	Newhouse, Utah
Vipont Mining Co.	649 E. S. Temple St., Salt Lake City, Utah
Victor Power and Mining Co.	Knob, Calif.
Vindicator Consolidated Gold Mining Co.	Independence, Colo.
Wanakah Mining Co.	Ouray, Colo.
Wellington Mines Co.	Breckenridge, Colo.
Westinghouse Estate	Duquesne, Ariz.
Wilson Mine	Robinson, Colo.
Winnemucca Mountain Mining Co.	Winnemucca, Nev.
Walker Mining Co.	Portola, Plumas Co., Calif.
Weringer Mines Co.	Woody, Calif.
Wedge Consolidated Mines Co.	Ouray, Colo.
White Pine Exploration Co.	Cherry Creek, Nev.
Weedon Mining Co., Ltd.	Sherbrooke, Que., Canada
Young American Mine	Sierra City, Calif.
Yavapai Consolidated Gold-Silver Copper Co.	Crown King, Yavapai Co., Ariz.
Yellow Pine Mines	Crisman, Colo.
Y. P. Mining Co.	Maxton, Ariz.
Yerrington Malachite Copper Co.	Mason, Lyon Co., Ariz.
Yuma-Warrior Mining Co.	Harqua Hala, Ariz.
Toniber Butte Milling Co.	Butte, Mont.
Burro Mountain Copper Co.	Tyrone, N. M.
Old Dominion Copper Mining and Smelting Co.	Globe, Gila Co., Ariz.
Rambler-Cariboo Mines	Silverton, B. C., Canada
Lucky Jim Mine	New Denver, B. C., Canada
Galena Farm Mine	Slocan City, B. C., Canada

Arizona Molybdenite Mining Co.	Yucca, Ariz.
Carribeau Mining Co.	Ophir, Colo.
Champion Consolidated Mining Co.	Champion, Ore.
Darwin Lead and Silver Mines and Development Corpn.	Darwin, Inyo Co., Calif.
Fierro Copper Co.	Fierro, N. M.
Golden Fleece Mill	Lake City, Colo.
Highland Mary Mines Co.	Ophir, Colo.
Ima Consolidated Mining and Milling Co.	Ima, Idaho
Kenyon Copper Mines, Ltd.	Massey, Ont.
Mountain Top Mining Co.	Ouray, Colo.
Mines Operating Co.	Butte, Mont.
Progress Mining and Milling Co.	Leadville, Colo.
Senorito Copper Corpn.	Senorito, N. M.

SUPPLEMENTARY LIST OF COMPANIES WHOSE WORKS OR OFFICE ADDRESS IS NOT OF RECORD

Adams Mill
Bonnie Clare Mines Co.
Bonanza King Mining Co.
Belcher-Hughes Mining and Milling Co.
Boulder Creek Mining Co.
Central Mine
Consolidated Mines Development Co.
Dixie Meadows Mine
Dewey Mine
Downey Bros.
Encomotas Copper Co.
Fairview & Red Rock Mines Co.
Florida Silver Mines
Foerster Mill
Gold Ore Mine
Gold Chariot Mine
Great Falls Barker Mining Co.
Hawke Milling Co.
King Copper Mine
Logan Mining and Milling Co.
Miller Independence Co.
Molybdenum Mining and Reduction Co.
Middlepass Mines Co.
Mike Horse Mining Co.
Memphis Red River Mining Co.
Promoter Mine
Rose Chemical Co.
Santa Xavier Mining Co.
Sunshine Copper Co.
Sandewal Consolidated Copper Mines
Silver Camp Mill
South Star Mines and Smelters
Southern Cross Mine
Texas Hill
Tiger Mine
Western Ore Concentration Co.
Wallace Smelter Plant
Waldorf Mine
Western Gold and Copper Co.

Tungsten and Molybdenite in North Queensland, Australia

The increasing demands for bismuth, tungsten and molybdenite ores, which metals are often associated in North Queensland, and the excellent prices now obtained are causing more attention to be directed to the districts producing these metals. As far as the British Empire is concerned, the Imperial Government has fixed prices for tungsten and molybdenite ores, but high prices are expected to rule for a considerable period.

The more important holdings of the Wolfram, North Queensland, district have been acquired by the Thermos Electric Ore Reduction Corporation of Luton, England. A start has been made toward active mining operations on a large scale; a central power station of 800 hp. is being erected. Diesel engines coupled to electric generators will supply power to the compressor plants at the mines and for a mill that will be erected.

The field has been languishing for some years owing to want of sufficient capital to develop the mines and also to lack of cheap and efficient crushing facilities. The mines have been worked by following the pipes or crevasses of quartz between the porphyry or granite walls. These pipes are sometimes phenomenally rich in patches, alternating with lean spots of varying size. Wherever the pipe enlarges, the metal contents generally prove poorer; that is, the metals are more sparsely distributed and cannot be easily picked by hand for bagging. Mining is rendered difficult, owing to the irregular directions taken by the pipes in increased depth.

In 1916 and 1917 there were a few mines, privately owned and worked, producing as much as a ton of molybdenite and as much or more bismuth-wolfram weekly. The quality of the metal won is excellent, the molybdenite assaying 87% to 94% for MoS_2 and the tungsten often assaying 66% to 68% tungstic acid. All this metal was picked by hand as the ore was brought to the surface. After hand-picking, the remaining ore is sent to the mill for treatment.

It is therefore with a great deal of interest that the coming of a new concern is watched, and it is hoped by the independent miners and engineers on the field that the problem of efficiently treating the product of the field will be solved by the new company. It is probable that the new company will be free from the prejudices and defective practices fatal to quick extraction.

Although the annual production of this field canot be far short of $500,000 for the three metals, the present mill, with a capacity of one ton per hour or less, has had to satisfy the mining public, which, whenever possible, resorted to hand-picking, the mill being unable to treat the richer ores at all, and with difficulty ores containing 6 to 10% of the mixed metals. The milling consists in crushing with stamps, extracting the wolfram and bismuth by jig and table concentration and the molybdenite by flotation, kerosene being used as a reagent.

The molybdenite is badly broken up by the action of the stamps, and the loss in the jigs and tables is excessive. In spite of protests from the producers who have to pay for this most inefficient milling and heavy losses in tailings, the late owners of the plant would not attempt to improve their methods.

A charge of $9 per ton for milling the low-grade ores and $9 per milling hour, or approximately $18 per ton on high-grade ores, was collected for this work.

OPERATIONS OF THE FRENCH COMPANY

In 1913 a French company started operations, intending to treat the dumps and ores too poor to stand transport or treatment by the existing mill. There was about 60,000 tons of dump material available, all of which had been picked over by hand. A sudden rise in prices before the French company got into operating condition caused a general treatment of the dumps once more by hand, and when the company started work the dumps were about cleaned up. Unfortunately, they had to cease operations since they had no mining interests in the field and their capital was exhausted. Their crushing plant remains on the field, and its large size alone precludes operations on a small scale. Lack of capital has hitherto prevented any reconstruction.

The method of crushing favored by the French company was to take the run-of-mine ores, obviating hand-picking entirely. The ore was passed through rock breakers to rolls in series with screens. Eight-mesh screen was finally used for retaining the molybdenite flakes. This method recovered most of the molybdenite and left very little for flotation. The nature of molybdenite calls for some such treatment to avoid sliming; wolfram, being also a sliming metal, was likewise benefited by not passing under stamps. The system was cheap and efficient, and much useless pounding of the ore was obviated.

It is hoped that the advisers of the new company will make an impartial inquiry into the merits of the crushing systems previous to making their choice. Engineers on the field at least are not uncertain of the result.

Sampling and Analyzing Zinc Ores and Products

By J. H. HASTINGS*

Practical suggestions for sampling ores in place, old dumps, mill and smelter feed, concentrates and spelter. Methods in vogue at mines, mills and smelters. Care and disposal of samples at customs smelter and custom mills.

To describe the sampling of mines for purchase would require a volume by itself, but a general description of the common practice may be an aid in sampling. Zinc properties are sampled, in general, in two ways, according to the nature of the deposit and the amount of development; by making cuts across the face of the vein or deposit, or by drilling with a churn or diamond drill. The former method is commonly used in veins, the other in sampling sheet deposits such as those of the Joplin district.

An engineer may be called upon to make an examination of a zinc property, which may be anything from a prospect without development to a fully developed mine with ore reserves already blocked out. If it is of the vein class, his aim will be to get his samples from across the vein at certain distances along the strike and dip. This is not such a difficult matter provided the vein is sufficiently opened up, but when the deposit is simply an irregular mass, it is a difficult matter and his chief aim will be to sample the deposit at regular intervals.

In the case of a prospective property that has not been opened below the surface, all that can be accomplished in the way of sampling is to dig trenches across the deposit at certain distances from each other. These trenches will not necessarily be at right angles to the dip or strike of the orebody, but will show what there is near the surface. It is only a hazard as to what to expect farther down.

GENERAL UDERGROUND SAMPLING

Some mines are sampled every five or ten feet along the vein by taking samples from the floor or the roof of the drifts and at like distances in the shafts, winzes or raises when in the vein. These samples are generally from a 3- or 4-in. wide channel cut in the ore with a single-jack and gad. They weigh from 5 to 40 lb. each and are placed in canvas sacks and tagged. As a rule the engineer marks the samples simply by number and records the sample number on a blueprint of the mine plan, which makes reference easy and convenient, the samples representing the grade of the ore in place in the mine.

The samples must be reduced to a convenient size and mesh for analysis and also dried. The best manner in which to reduce the sample is to first grind it in a small jaw-crusher to about ¼-in. diameter; then dry, mix and reduce the quantity by quartering to 10 lb. This can be further reduced to 30-mesh in a "coffee mill" and riffled to ¼ lb. and then pulverized in a disk pulverizer or on a bucking board until all the pulp will pass through a 100-mesh screen. The final sample of 4 oz. is placed in an envelope or paper bag and properly marked and is ready for analysis.

The type of mineral deposit occurring in the Joplin district may be sampled by drilling with a churn drill. Holes are spaced at regular intervals and the drillings removed from the hole with a sand pump. After the drill gets down into the ore, these drillings may be emptied into a tub and allowed to settle, the water drained off, the sample washed into a pan, dried, mixed, any lumps reduced and ground to 30-mesh, riffled to a quarter pound and pulverized to pass through a 100-mesh screen, when the sample is ready for analysis.

Similar deposits may be drilled with the diamond drill and the part of the core containing mineral matter reduced. Of course, in any kind of sampling sufficient data as to distances, locations, etc., must be kept so as to insure a complete record, from which measurements the engineer bases his calculations of the tonnage in place, and from the analysis of the samples the value of the ore.

OTHER MINE SAMPLES

There are many old dumps throughout the country containing zinc, and it is another problem for the engineer to obtain a representative sample from them upon which to base the calculation of their value. The two accepted methods are the pipe and the opencut methods. The former can be used only when the ore has been broken finer than a 3-in. cube, when it is feasible to drive a 3-in. pipe into the dump and withdraw it filled with ore. The other method, the use of the trench, consists in digging through at regular distances and stripping down the walls of the trenches for the samples, which may then be crushed, quartered, ground, mixed, riffled and pulverized for analysis. In case the pile of ore is very high and in form of a cone, the trenches can be dug from the periphery and down from the top.

After the mine or prospect has reached a productive stage, samples must be taken from day to day as the work progresses in order to keep informed of the grade of the material being extracted to distinguish between ore and waste rock. These samples also provide a means of keeping a check on the original estimates of the value of the ore deposit. The common method of taking samples from a mine is simply to have the foreman take a grab sample of the pile of material shot down and by taking cuts from the different faces where the work is in progress. These samples are dried, crushed, ground and pulverized and, as there are generally a good many of them, are small in size, to make less work.

The shipments from the mine are either direct smelting or milling ore. In many instances the mill is situated near-by; in others, the shipments are made over a considerable distance. In case of smelting ore the shipments are sometimes made to some custom smelter, sometimes hundreds of miles from the mine. When the ore goes to a custom plant, the receiving works' samples are used as a oasis for settlement. A check sample, which should be as nearly representative of each carload as facilities at hand can make it, should, in all cases, be taken at the mine. In the case of direct smelting ore, each carload is generally sent to a public sampling works, where an automatically cut sample is taken and the car rebilled to its destination. This is a satisfactory procedure where convenient, but even in this case a check sample is taken at the mine.

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*Monongahela, Penn.

When the mill is adjacent to the mine, the removal of a sample automatically can be accomplished with a mechanical sampler run in connection with the crushing plane. When sent to a custom mill, a certain amount, preferably one-tenth of the weight, should be thrown aside while loading a car, and this crushed or broken with a hammer to 2-in. lumps, when it can be tenth shoveled and this tenth broken to ½-in. and reduced by quartering to 50 lb. and a 5-lb. moisture sample removed from the discarded portion. The 50 lb. is then dried, ground in a "coffee mill" to 30-mesh, riffled to ¼ lb. and this sample pulverized. This procedure applies to shipments to smelteries as well. In the latter case the ore is nearly always calamine and easily broken. These samples should check quite well with the results obtained from the receiving-works' samples.

Once the ore is received at the mill, it must be sampled automatically as it is unloaded or by the tenth shovel process already described, and the moisture determined. The next problem is to secure representative samples by which to control the grade of the products and follow the losses. The daily mill feed must be sampled if feed is from stockpiles, and such samples should show results consistent with the ore receipts. The next samples in importance from an economical viewpoint are the tailings in order to determine the losses occurring in the milling process. A practical way to obtain the mill feed or crude-ore samples is to have an automatic sampler cutting out a certain portion, or have a workman periodically reserve a portion of the crushed ore. Some sort of automatic tailing sampler should be installed, if possible, or this sample can also be taken periodically. As to sampling the intermediate and finished products, automatic devices should be used wherever practicable in order to eliminate the human factor, but, of course, this is not always feasible especially in a small mill.

Mill Shipment Samples

The sampling of the products of the mill for shipment, ranging in size from ½-in. down to the finest pulp —that is, from jig concentrates to flotation concentrates —and from dry material up to that holding 18 to 20% moisture, should be carried out in such a manner as to be a reliable check on the sampling done at the smelting works. The usual methods for sampling the fine material are by the pipe sampler, either from the car or wheelbarrow used in loading, and by digging a certain number of holes in the ore after being loaded in the car and scraping the samples up from the walls of the holes. Of the two methods, that of the holes appears to be the most accurate, as ore is likely to stick in the pipe and not give an even section of the carload. After the sample is taken from the car, if finer than 30-mesh, it is quartered to about 5 lb.; if coarser, about 50 lb. is taken and reduced in mesh by grinding, then in quantity by quartering. A moisture sample consisting of the regular sample for analysis or an extra portion should be weighed out and dried. This sample usually amounts to 5 lb., and is weighed on special moisture scales, supplied with double beam to read percentage direct. The sample is further prepared for analysis by methods already described.

The next stage in the sampling process is when the ore arrives at the smeltery. It may come in the form of lump calamine, lump sulphide or any of the various mill products, both calamine and sulphide. (The term calamine is used here to designate any of the oxidized zinc ores.) The ore may be imported from Australia, Sardinia, China, and various other parts of the globe, or shipped from different local points. It is customary for the shippers to have a representative on the ground to inspect, in their interests, the smelter's sampling methods, and, in case of imported ore, for the Government also to have a man stationed at the works to take the necessary samples to enable a proper duty to be exacted.

At a few of the zinc smelteries there are proper facilities for sampling lump ore automatically or at least mechanically, but at most it is rather a slow and unsatisfactory process to procure a representative sample. Where neither facility is provided, the lump ore must be sampled by taking one-tenth, or one-twentieth of a car and breaking the lumps to 2-in. size either by crusher or hammer; taking one-tenth of this portion and again breaking the lumps to ½ in.; then mixing and quartering the ore to 50 lb., taking out a 5-lb. moisture sample and grinding, riffling and pulverizing. When the government requires samples, the final sample for pulverizing should weigh about 1½ lb; the sample is divided into six portions—two for the Government, one for the shipper, one for the smelter, one for umpire purposes and one to be held in reserve. The final samples should be properly marked and sealed. The finer ore can be sampled in the cars or as it is being unloaded as in mill shipments.

Lot Samples at Smelter

After the ore is unloaded and sampled and in the storage bins, its course through the smelting process begins. The ores may be smelted separately or mixed in different proportions beforehand. A daily sample is required of each kind of crude ore charged to the roasting kilns, or to the spelter furnaces, according to whether it is sulphide or oxide. The samples are generally taken from each car of ore as it is hauled to the kilns. A pipe sampler, slotted and pointed and closed at the bottom end, can be thrust into the ore and gives a very satisfactory sample as the ore is dry and fine. This gives a bucketful of ore which may be riffled to 5 lb., dried for percentage of moisture, ground to 30-mesh, divided by a Jones' riffle to from 2 to 4 oz., and pulverized. The roasted ore is sampled in a manner similar to the crude ore. A sample should be taken for each set of roasting hearths.

The roasted ore, after being conveyed to the mixer building, is deposited in bins or mixed at once in furnace charges. The furnace charges are sampled as they are being made up, preferably with a pipe sampler, or taken from the stream of ore being discharged from the bins—the samples being placed in cans. If it is wet calamine ore, the cans should have screw tops. There should be a sample of the charge for each furnace. The samples are prepared the same as the kiln samples. Moisture samples should be taken in all cases on the crude ore, since otherwise errors are likely to be introduced through handling or manipulation.

The residues that are raked out of the retorts, if they are thrown away, should be sampled periodically, either by taking shovelfuls out of the residue car or by the pipe method. If they contain other metals and are reserved for re-treatment, of course each car shipment must be carefully sampled by the pipe method or by the tenth or twentieth shovel. It is sometimes difficult to procure an average daily sample, especially if the residues are allowed to accumulate for more than one day in bins beneath the spelter furnaces.

The spelter must be sampled periodically by reserving a certain number of slabs from each draw, and if a special grade is being made, each car must be thoroughly sampled. The standard method set by the American Society for Testing Materials is to take six slabs at random and saw each slab completely across from the middle of one long side to the middle of the other and use the sawdust as the sample, or drill three 9-mm. holes along one diagonal of each slab, boring completely through and taking care to make fine drillings. The holes should be drilled as nearly as possible at the middle and halfway between either end and the middle of such diagonals. Go over the drillings or sawings with a powerful magnet to take out any iron that may have come from the drill, or saw and mix the sample thoroughly. The drill or saw must be thoroughly cleaned before use, and no lubricant shall be used in either drilling or sawing.

ANALYSIS OF THE SAMPLES

The analyses necessary on the samples from a zinc-mine examination depend upon the character of the ore. Determinations of the metals occurring in commercial quantities must be made, also determinations should be made on enough samples to show the impurities present affecting the metallurgical treatment of the ore.

The samples representing shipments to smelteries should be run for zinc and such other metals as are paid for and for any impurities for which the smelter is penalizing. The samples of shipments to custom mills must be run for zinc and other metals and impurities, as stated for smeltery shipments. In cases where the mill belongs to the mining company, the samples should be run for zinc and other valuable metals, leaving the determination of impurities to be made on the mill-receipt samples.

At a custom mill the buyers' pulp is anaylzed in duplicate for zinc and other metals being paid for, and also for impurities on which a penalty is imposed. A pulp sample is sent to the shipper, who analyzes it for the same, and on comparison of the shipper's and buyer's results, if there is more difference than the limit which has been agreed upon beforehand, the umpire pulp is sent out to a third chemist, and if his results fall between the two, it is taken as final; if not, the one nearest to the umpire's result, whether purchasers or sellers, is taken for settlement.

The analysis required of the finished mill products consists in determining the metals that the smelter would pay for as flux or as recoverable and the impurities affecting the value or grade which could be removed in the milling process.

The furnace charges are run for zinc and the residues from the spelter furnaces for zinc and other valuable metals and, in case of shipments, for impurities that may affect the further smelting of them.

Spelter consists of four grades—High-Grade, Intermediate, Brass Special and Prime Western—and according to the American Society for Testing Materials should show analyses as follows:

	Zinc, Minimum	Cadmium, Maximum	Iron, Maximum	Lead, Maximum	Aluminum	Other Elements, Tin, Arsenic, Antimony, Sulphur	Sum of Cadmium, Iron and Lead, Maximum
High-grade.. ..	99.85	0.05	0.03	0.07	None	None	0.10
Intermediate....	99.35	0.50	0.03	0.20	None	Traces only	0.50
Brass special....	99.60	0.75	0.04	0.75	Traces only	Traces only	1.20
Prime western	98.00	0.75	0.08	1.50	Traces only	Traces only	2.00

Analysis of the periodical samples should be made in accordance with the foregoing, likewise, the individual shipments of the first three grades.

Iron Industry in Chile

Among the subjects considered by the National Congress of Chile during the special session convened May 9 was the adoption of measures for the establishment of the iron industry.

The iron and steel imports of Chile during 1913 amounted to 266,000 metric tons, which would indicate an actual consumption of 65 kg. per capita. This consumption is considerably less than that recorded in countries where the development of manufactures is further advanced than in Chile. The per capita consumption in Germany, for instance, was 380 kg. prior to the war; that of the United States, 250; of Great Britain, 170; and of France, 150. There has begun an era of industrial progress in Chile, and it is probable that the per capita consumption of iron and steel will increase.

While it is true that Chile possesses iron mines of considerable richness, the absence of good coking coal will be a handicap to the new industry. It is at present planned to use charcoal in the furnaces, and the government is planning to secure the services of Swedish and Belgian experts who are familiar with this industry. The forests of southern Chile will supply an abundance of charcoal for many years to come, and the rivers of the same region can be made to produce the horsepower required for the new industry.

Indian Mica Production Increases

Mica produced by mines in southern India in the year ended June 30, 1916, was 505,037 lb. compared with 331,568 lb. in 1914-15, says *Commerce Reports*. Exports from Madras in the fiscal year ended Mar. 31, 1916, were 576,240 lb. (all to the United Kingdom); in 1914-15 they were 621,376 lb. (133,316 lb. to Germany and 4592 lb. to the United States); and in 1913-14 the total was 1,217,552 lb. of which 688,576 lb. went to the United Kingdom, 481,600 lb. to Germany, 34,944 lb. to Holland, 11,872 lb. to the United States, and 560 lb. to others.

Organization of Industry in Great Britain*

It is not easy to translate into terms of American finance, industry, dimension and employment the thing that is happening in Great Britain in the development of the munitions industry. The thing is so big as to be almost beyond understanding. Today the British Ministry of Munitions is the greatest employer of labor in the world. It controls in the name of the government more than 20,000 workshops and factories and employs almost 2,000,000 people. It is by a long way the greatest single employer of labor in the world. More than this, the activities of the Ministry are constantly expanding. Under the defense of the realm act and the munitions act the government has taken to itself perfectly unprecedented power over industry. . . .

England's Enlarged Industrial Equipment

Great Britain will emerge from the war with her industrial equipment immensely varied and enlarged. A great part of the work done by the industrial and scientific agents of the war services will be of the greatest permanent usefulness. For instance, attention has recently been called to what English scientists and artisans have done in the matter of producing high-power lenses. Formerly the Germans monopolized this business. Nobody in England knew much about the manufacture of this kind of glass or its conversion into lenses. War made it absolutely necessary that these aids to vision be produced in numbers never before dreamed of. A committee from the Ministry of Munitions set about to discover the formulas for producing high-power glass and succeeded. Today it is confidently declared that England can surpass the Germans in this, one of the fields in which the Germans regarded themselves as supreme.

Before the war England, although itself a great iron-ore producer, brought immense quantities of ores from Spain, Scandinavia and other countries. The shortage of shipping and the increased requirement of iron and steel made it absolutely necessary that more of the ore be produced at home. The Ministry of Munitions declared in a recent address that accomplishments in this direction are equivalent to increasing the national product of steel by more than 2,000,000 tons a year. Committees have been formed to project this enlarged scale of the metal industry beyond the day of peace and to insure expansion of production after the war.

There will of course be demand for everything that can possibly be produced in this line, because all kinds of iron and steel construction that could possibly be postponed have been prohibited during the war. London and every other city in England is dotted with half-finished buildings on the American steel-frame plan which were started before the war and left unfinished when the edict went forth that no more steel could be spared for such purposes. It has been almost impossible to build any kind of structure in these islands in the last two years. No matter how necessary it seems, a hard-hearted building authority which is in intimate league with the military and munitions department insists on viséing every proposal for construction work, and it is about as easy for a camel to go through the eye of a needle or for a rich man to escape the income tax as it is for a mere citizen to get the necessary permit to erect a building of any kind.

Forced Economy in Materials

A very important part of the government's work of supervising industry has been the enforcement of measures for economy in materials, labor, transportation and the like. When the flour mills of the country, for example, were taken over by the government, there was an inquiry which developed that the transportation of grain to small mills was costing more money than the actual milling process. The result has been a movement to close small establishments and to concentrate the business in large ones for the sake of economy in both transportation and operating costs. The same thing has been applied to many other industries. Before the war England looked up to and admired the American system of large-plant production but imagined it could never be adapted to the requirements of a country like England. Today, England is advancing so fast in this direction that by the time peace is restored it will be quite able to compete with America and Germany in this regard.

All manner of materials which formerly were allowed to go to waste are now gathered up and conserved with the greatest care under government direction. For instance, just the other day an announcement was made that hereafter worn-out army boots would be gathered in depots and sold either to people who wanted the material in them or for further wear. The army boot is made of the best possible material, and after it has been utterly worn out for the purposes of the soldier a large share of the material in it is available for other uses.

England has discovered how to produce all the potash it immediately requires; America is likewise increasing its domestic potash supplies, and the Kali Syndicate is likely, if the war lasts long enough, to discover that its monopoly of many years is a punctured balloon.

All kinds of scrap metal are gathered up with the greatest care. Shortage of shipping made it absolutely necessary to draw more exclusively than ever before on the timber supplies of the islands, and today one of the most disheartening sights one will note from a railroad train is the spectacle of gangs of Canadian lumbermen cutting down and logging the beautiful forests. It is worth while to add that this work likewise has been done as carefully and systematically as wartime conditions permit, with a view to inflicting the least possible injury on the forests. Trees are carefully culled out of them in such a manner as to leave the smaller ones and give them a better chance to develop. There is no such wicked waste of timber supplies as has been going on in the great forest areas in the United States for decades past, with the result of finally bringing that country to within the verge of a lumber famine.

These are just a few examples of the industrial reorganization, the new economies, the increasing efficiency, the intensive devotion of national resources to the national cause, that has been effected in Great Britain. The point is that as the United States more and more realizes what its opportunity in this war is, it will appreciate every increasing necessity of adopting every measure of conservation and efficiency that has been adopted in Europe and improving upon them.

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*From an article in the New York "Sun," by Judson C. Welliver, its London representative.

Tin Smelting in Bolivia

By Mark R. Lamb
Metallurgical engineer, 30 Church St., New York.

Potosi may be said to be the birthplace of tin smeltng in Bolivia. Many years ago—before you and I knew anything about tin—Don Luis Soux was in charge of the silver mines of a group of very aristocratic people. These silver-mine owners were practically "titled," since to be an *Azoguero* was like being a member of the Engineers' Club in New York. But the profits from the silver mines began to diminish, and Don Luis suggested that he could make a profit by producing tin. You see, the ore was treated only for silver and the tailings contained much tin, which was run to the river.

His master stormed at the suggestion that they should descend to making tin, and he was given peremptory orders not to blot their escutcheon with tin. However, Don Luis needed the money and went ahead and made tin and sold it and turned in the profits, merely asking that a part of these excess profits be at his disposal to increase his tin plant.

You can easily imagine their unbounded indignation at his presumption. Their letter, written in curious Spanish of the period, put Don Luis firmly in his place for presuming to dictate how the *Azogueros* should invest their own money. Afterward, Don Luis, who saw the opportunity and importance of the tin, began to accumulate properties. His efforts and failures and final triumphs make an absorbingly interesting story, and you shall have it later.

First Smelting of Tin

One of his first successes was the smelting of tin ores in water-jacketed furnaces. He had three, and the fued was charcoal. At present no smelting is done, but the margin between smelting and shipping is very narrow. In fact, where concentrates below shipping grade cannot be raised in tin content, probably smelting would be more profitable, especially with present high freight, expensive concentrate bags and shipping delays.

The three water-jacketed furnaces are connected by flues to boilers. In operation the furnace is nothing but an efficient gas producer which incidentally smelts tin. The gases are used to raise steam in the boiler, for remelting the tin in the refining plant and for any other required power purposes. As the tin comes from the furnace it is about 92% pure and is brought up to 96-97% by remelting.

Another tin smelter in Potosi, Don uan Maurice, makes an excellent white metal, as all the necessary metallic ingredients are produced in the district. The sale of this bearing metal is growing. The price of exactly the same metal from abroad is more than double. It is the same condition that ruled in the rubber market a few years ago, when American rubber buyers preferred to pay freight and commission and buy in London rather than buy in New York directly from the Bolivian producers.

But to get back to tin. A subsidiary of the Llallagua company is building a small reverberatory tin smeltery at Arica and is pushing the work rapidly to completion. Besides making high-grade pig tin, it will make the usual byproducts, such as solder, bearing metal and bronze. Mr. Copeland is sticking strictly to recognized practice in the art, and his several years devoted to the study of the industry everywhere that tin is smelted, makes it a certainty that the smelting will be a success. The difficulty of shipping concentrates to Europe at present adds to the certainty of success of this smeltery.

There is another furnace that is making tin from Bolivian concentrate. It is extremely simple and attractive in appearance and, like the Bolivian *yungas*, is pregnant with possibilities. It looks to an outsider, however, like trying to get the fabled genie back into the bottle. The furnace is oval, 3 and 4 ft. in diameter and 3 ft. deep, and uses 300 hp. in ordinary operation. To confine all these horses in such a small stable for any length of time results in melted brick, destroyed cover and much tin fume.

Considerable fuel is required in the reduction of the tin. The explanation of the absence of iron, tungsten, antimony, lead, zinc, bismuth, arsenic, silica, gold, silver, etc., at the temperature of the electric furnace and in a reducing atmosphere, is that the slag is 64% silica.

Quality of Tin Produced

At the time of my visit there was a very attractive pile of pigs of tin ready for shipment. These were said to assay 99.64%, and a sample I took assayed 0.17% As, 0.28% Sb, 0.74% Cu, 0.05% Fe, 0.12% Pb, and 98.64% Sn (by difference), which is somewhat different from 99.64%. Of course, the sample I took was not of all the bars, as I had to take it when no one was looking. Also, it was not a sample of what had been shipped before nor of what will be shipped in the future. It is good work, compared with blast-furnace practice, but is not equal to ordinary reverberatory results.

The smelting of tin in Bolivia came near being made a monopoly or worse. The "worse" was that the tin miner was to be obliged to sell his concentrates to the smelters.

The market for tin concentrates is so disturbed that there will be many changes, and smelting in Bolivia will have a much better opportunity to become established than when German, English and Belgian smelters competed for the concentrate.

A shipment of 11 tons of pig tin smelted in the electric furnace at La Paz has recently been sold in New York. The price obtained was 50¾c. per lb. when best Banca sold at 55c. and Straits sold at 60c. to 61c. per lb. The analysis of the lot is given in the table.

ANALYSIS OF TIN SHIPMENT

	%
Lead	0.076
Arsenic	0.467
Antimony	0.009
Iron	0.225
Copper	0.147
Sulphur	0.077
Tin (by difference)	98.99

Tin is not sold on the basis of analysis. Nothing but Straits tin is considered delivery on the New York metal market, so that such lots of tin from Bolivia, China and other points must be sold simply by seeking a purchaser and making a bargain.

The tin-plate manufacturers insist that nothing will serve their purpose except the Straits tin, which assays better than 99.75%, and they insist that they will be the first to appreciate and adopt a method of using the cheaper tins in the manufacture of their products.

Whether this is really true—that is, whether these manufacturers really try to use tin from other places or not—is difficult to ascertain. There may be some thoroughly good reason for this preference.

The fact remains, however, that before the war the difference between Banca and Straits was not much over 1c. per lb.; the difference today is 8c. per lb., and the metal buyers will tell you that this is due to the fact that before the war Europe absorbed all this off-color tin, whereas now it is all offered in this market and there is keen competition in the disposal of it, so that heavier price concessions must be made. This will, in part, explain to the producer of pig tin in Bolivia why his tin, which assays 99%, is not within 1% as valuable as the product coming from the Straits and assaying up to 99.75% metallic tin.

First Producing Oil Well in Cuba

Havana Correspondence

Well No. 5 of the Union Oil Co., which has lately come into production, was drilled on the Santiago claim, leased by the company. The Union Oil Co., which has its headquarters at Empedrado 34, Havana, is a Cuban corporation. Its oil properties are at Bacuranas in the Province of Havana, only 13 miles from the capital.

VIEWS OF THE UNION OIL CO.'S OPERATION AT BACURANAS, CUBA

Well No. 5 is the first well in Cuba to produce oil in commercial quantities. It is 1005 ft. deep and was making about 10 bbl. a day. On June 5 it was dynamited and began to yield about 150 bbl. in 24 hours. The oil flows by periods three times a day, making about 50 bbl. at each flow. Oil was struck at 925 ft. in a layer of oil sand 80 ft. in thickness. It is the first well where any considerable thickness of oil sand has been found. Since the photograph was taken, the flow of oil has become more steady and there is reason to believe that the production will increase. Another well (No. 4) on the same property, distant about 200 ft. from No. 5, is also producing, by pumping, nearly 25 bbl. in 24 hours. It is only 550 ft. deep, and its production at that depth is somewhat unusual.

The geology of the field has not yet been thoroughly investigated, and the character of the formation is undetermined, but it may be stated that the oil is found near the contact of a serpentine belt, which stretches from east to west in the northern part of Havana Province, with sand and limestone strata probably of Cretaceous age. Oil seepages may be noted at different points along the line of contact; also numerous asphalt (maltha) deposits.

The Union Oil Co. has been drilling on this field for the last two years, and although oil was struck a year and a half ago, it was only during the month of June this year that quantities of oil of commercial importance.

The Santiago claim on which wells Nos. 4 and 5 are situated is 12 hectaras in extent and distant about 13 miles from Havana. This distance can be traveled nearly 12 miles over macadam roads and about one mile over earth roads. This claim and the Francis, the Juan Francisco and the Inglaterra claims, which belong to the Union Oil Co., are all in the Bacuranao district, municipality of Guanabacoa, Province of Havana. On the Juan Francisco claim, adjoining the Santiago, a well is being drilled, which is about 1790 ft. deep at present. At 500 ft. and at 600 ft., small amounts of oil were struck, and at 660 ft. some gas came out. At 900 ft. more gas was noted. No sandstone has been reached as yet, but the work will be continued until conclusive evidence is secured. The opening of this well in Cuba is of considerable importance, since it proves the existence of the oil in such quantities as may be commercially profitable.

Chromic Iron in New Caledonia

A citizen of Sydney, says *Commerce Reports*, who is interested in New Caledonia and has spent many years there, reports that the deposits of chromic iron ore are large. Recently, several American steamers, after discharging cargo at Sydney, went to New Caledonia to load chromic iron ore for the United States, providing a satisfactory cargo for the return trip.

The island is rich in nickel, lead and copper, and there are also gold, silver and coal. The climate, unlike that in some other South Sea Islands, is reported to be quite healthful. The soil is generally broken up by hills, the best agricultural lands being river valleys. The island is about 1000 miles from Australia.

Foreign Iron and Steel Trade

The following table shows the exports and imports of iron and steel and manufactures thereof for the month of May, as reported by the Bureau of Commerce. The first line shows the total value; the second line the value of machinery, included in the total; the third line the volume in gross tons, of those iron and steel products which are reported by weight:

	Exports		Imports	
	1916	1917	1916	1917
Total value	$72,918,913	$107,362,635	..	.
Machinery value	21,984,961	22,960,478	.	..
Iron and steel, tons	540,591	587,900	32,113	26,038

The decrease in tonnage imports was chiefly in ferromanganese and scrap. The increase in exports, both value and tonnage, over last year was large, but the totals were slightly below those of March of this year. The larger increases this year were in billets, ingots and blooms, and in steel plates and sheets.

Imports of special alloys in May were as below in gross tons:

	1916	1917	Changes
Ferromanganese		2,019	
Ferrosilicon	417	1,144	I. 727
Nickel ore and matte	7,865	7,024	D. 841
Manganese ore	74,825	81,269	I. 6,444
Tungston ore		404	.

Ferromanganese and tungsten ore were not reported separately in 1916. Exports of ferrotungsten and tungsten metal this year were 207 tons; of ferrovanadium, 139 tons. Exports of nickel and nickel oxide were 806 tons, against 1622 tons last year.

Steel Production in 1916

The production of steel ingots and castings in the United States in 1916 is reported by the American Iron and Steel Association at 42,773,680 gross tons, which exceeded the make of pig iron for the year by 4,338,893 tons. Of the total last year, 41,401,917 tons were ingots and 1,371,763 tons direct castings.

In 1916, 174 works in 25 states and the District of Columbia made steel ingots, against 134 works in 20 states and the District of Columbia in 1915. In 1916, 230 works in 28 states, the District of Columbia and the Canal Zone, Panama, made steel castings, against 218 works in 27 states, the District of Columbia and the Canal Zone, Panama, in 1915.

The production for two years past has been, in gross tons, according to processes used:

	1915		1916	
	Tons	%	Tons	%
Basic open hearth	22,308,725	69 4	29,616,658	69 2
Acid open hearth	1,370,377	4 3	1,748,769	4 2
Bessemer	8,287,213	25 7	11,059,039	25 9
Crucible	113,782	0 4	129,692	0 3
Electric	69,412	0 2	168,918	0 4
Miscellaneous	1,527		604	
Total	32,157,036	100 0	42,773,680	100.0

It is noteworthy that the production of ingots by the bessemer process shows a very large increase, the tonnage being 11,059,039, the largest output by this process since 1907, when 11,667,549 tons was made. The production by the openhearth process was by far the greatest on record. The crucible output was the largest since 1907, and the production by the electric process far exceeds that of any previous year, it being 168,918 tons in 1916, compared with 69,412 tons in 1915, which was the highest previous record. Included in the production of basic openhearth steel is the production of duplex ingots and castings, 3,436,457 tons, an increase of 1,654,926 tons, or 92.9% over 1915. The total make of alloy steel ingots and castings in 1916 was 1,362,615 tons, being 341,468 tons more than in the preceding year.

Steel production for 10 years past has been as follows, in gross tons:

1907	23,362,594	1912	31,251,303
1908	14,023,247	1913	31,300,874
1909	23,955,021	1914	23,513,030
1910	26,094,919	1915	32,151,036
1911	23,676,106	1916	42,773,680

The production of 1916 was the largest ever reported, exceding that of 1915 by 10,622,644 tons, or 33%, and being far ahead of any previous year.

In 1916 the production of all kinds of iron and steel rolled into finished forms (including blooms, billets and axle blanks rolled for forging purposes and semi-finished products which were rolled for export in that year) shows an increase of 7,987,465 tons, or 32.7%, as compared with the output in 1915. The make of finished rolled iron and steel in 1916 is shown in the following table, in gross tons:

Products	Iron	Steel	Total
Rails		2,854,518	2,854,518
Plates and sheets	13,303	7,440,677	7,453,980
Nail and spike plate	2,979	27,109	30,088
Wire rods	867	3,517,879	3,518,746
Structural shapes	1,823	3,028,141	3,029,964
Merchant bars	993,948	5,625,598	6,619,546
Bars for reinforced concrete work	2,683	458,717	461,400
Skelp, flue and pipe iron or steel	355,445	2,572,229	2,927,674
Long angle splice bars, tie-plate bars, etc.	77,656	614,164	691,820
Hoops	630	367,534	368,164
Bands and cotton-ties		173,311	173,311
Rolled sheet piling, not including fabricated		19,196	19,196
Railroad ties		34,311	34,311
Rolled forging blooms, forging billets, etc.	549	2,015,411	2,015,960
Exports of blooms, billets, sheet bars, etc.		512,483	512,483
All other finished rolled products	372,688	1,296,540	1,669,228
Total, gross tons	1,822,571	30,557,818	32,380,389

The production of galvanized sheets in 1916 was 1,346,924,950 lb.; of galvanized formed products, 130,302,195 lb.; total, 1,477,227,145 lb. This was a decrease of 216,609,851 lb. from 1915, due largely to the high price of zinc.

The output of tin plate was: Coke plates, 2,494,648,296 lb.; charcoal plates, 57,575,979 lb.; total tin plates, 2,552,224,275 lb.; terne plates, 214,176,952 lb.; total, 2,766,401,227 lb., an increase of 401,105,527 lb. over 1915. Exports of tin plates increased from 154,642 gross tons in 1915 to 227,391 tons last year.

The production of merchant bars show an increase of nearly 60%. This was largely due to the quantities of shell steel and shrapnel steel which came under the merchant-bar classification. The exports of steel bars were 774,455 tons last year.

The production of nails in 1916, in kegs of 100 lb. each, was: Wire, 17,147,665; cut, 764,835; total, 17,912,500. The total shows an increase of 2,554,147 kegs over 1915. Exports of wire nails were 3,363,876 kegs, an increase of 1,312,401 kegs over 1915; exports of cut nails were 106,451 kegs, an increase of 11,573 kegs.

The production of forged iron and steel by rolling mills and steel works in 1916 was: Iron, 3352; steel, 920,415; total 923,767 tons, an increase of 400,044 tons.

The production of hammered charcoal-iron blooms, billets, etc., was 80,685 gross tons, of which 5405 tons were made for sale and 75,280 tons for use of makers. The total was 37,504 tons more than in 1915.

The make of cast-iron pipe was 1,080,623 net tons; pipe fittings, 133,710 tons; total, 1,214,333 tons, being only 537 tons less than in the previous year.

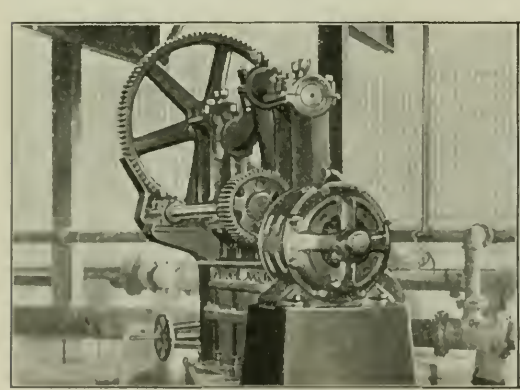
The Selection of Gearing

By W. H. Phillips
Research Engineer, R. D. Nutall Co.

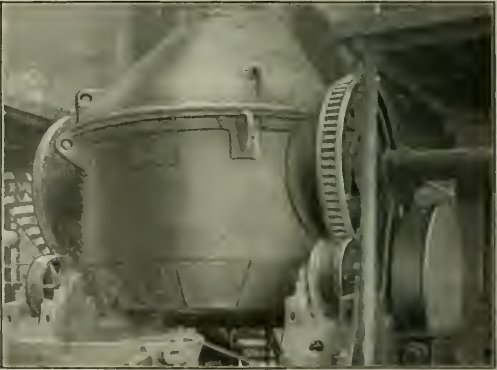
Alloy steels for use in gears had to be eliminated owing to their cost, and in consequence heat-treated carbon steel was developed to give the required results. There are three classes of heat-treatment—oil-quenching, casehardening, and a special process—each possessing adaptability to a certain class of service.

THE rapid progress made in the last few years in the manufacture of high-grade heat-treated gearing was necessary before certain industries, such as the automobile business, could develop. In certain other industries, such as electric railways, with their ever-greater carrying capacity, power and speed, the question of suitable gearing was also becoming serious. The increasing size of the motor, with the smaller available space for the gear, imposed greater loads on the gear material. The development of heat-treatment therefore has been highly beneficial to these industries, but the application should not stop here. The metal-mining field with its heavy and often excessive service, is an industry well suited to the use of improved gearing.

If by increasing the cost of gearing from 25 to 50%, a gear is produced that will triple the life of the untreated-steel gear and at the same time eliminate the breakage with its consequential damage, there can be no doubt of its economy. A few of the advantages to be derived by such a step are: Lower ultimate cost of gearing; reduction of time loss; reduction of labor maintenance; reliability. Each broken or worn-out gear on a crusher in the mill, for example, will tie up the entire mill section waiting replacement of the gear. This will be the greatest loss, and after the cost of the new gear, the labor involved in replacing, the reduced production and the interest on idle investment are added, the ultimate economy of eliminating such waste will be sufficiently apparent.



RECIPROCATING-PUMP GEARING TO RESIST CONSTANT TORQUE



CONVERTER GEARING TO RESIST WIDELY VARYING TORQUE

The untreated gear costs $10 and runs one year. The treated gear costs $15 and runs three years. This would show a saving of $15 on initial cost. If it requires two hours to make replacement, it would require six hours to replace the $10 gear three times, and but two hours to replace the $15 gear, or four hours saved in labor. Four hours would also be saved in production of the machine. The hazard of breakage, with its consequences, is an unknown factor, but may be serious in some services.

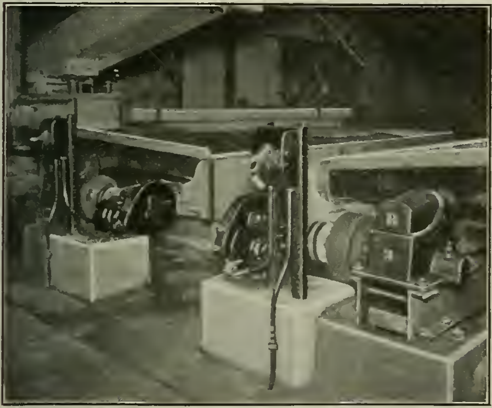
If it is true that there is an economy in the use of heat-treated gearing, the question naturally arises as to what is the proper grade for different conditions. This is a matter that should be given careful consideration, lest the wrong application is made and the results prove unsatisfactory.

Except where weight and space are important, alloy-steel gearing is not commercially practical because of its high cost. In the automobile field, where a comparatively small gear tooth must stand great strains, the strength and toughness resulting from alloying certain elements such as chrome vanadium, and nickel with steel, are very desirable, if not absolutely necessary. But this covers a comparatively small area of the gear field, and for the most part, heat-treated carbon-steel gearing is meeting every requirement imposed upon it and still has a great field for development.

Heat-treated carbon-steel gearing may be divided into three general classes—oil-treated, casehardened, and special-treated gears. The first two classes were introduced in the sequence given and have met many problems. Each has its advantage for different services and in this service has proved efficient. There are conditions encountered, however, in which these two grades are not applicable. The third class mentioned has been developed after a careful study of actual conditions and embodies the best qualities of both the former classes.

There are applications where the service is so light that the resultant long life and low maintenance cost do not necessitate a high-grade product. There are other services where the gear must transmit a uniformly high torque without sudden jars or dynamic blows, in which case it is a question of wear alone, surface hardness as found in the casehardened produce being required. There are still other applications where the load to be transmitted is uniformly low but with occasional shocks. This last-named condition requires a gear with only medium hardness but with high ductility, such as the first class or oil-treated gear. There are installations, and these are in the majority, where the service imposes the heavy duty with its resultant wear as well as shocks with the liability of breakage. This is especially true in concentrating-mill and smeltery work. It is for such service that the third class or special grades of gearing have been developed. By analyzing the conditions and selecting the proper grade it will be possible to obtain the best results.

Before considering the three classes of gearing, comparing and explaining the properties of each, it will be well to explain briefly how gearing is manufactured to insure equality and uniformity of product.



CONCENTRATING-TABLE MOTOR, GEARING ENCLOSED

The old-fashioned eye pyrometer and rule-of-thumb methods of heat-treatment used a few years back have given place to the modern treating department with its closely regulated furnaces and accurate temperature-recording instruments. Poor heat-treatment is worse than no treatment at all, often leaving the steel coarse-grained and brittle. The laboratory that must be maintained in conjunction with the treating department gives the exact analysis of the gear to be treated. Today, knowing the chemistry, the method of procedure becomes an exact science with the uncertainty and doubts removed.

PHYSICAL TESTS FOR GEAR STEEL

One or more gears in every lot of 100 should be taken for physical test, the test, when size permits, being taken from the root of the tooth. This test should conform to the A.S.T.M. standard 2-in. pulling test giving tensile strength, yield point, elongation and reduction. This testing of one gear in every lot of a hundred or fraction of a hundred does not necessarily insure uniformity There may be one or more gears that, owing to one cause or another, have not come up to the required standard. As a check on each gear, the Brinell hardness test may be used, the advantage of this method being that it does not deface the gear to any extent, yet is thorough and reliable. Briefly, it consists in pressing a 10-mm. ball into a flat surface of the steel at a constant pressure of 3000 kg. and measuring the diameter of the impression with a scale magnified and graduated to one-twentieth of a millimeter. As a result of many thousands of these tests, a good working knowledge of the tensile strength of the steel can be obtained. By the Brinell method each gear is tested on the opposite sides of the periphery, it being known what the hardness should be within a certain range. The gear is rejected if the hardness is without this range. In this way a high uniformity may be obtained. This is the most reliable, practical and most widely used hardness test known, all variables except the hardness of the steel itself being eliminated. Therefore, when gearing has been analyzed, properly treated and tested, its conformance to the required specifications can be depended upon.

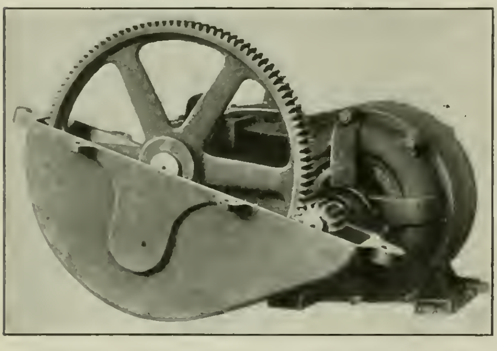
OIL TREATMENT AND CASEHARDENING

The oil treatment was the first method used for hardening and toughening gearing. The method consists in heating the steel to the required temperature and quenching in oil. This treatment is not severe and does not set up heavy strains in the steel. The ductility is high, but the hardness only slightly greater than that of untreated steel, as is also the strength. Where it is desirable to increase the hardness and strength somewhat and retain a high ductility, or in other words, when the gearing is to be subjected to shocks with normally light loads, ductility is important, and an oil-treated gear may be advisable. The increased cost of this grade over the untreated grade is not high, and this may be worthy of consideration. As shown by the Brinell test, the hardness is increased about 75% While this may seem to be a very material increase by comparison, it is relatively small. The oil treatment may be applied to forged or cast-steel gears.

The casehardening process consists essentially of a high-carbon case backed up by a low-carbon core. A low-carbon steel is used, the high-carbon case being obtained by treatment. The depth of this case can be controlled, giving any penetration desired. This treatment has been known for a long time, but it has been applied to gearing only in recent years. Comparing the hardness of the case and core with that of untreated steel, the case is found to be four times as hard as untreated steel, while the core is only slightly if any harder. When the service is such that heavy shocks do not occur and all the gear must do is transmit uniform load, the very hard case of this product resists wear well and the gear will have a long life. When, however, the load to be transmitted is variable and there is liability of heavy shocks, the case will get this strain first and being very brittle will tend to fail. This treatment is somewhat more expensive than other grades as it requires at least five applications of heat to properly harden a gear. Care must be exercised in handling and installing this gear as the case will be spalled off by a slight blow. It is desirable also, in order to secure maximum life, that it be run in both directions to utilize the benefit of the case on both sides of the tooth.

With the steadily-increasing knowledge of steel and of the methods of heat-treatment year by year, the oil-treated and casehardened grades have been improved gradually until now they have been perfected as far as possible, and the metallurgist for some time has been looking to other fields for a grade that would include the good qualities of both, supply what they lacked and, if possible, reduce the cost of the heat-treatment. As stated before, the alloy steel had to be eliminated owing to its cost, and the only course left was to develop a treatment for carbon steel that would give the required results. Several of these so-called special grades were introduced, one of the more notable being the BP grade manufactured by the R. D. Nutall Co., of Pittsburgh, Penn.

It was found that by slight changes in chemistry a combination could be obtained which, when subjected to a special treatment, produced physical properties adapted to gearing. The hardness at the surface of the steel is from three to four times that of untreated steel, and grades off slightly toward the center of the tooth until it is from two and one-half to three times as hard as untreated steel. This reduction in hardness is in a straight-line ratio and each fiber of the steel from the surface to the center or neutral axis of the tooth, which may be slightly to one side of the geometric center, will be stressed in proportion to its ability to carry the load, so that, when the tooth receives a blow or shock, every fiber is carrying its share of the load. The ductility of this steel is comparatively high and is in inverse ratio to the strength. The metal is homogeneous, there being no line of demarcation between any two fibers. While the surface of the tooth is hard, yet it is of a tough hardness and will not shock or spall. It is often advisable to treat the pinion only of a combination, it being the weaker and hardest-worked member. A pinion so treated, owing to the nature of the hardness, is not liable to cause excessive wear on the meshing untreated gear. It can be seen readily that a gear of this type, which is of moderate price, will have a great tendency to overcome breakage and at the same time give a high resistance to wear. It should triple the life of untreated gearing and eliminate the cost of consequential damage and delays caused by gear breakage.



CONCENTRATING-TABLE MOTOR, GEARING EXPOSED

Very often gears are designed with no intention of ever being heat-treated, and may be so flimsy in certain sections that it would be impossible to submit them to the strains necessary in heat-treatment. These gears, however, are intended for light service and usually give no trouble if untreated.

The effect of dynamic blows on spur gearing when running at high speed and transmitting heavy loads, while it has never been accurately ascertained, is known to be great, often excessive, and in such service forged steel should be used whenever possible.

The wide application of the heat-treated gear not only in the railway and automobile field, but also in many branches of the industrial field, among the more notable being the steel mills, smelteries, concentrating mills and mines, has been so successful that it is not a question of heat-treated versus untreated gearing, but rather the selection of the proper grade of treated gear for the service to be performed.

MINE, MILL AND SMELTERY APPLICATIONS

Upon analyzing the gear requirements for mine, mill and smeltery applications, the following inherent characteristics are apparent and the grades of gear best suited to such service are suggested:

Mine service: For hoists reliability is of paramount importance, requiring a gear with great resistance to breakage. Herringbone units are recommended. For locomotives constant torque and reduction of maintenance are important, requiring a gear offering resistance to wear yet tough enough to stand up under conditions that necessarily prevail in mine-locomotive operation. Special grade gears are recommended. For reciprocating pumps constant torque and reduction of maintenance are important, requiring a gear of hard wearing surface. It does not, however, have to resist heavy shocks. Casehardened gears are recommended.

Mill service: For conveyors and elevators constant torque, location and reduction of maintenance are important. Casehardened gears are recommended. For rolls and crushers heavy shock and reduction of time loss are important. A tough, strong gear is required. Special grade gears are recommended. For tube and ball mills heavy vibration, reduction of time loss and maintenance are important. Special grade gears are recommended.

Smeltery service: For cranes widely varying torque and reduction in maintenance are important. Special grade gears are recommended. For converters widely varying torque, reliability and reduction of maintenance are important. Special grade gears are recommended. For casting machines heavy shocks, reduction of maintenance and time loss are important. Special grade gears are recommended. For blowers constant torque and reduction of maintenance are important. Casehardened gears are recommended. It must be borne in mind that these suggestions as to the grades to be used in the different services may be varied with special conditions, but in general the applications will be found to be satisfactory.

In conclusion it might be well to state that with many industries of the country working over capacity, the necessity for reliability of machine parts was never before so great, or the consequences of breakdown so costly. A careful study of the gear situation in the plant or mine should be made therefore at this time, and any changes necessary to insure reliability made at once.

An Opportunity for Engineering Service

The war has interrupted the supply of many mineral that were normally imported. In view of present transportation conditions a serious shortage exists in certain materials and will soon develop in others. Some immediate action is imperative. The first thing is to take a careful inventory of American resources. We must know where the ore deposits are, what has hitherto hindered their utilization, what methods must be used, and what equipment will be needed if an emergency demands their rapid development.

Many properties must be reëxamined from a new point of view—that of present necessity rather than of normal profit. When the shortage is realized, the preliminary steps for relief should have been completed. It is a necessary and patriotic form of mineral insurance.

Do not forget that these are war times and that what may have been valueless a year ago may be a "lifesaver" now. An abandoned copper prospect of 1913 might make a successful pyrite mine in 1917. We are fighting an autocratic enemy who knows his resources to the last pound and uses them with most efficient organization. We have no Kaiser, so each of us must do his share to put our Government in the same situation. The Government needs your facts.

Part of this essential information is contained in the mining reports in your files. The following minerals are of special importance: Pyrite and pyrrhotite east of the Rocky Mountains; sulphur, manganese and manganiferous iron ore, lead, nitrate, chromite, tin, nickel, platinum, flake graphite, sheet mica, and high-grade refractory clay.

Will you submit a list of the reports (or the reports themselves, if you prefer) which you have on properties and deposits that may be of importance under the present abnormal war conditions? Give the date of the report, the name of the engineer who made it, the type of ore, the precise location of the deposit, and its relation to transportation. On request, will you lend these reports for the use of the War Minerals Committee, or such appropriate department of the Government as you may specify? Reports will be held confidential if you so indicate. Can you donate a certain amount of service to the further examination of properties which may be selected as of greatest importance? Address, The War Minerals Committee, Room 4241, Interior Department Building, Washington, D. C.

The members of this committee who have been designated by their respective organizations are as follows: William Young Westervelt, consulting mining engineer, chairman representing the American Institute of Mining Engineers, and the Mining and Metallurgical Society of America; Alfred G. White, mine economist, United States Bureau of Mines; W. O. Hotchkiss, state geologist of Wisconsin, representing the Geology Committee of the National Research Council and the Association of State Geologists; David White, chief geologist, United States Geological Survey.

This committee has, as its specific purpose, the consideration of the development of a sufficient supply of those minerals of which a scarcity now exists or may develop. It is intended to promote united action by the mining and geological professions as represented by Federal and state bureaus and the mining societies, and to secure the effective service of such individual engineers and geologists as desire to be of assistance.

Negligence as Element of Liability

By A. L. H. Street[*]

In reversing judgment against owners of a mine in the Joplin district, awarded by the trial court in favor of a shoveler who was injured at the bottom of a stope through fall of rock and dirt from the roof, the Springfield, Mo., Court of Appeals holds that if the employers did all that a reasonably prudent man could be expected to do in the circumstances, by preparing a level place at the top of the stope to catch any fall of overhanging dirt or rock, liability for the accident could not be predicated on failure to timber the roof. (Neeley vs. Snyder, 193 Southwestern Reporter, 610.)

Foreign Trade in Lead and Zinc

Imports of lead and zinc during March and April, 1917, are reported by the Department of Commerce as follows:

Articles and Countries	March Contents, Lb.	April Contents, Lb.
Lead Ore:		
France	64,692	
Canada	3,057,064	1,029,317
Colombia	1,781	
Salvador	428	
Mexico	2,197,645	1,370,087
Chile		1,142,854
Peru	4,785	86,393
	5,326,395	3,628,651
Lead—Base Bullion and Bullion:		
Mexico	6,870,205	6,953,531
Lead—Pigs, Bars, etc.		
France	69,710	
Panama	8,453	9,989
Barbados		567
Colombia	1,054	
Haiti	37,052	1,882
Canada		1,500
Guatemala		52,400
	116,269	66,338

The gross weight of lead ore imported was 6357 long tons.

The actual tonnage of zinc ore imported in April amounted to 14,696 tons. The countries of orgin and the metal contents were as follows:

Countries:	March Contents, Lb.	April Contents, Lb.
Canada	665,000	145,000
Australia	6,650,000	
Mexico	13,631,418	10,487,907
	20,946,418	10,632,907
Zinc in Blocks, Pigs, etc.:		
Costa Rica	3,611	250
Panama	6,998	2,291
Cuba	68,111	16,488
Mexico	3,308	
Brazil	4,345	
Ecuador		7,580
	86,373	26,609

Imports of zinc dust amounted to 67,287 lb. in March, 1917, and to 134,398 lb. in April.

Exports of lead and zinc were as follows (in pounds):

	March	April
Lead:		
Pigs, bars, etc., produced from domestic ore	7,488,872	6,907,870
Pigs, bars, etc., produced from foreign ore	1,671,469	4,764,621
Zinc:		
Pigs, etc., produced from domestic ore	32,995,927	22,442,083
Pigs, etc., produced from foreign ore	16,460,533	6,495,603
Sheets, etc.	1,819,556	2,907,345

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[*] Attorney at law, 829 Security Building, Minneapolis, Minn.

Details of Practical Mining

Slope Cut-and-Fill Method of Mining

By JOSEPH P. HODGSON
Mining department, Phelps Dodge Corporation, Bisbee, Ariz.

The stoping method discussed in this article is one that is particularly applicable to hard sulphide orebodies in copper or iron mines where waste filling is an absolute necessity for the safety of the men and the property. Since the cut-and-fill method is often used as "cutting and filling" on the horizontal, or in combination with shrinkage, it will be referred to in this paper as the slope cut-and-fill. A concrete example has been selected of a typical stope which is in operation in one of the larger mines of the Southwest, and the outline of its different stages may be enumerated as follows:

A main haulage drift is first driven through and around the edges of the orebody, as illustrated in Fig. 1. The fill or waste raises *a*, *b*, *c*, *d*, *c*, and *f* are next put up to the level above. Then the two-compartment, cribbed, service raises *g*, *h* and *i*, Fig. 1, are carried through the fill as stoping progresses. The purpose of these three raises is to provide ventilation, manways and room for handling tools and supplies. The ore chutes are 25 ft. apart and are situated around the edges of the orebody.

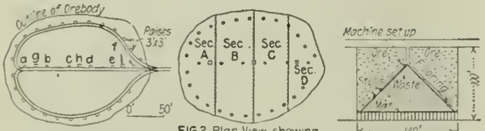

FIG.1 Plan View of Orebody (150'x200') Sill Floor

FIG.2 Plan View showing Sections or Ribbons of Ore. First Stoping Floor

FIG.3 Vertical Section A Lengthwise

METHOD OF SPACING STOPE FOR CUT-AND-FILL METHOD OF MINING

After the main-level drifts, raises and chutes are finished, stoping operations are begun on the first stoping floor, shown in Fig. 2, the sill being left until another stope is brought up from beneath.

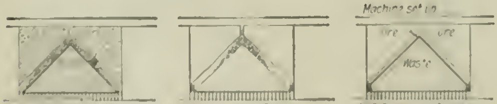

FIG 4 Vertical Section A Lengthwise

FIG 5 Vertical Section

FIG 6 Vertical Section A Lengthwise

SECTIONS SHOWING METHOD OF OPERATING BY CUT-AND-FILL METHOD

In Fig. 2 the stope is in the producing stage. Grizzlies of 10-lb. rails are put over the different ore chutes for safety, and the ore is blasted down. The chutes are drawn and stoping operations continued until the back of the stope is about 15 ft. high. The broken ore is then cleaned out and a floor of plank or split poles is laid, which acts as a mat between the ore left in the stope sill and the waste filling. Also partitions consisting of rows of stulls with lagging may be put in, dividing the stope into four or more sections, if considered necessary as shown by *A*, *B*, *C* and *D*, Fig. 2. These stulls and lagging provide a partition between sections and hold the waste fill in place, one section being carried ahead of the others as stoping proceeds.

The work is so arranged that two sections are producing while the remaining two are being filled with waste. Drilling machines are set up near the raises (*a*, *b*, *c*, *d*, *e*, *f*), and "ribbons of ore" are cut downward along the sections to the limits of the orebody. The largest cuts are made along the major axes of the orebody. The ore is drawn out through the raises (*g*, *h*, *i*) and the ore chutes. Waste is turned in from the level above and allowed to fill the stope until it is within 3 ft. of the back; then flooring is laid on the waste again and machines set up for drilling. The stages of carrying up section *A* are illustrated in Figs. 3, 4, 5 and 6. In Fig. 3 waste has been turned in until it is within 3 ft. of the back. A floor has been laid and the machine set up ready to drill and make the next cut. Several short stulls have been put under boulders. Fig. 6 shows the stope ready for the next cut of ore.

The work in sections *B*, *C* and *D* is a repetition of that done in section *A*. The service raises and chutes are always built up before waste is turned into the stope. After the stope is carried up far enough to be on the slope, there is practically no mucking.

Where local conditions will permit its application, the method described is the most advantageous of any of the cut-and-fill systems; it is safe. the miners working at all times close to the backs, and being on the slope, the stope backs in almost all cases are stronger, it is very elastic, as the crib raises may be inclined in any direction as they are carried through the filling in the process of stoping, in case the ore should bear in one direction or the other; it is economical, as the costs of filling are reduced to a minimum; it produces the least amount of dust, as water machines are used instead of stopers. The costs of handling ore are low, and each mucker can handle a comparatively large tonnage per shift, while the amount of timber used per ton of ore extracted is exceedingly small.

Prevention of Rope Jamming on Drum

By Hale H. Hunner[*]

The rope used was second-hand, ½ in. in diameter and had several kinks that made it impossible to get a perfectly smooth wind when reeling it on the drum. The kinks were pounded out as much as possible when the rope was first put on. After a few shifts the rope had crowded over enough to cut into the layer below, badly mashing the strands, which would have been ruined in a short time.

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[*] Nashwauk, Minn.

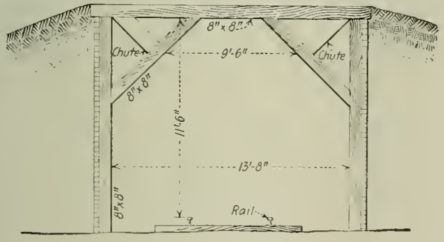
The drum was unwound and rewound, care being taken to drive each loop snug against the last. Where a kink occurred in the rope, a little space was left on either side, which was sufficient to allow the rope to cut in on the lower layer. After a few days' operating, the rope was again rewound and a sheet of galvanized pipe covering was cut the width of the drum and long enough to cover the under layer of rope and lap about one inch. The sheeting was put on as the rope was starting back from the end of the drum, and as soon as two loops had covered the sheeting, the other side was drawn up tight with a loop of hay wire. The rope cut into the sheeting about one-eighth of an inch and never gave any more trouble.

When the shaft was deep enough to use the layer of rope below, the sheeting was removed and placed over the next layer on the drum.

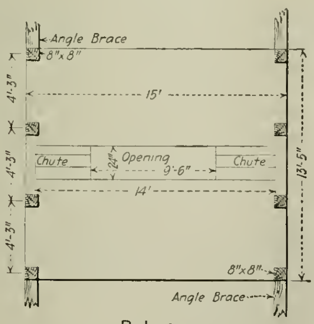
Wagon-Dump Trestle Over Railroad

By Albert G. Wolf*

In hauling ore to the railroad in wagons a considerable saving in time and expense can be effected if. instead of having to shovel the ore, facilities are provided for dumping directly into gondolas. The construction of such a dumping-trestle in details is shown in the illustration. The 8 x 8-in. posts, caps and angle braces furnish a sufficiently strong structure for any wagon load that may be hauled upon it. The general dimensions may be varied somewhat to suit different conditions, but care must be taken to allow sufficient width and headroom. The opening in the floor, 2 x 14 ft., is long enough and nearly wide enough to catch all the ore as it falls from the wagon, and permits the team to be driven astride the hole. The small amount of ore which falls along the sides of the opening can easily and quickly be pushed in with a shovel. The chutes at either end of the opening should be steep so that no ore will stick, and the lower ends of the chutes should not be over 9 ft. 6 in. apart for standard-gage cars. Approaches will have to be built up in a level country; dirt-fill is probably the cheapest and most satisfactory in the long run. If a railroad cut is conveniently situated this expense in construction can be saved.



End Elevation



Plan

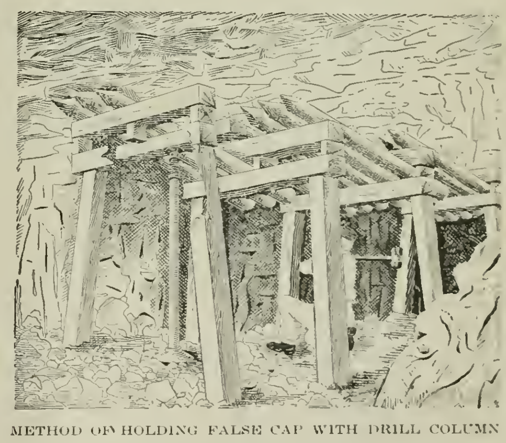
DETAILS OF LOADING PLATFORM OVER RAILROAD TRACK

[In many parts of the country it is illegal to build a loading platform over a railroad track, even over a switch on private property. An approach to sufficient height to load a gondola car and comply with height of headroom required by the railroads would cost the equivalent of many car loadings.—Editor.]

Drifting with a Drill Column

By Algernon Del Mar*

It is usual when drifting through caved ground to drive lagging ahead under the bridge in the cap of the tunnel set and to support this lagging with a false set until enough ground is excavated to place the regular set of timbers with cap and bridge for further work. If the pressure is mainly from above, a drill column may be used in place of the false set with a saving in time, for all that is necessary is to put a headboard sufficiently long to reach across the drift on top of the drill column and screw it tight. When enough dirt has been taken out to place the tunnel set and this has been put in place with cap and bridge, the jackscrew on the column is loosened and the lagging drops on the bridge. The sketch will make this method sufficiently clear. Instead of hammering the lagging in, the same drill column (before being used as a false set) may be used to force the lagging ahead. Some prefer to point the lagging with a chisel edge, while others will use a pencil point. The bridge may be supported on the cap in two or more places according to the pressure on the bridge. The sketch shows a drift and the column in use.



METHOD OF HOLDING FALSE CAP WITH DRILL COLUMN

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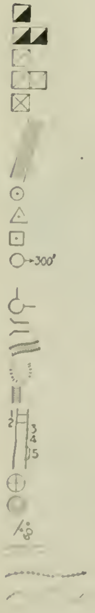
*Mining engineer, Denver, Colo.

*Dewey Mine, Gazelle, Calif.

Correspondence and Discussion

Standard Map Conventions

In the *Journal* of Nov. 25, 1916, E. B. Wood suggested that the adoption of a set of conventional designs for maps would be an advantage. I agree with him. How much more convenient it would be in learning the workings of a mine new to one to be sure of the meaning of the various conventional signs on the maps without having to ask the surveyor. Again, it may be the case that at different periods of the mine's life different surveyors were employed, who each used different signs for the same thing. What is still more confusing is to find on a map the same design used for more than one kind of mine working; for example, note the confusion in mind when raises and winzes extending from the same level are represented by the same sign. Worst of all, some surveyors, either through carelessness or ignorance of what a map should show, fail to indicate all the mine workings. A list might easily be compiled that would show all the usual features at a glance.



SUGGESTED MAP CONVENTIONS

Single-compartment shaft or winze.
Double-compartment shaft or winze.
Single-compartment raise, vertical.
Double-compartment raise, vertical.
Ore chute, or mill hole.
Incline shaft, raise or winze (used in connection with above signs at points where incline holes through).
Survey station.
Triangulation station.
Bench mark.
When level too long for map, last station indicated thus, and distance shown by figures.
Claim corner.
Adit or tunnel portal.
Mine track on surface.
Dump.
Ladderway.
Plan of drift with sample cuts; 1 and 2 across back, 3 and 4 vertically on wall, 5 horizontally along wall.
Churn drill hole.
Diamond drill hole.
Fault or slip, showing dip.
Road, two parallel lines.
Railroad.
Trail.

In choosing a list of standard conventions, it is important not to have too many signs. I have in mind a list proposed by one surveyor, which contained about seventy designs and required a dozen or more colors. Such a list is of no value. In the first place it is impossible to remember all the signs and what they represent, and the colors are useless, for in making prints the value of a color in differentiating is lost and some colors will not reproduce at all. A set of standard map conventions to be of the greatest value should include only such as represent the most common, and therefore most important, features of the surface, underground workings and surveys, and should be entirely in black.

The accompanying list is a tentative suggestion for a set of standard map conventions. With the exception of the fault line, no attempt has been made in this list to cover the field of geological features, for on most geological maps and sections the use of a legend is necessary. Other engineers may consider some of these signs of too little importance to be included in any standardized set, while they may have additional signs to suggest. It is a matter of opinion, and therefore open to discussion. ALBERT G. WOLF.

Denver, Colo., June 24, 1917.

Fires in Mines

In the article, "Cementation as Applied to Mining," in the *Journal* of July 7, as well as in the original article by Mr. Blandford from which the abstract was made, the process of cementation has been referred to as being applicable to the sealing off of fire zones in mines. In a number of districts where mine fires have occurred, the sealing off of the fire zone has, if accomplished, been unsuccessful in attaining its desired result; that is, the extinguishing of the fire.

Assuming that the combustible material consists of sulphides and oxides of iron and copper and old timbers, etc., in old stopes, and that the whole mass could be hermetically sealed so as to exclude all air, the chances are nine to one that combustion would continue indefinitely, as the sensible heat of the burning mass would in all probabilities be sufficient to "crack" the oxidized ores throughout a part of the zone, furnishing more than the necessary oxygen to sustain combustion in the sulphides. This might mean that it would require decades to stop the combustion. Sulphur, while inflammable at a comparatively low temperature, will not burn at 212°, nor will it combine chemically with oxygen at that temperature. The heat of formation of sulphur compounds is well above the temperature of steam under any normal pressure. Therefore, if the sensible temperature of the fire zone should be reduced to less than the oxidizing temperature of sulphur and the cracking temperature of the oxidized ores, the fire would extinguish itself. If, for example, two holes were drilled into the hot zone and water were pumped into one and steam forced out of the other, each pound of water at 212° would absorb about 1000 B.t.u. of sensible heat. When sufficient sensible heat had been extracted, combustion would cease. In fact, the sulphide ores are not, in all probability, burning in the ordinary sense, but the "fire" is chemical, pure and simple. Therefore it is necessary to reduce the temperature of the mass to below the critical point at which the reaction begins or continues to take place.

What the cooling effect in such an operation can be, no one could attempt to estimate, nor could an estimate be made as to how many B.t.u.'s need be extracted from the zone to extinguish the fire, but with known conditions the calculation could be made.

The steam which would emanate from a well, upon condensation could be used again and, even if it eventually became concentrated H_2SO_4, its power of absorption of heat would still be about 600 B.t.u. per pound.

Philadelphia, July 10, 1917. WILLIAM JONES.

Danger in Brass Carbide Lamps

Some time within the last two years I have noticed several articles in the technical press dealing with the subject of danger in brass carbide lamps, as a result of someone's suggestion that he had once heard that brass should not be used for acetylene lamps. According to my recollection, the Bureau of Mines investigated the subject and reported that it had been unable to demonstrate any good reasons why brass should not be used for this purpose. Hence the following incident, observed and tested by me may be of interest:

A man in the course of cleaning his lamp picked up a soft-iron spad and began to scratch off the deposit that had formed on the bottom of the water compartment, which, by the way, was already as clean as careful scraping with pieces of wood could make it. At the very first scratch made with the blunt end of the spad, a large smoky yellow flame, comparing favorably in size and color with that of the common wax match used in Cuba, burst forth.

Upon further investigation it was found that a dense-black scale, probably not over 0.01 in. thick, which covered the bottom of this water compartment, would yield large, fat sparks resembling those obtained from the iron selenide sparking alloy, whenever scratched with the head of the soft-iron spad, but no sparks could be obtained by scratching with the point.

After clearing away a considerable area of this deposit and repeating the test on the really clean brass, no suggestion of a spark could be obtained. In the absence of means for further investigation we concluded that the deposit was carbon which from recent use of the lamp was sufficiently charged with absorbed acetylene gas to ignite under the conditions described. Other lamps which showed analogous conditions, except, that they had not been used recently, failed to yield sparks when such deposits were attacked.

These lamps were all of brass and had once been galvanized. We were unable to attribute the sparks to the brass, but it may possibly be proved that such deposits do not form upon metals of lower heat conductivity.

JOHN B. STEWART.

National City Bank Building, Havana, Cuba.

Tube-Mill Practice in Rhodesia

In the *Journal* of Mar. 17 there is an article by A. W. Allen, on "Tube Mill Practice in Rhodesia," in which he makes disparaging reference to the work done by Komata liners as compared with El Oro liners. I would have replied to this criticism earlier, but have been awaiting answers to inquiries as to who supplied this particular liner, and find that it must have been obtained outside of any accredited agents and is probably not correctly designed for the work it is doing at the property in question.

The remarkable success of the Komata liner in the United States and other countries shows that it can hold its own against any other type. A few years ago some careful tests were made at one of our leading Western mines to ascertain the relative cost and efficiency of the Komata and El Oro liners. Tube mills 4 ft. 6 in. diameter by 20 ft. long were used and the following data obtained:

The first cost of the two types of liners is about the same, but the Komata shows very much less wear of metal than the El Oro. Power consumption with the Komata liners is slightly above that of El Oro liners, but the actual work done with the Komata is considerably greater than that done with the El Oro, as shown by the following tests:

TESTS OF EL ORO AND KOMATA LINERS IN TUBE MILLS

	El Oro		Komata	
Mesh	Feed	Product	Feed	Product
28	14 6%	0 6%	18 5%	0 1%
35	13 7	2 3	16 8	0 7
65	38 7	11 4	35 3	11 6
80	7 3	5 5	8 0	.8 4
150	18 1	37 5	15 5	35 5
280	5 3	15 1	3 7	18 5
—280	2.3	27 6	2 2	25 2
	100 0%	100 0%	100 0%	100 0%

Silver City, Idaho, June 13, 1917. F. C. BROWN.

Gold-Bearing Quartz on the Saramacca River, Dutch Guiana

While attention has heretofore been directed mainly to placer mining, gold-bearing quartz veins are known to occur in Dutch Guiana, South America, and several attempts have been made to develop them.

Rich ore has now been opened up by the Janapau Gold Mining Syndicate on the Saramacca River, samples taken over the reefs showing as high as 34 oz. Au per ton. The distance from Paramaribo, the capital of the colony, to the district is short; the government railroad runs up to a point on the Saramacca known as Kwakoegren, from where the landing proper is but a stone's throw. This trip from Kwakoegren can be made by means of steam launches in three hours, making the whole trip up the river from Paramaribo in seven hours.

There is at present, according to the manager's report, 20,000 tons of ore in sight already developed and in shape for milling.

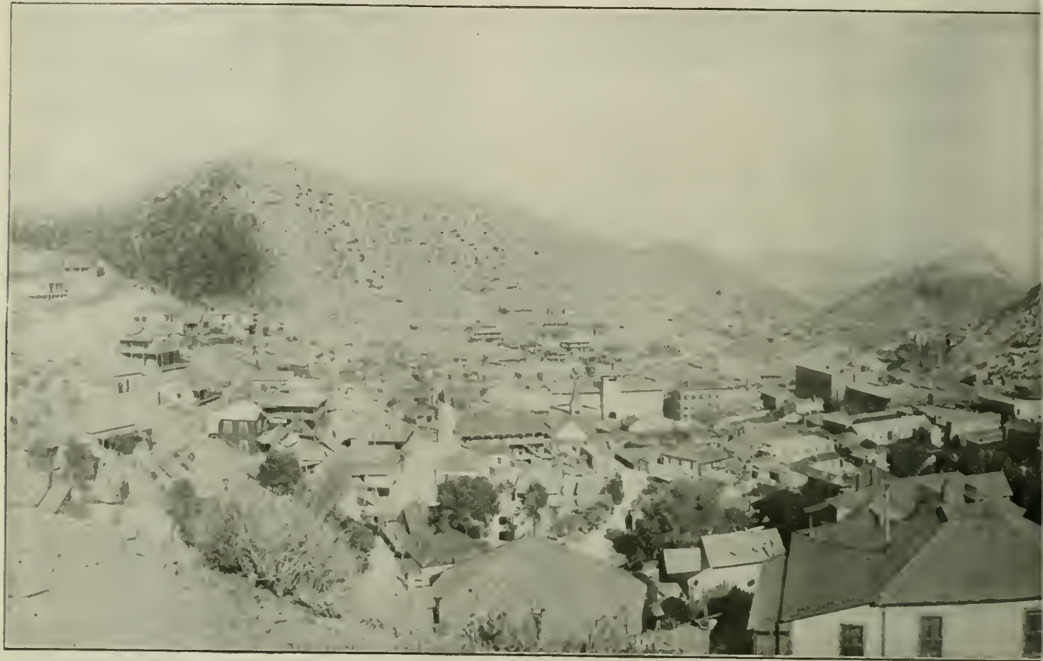
The syndicate, which is purely a local one, has a capital of $20,000 in shares of $20 each; a great deal of the stock has already been taken up, but this amount it is anticipated, will be inadequate for what is actually required to install an up-to-date milling plant and for working expenses.

It has been suggested to erect the plant at the water front or landing, to have a light tramway line laid down for transporting the ore and to establish headquarters for the staff at this point. Water is in abundance the year round; fuel in the form of forest timber is almost unlimited.

J. B. PERCIVAL

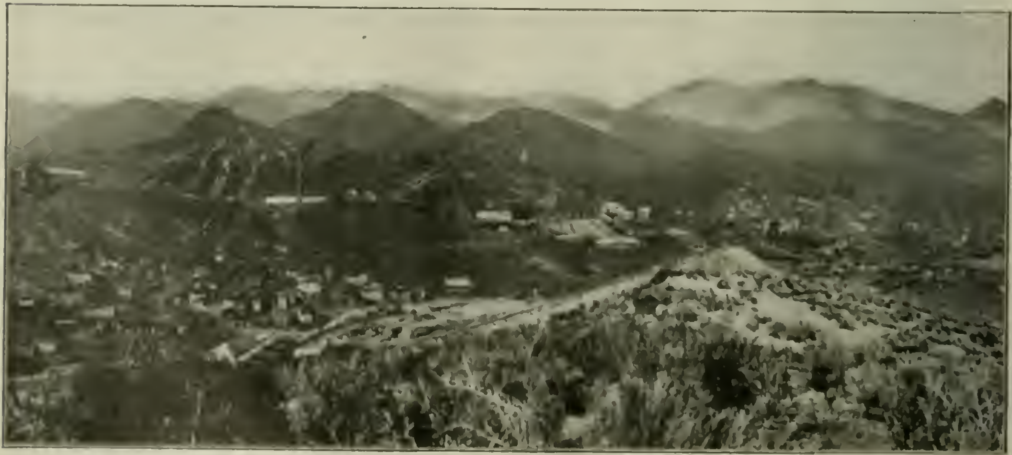
Paramaribo, Dutch Guiana, June 12, 1917.

Bisbee, Arizona's Firs



TOWN OF BISBEE, RECENTL

This view shows the residential section, the famous Sacramento Hill (and the stacks of the o



LOWER PART OF BISBEE DISTRICT, SHOWING GARDNER MINE, LOWELL MINE, SACRAMENTO HILL (IN BACKGROUND), C. & A. JUNCTION SHAFT (RIGHT CENTER) AND C. & A. HOSPITAL

Great Copper District

ONVULSED BY I. W. W. TROUBLES
melting works) in the centerbackground and the familiar road up Tombstone Gulch at the right

SACRAMENTO HILL, WHERE LOW-GRADE DISSEMINATED ORE IS NOW BEING MINED BY THE COPPER QUEEN COMPANY; SACRAMENTO SHAFT AND LOADING STATION IN FOREGROUND

Events and Economics of the War

The drawing of men for the draft army overshadowed in importance all other events of the week. Preparations are now under way for the speedy examination of those drawn. The Food Bill finally passed the Senate but in a form that is said to be objectionable to both the House and the President. The $640,000,000 Aviation Bill, the largest single appropriation ever made, is now law.

The need of ships has been impressed upon the country. The removal of Denman, followed by Goethal's resignation, relieves a situation that long since had become serious.

Abroad, the British Cabinet has undergone another shape-up. Treason and ignorance have caused a temporary collapse of the Russian offensive. The new German Chancellor failed to indicate in his speech any possibility of change in the imperial policy.

Business Expansion Possible Under Federal Control

The effect upon business of Federal control is discussed by the National City Bank in the last issue of its publication, *The Americas*. England's achievement in regulating its industries is cited as an example of what we may do.

"As to war-time conditions," says the City Bank, "we see Great Britain with its population of 46,000,000 (comparing with our 104,000,000) and its manufacturing capacity estimated to have an output of about eight billions' worth of product a year at the beginning of the war (comparing with a 1914 capacity in America of over $24,000,000,000 and now at least $29,000,000,000), confronted with the necessity of raising with emergency speed 5,000,000 soldiers out of her limited population (as against our present expected levy of 2,000,000, with talk of a final 5,000,000 out of our more than twice as many inhabitants) and with the economic burden of manufacturing immense stores of munitions with a national industrial plant a third the size of our own, in the face of a draft of so high a proportion of her working forces, and of the necessity of importing practically all of her raw materials.

"Yet, handicapped by a collapse of the machinery of international credits and exchange, so vital for her necessity of getting materials, confronted also with other critical problems from which we are absolutely free, Great Britain has so organized that the production of her industry is enormously increased despite the draft of men for war, internal prosperity is general, and a consistent policy of keeping up the foreign commerce of the country has been astonishingly successful.

"This has been done by means of a progressive government control that has now reached a degree of direct touch with every inhabitant's personal affairs that, in August, 1914, almost any Englishman would have refused to consider as a possibility.

"England has accomplished a wonderful organization of national unity and team work, entirely compatible with the individuality and initiative and enterprise which Englishmen and Americans will never give up. Railroads, mines, the controlled industries, shipping, and other big forms of enterprise are working under the local management of their owners—working under some satisfactory agreement as to remuneration, and with the individual managements in the direct employ of the nation, exercising all their abilities to do what the government directs. Outside of these, enterprises that are still under independent management, and looking for profits in the ordinary way, are nevertheless guiding their activities in accordance with definite government policies, subject to its permission in regard to materials, labor, prices, wages and priority of preference in handling business.

"War-control has practically gripped every person's affairs. Wastefulness at home or in the shop is an offense. The government has power to assume control whenever it sees fit, of any factory, any railroad, any farm, any shop. It is a 'summary offense against the defense of the realm' for either workman or business executive to absent himself from any work or duty in which the government has an interest, to wilfully miscarry instructions, or to impede or delay the production."

"We have," the article continues, "a Council for Industrial Defense, with a Priority Board, at Washington. We are already throwing the full strength of our great metals industries into war preparations. Our railroads have been coördinated. If the Government decides to adopt the English idea of automatic priority control of business, giving a convenient period for preparation, our great industrial resources should assume the expected burden."

Ford's Tractor "Food Makers"

In a description of the new Ford tractor Theodore M. Knappen, writing in the New York *Tribune*, says in part:

If the last crust will win the war, as the German food dictator says, the crust will be ours. Fifty mechanical horses working a 7000-acre farm near Detroit are showing the way. These 50 little farm tractors are the officers in training for the million that are to come. They are showing how they can do everything on a farm that a horse can do—and a lot more. The horses can go to war. The little tractors will look after the farms and the food supply.

If the war lasts another year, 50,000 of these little tractors will replace 600,000 horses and an untold amount of human labor. If it lasts five years a million tractors will be doing the work of 6,000,000 horses and a million men. After that we may expect to see a million mechanical horses born yearly—born full grown and ready to work.

The first battle will be fought in England. The first tractor army goes there—paid for by the British government, but without profit. Thus the tractor baffles the submarines. Food produced in England is never sunk.

It's a little machine, this tractor. It is only eight feet long and four feet high. Husky farmers look at it and joke about buying one for a watch charm. But the Ford organization brains, experience and money are behind it. Several hundred men are at work in the experimental factory located on the farm. Actual production on an enormous scale is near. The difficulties in the way—such as lack of material—are great, but as a war measure the tractor has the right of way.

And after the war? A revolution in agriculture. These little machines will eventually cost as little, perhaps, as $200 or $300—not more than a good draft horse, and it costs less to keep them up.

The day before I had seen 40,000 men at work in one Ford factory. I foresaw another army corps turning out a "food maker" a minute—and winning the war.

"Yes, that little contraption," said a motor manufacturer, "which a child can handle, ends the farm-labor problem and will make the crops while the boys in the trenches fight for democracy. American mechanical genius will put a hundred thousand airplanes on the fighting line and a million food producers on the last reserve line—the bread line—come the end of the war by battle shock or rations, we win."

War Will Take All Steel

It should be anticipated that the steel situation which is developing with rapidity, says a bulletin issued by the United States Chamber of Commerce, will probably make it impossible for general manufacturers who are unable to find a steel substitute, to secure adequate supplies of steel and may even make it impossible to secure any. No substantial increase in production is anticipated. Even maximum production from existing facilities cannot be expected, because transportation, labor, and material conditions will interfere with the full operation of plants. On the other hand, indications are that the war requirements will continue to increase.

Steel is needed in war for ships, railroad cars and locomotives, rails, trucks and containers. It must be had for shells and other munitions work. In addition, businesses producing Government supplies, and the necessities of life require steel in great quantities. When all these requirements are met, it is said, little if any steel will be left for so-called general business.

Materials which can be used in place of steel are plentiful in comparison. Lumber may be expected to meet all needs, and cement may be had in quantity for concrete work. While there may be delays in getting supplies of these materials, a hopeless shortage does not exist. The course for business men is clear. Every effort should be made to use wood and concrete in place of steel, and work requiring steel should be postponed wherever possible.

Apparently little will be gained by contracting ahead for steel. Experience today indicates that it will soon be necessary for producers of steel to ship their product where required in connection with the war rather than to fill such contracts as they may have on their order books. When the production of railroad cars and locomotives is interfered with because necessary steel is going to industries producing pleasure automobiles, steel furniture and buildings for amusement purposes, the situation cannot be expected to continue.

Business men will probably make their plans in the expectation that soon there will be established an order of distribution of steel, and that the wild scramble to enter orders for future delivery of steel will be ineffective. In fact, failure to recognize this may lead to unfortunate results. In a business requiring steel, if contracts are placed for future delivery, not only for steel but for other materials, the manufacturer may find that he cannot get the steel but can get the other materials. In this case he might find that he had on hand large quantities of materials that he could not use because he had no steel.

In purchasing supplies, it is argued, business men will doubtless consider the wisdom of returning, as far as possible, to doing business locally. The extraordinary service being rendered by the railroads in connection with the war will limit general transportation and put an end during the war to the condition that has developed during the last 50 years. No longer can a man in Illinois rely on Pennsylvania as a dependable source of supply for raw materials and equipment. For many commodities the railroads can no longer spare the equipment to bring distant points into close contact. Purchase must be made near at home wherever this can be done. The preference that must be given to shipments of iron and steel will soon make this situation of daily importance.

Conference on Steel

The details of the conferences between the steel men and the Government authorities relative to the Government's steel requirements are outlined as follows by the New York *Sun:*

1. The members of the committee on steel and steel products appointed by the American Iron and Steel Institute, representing from 65 to 80% of the finished-steel output of the country, agreed with the Government, owing to the urgency of supplying materials immediately, to accept the orders without knowing what prices they are to receive.

2. The Government contemplates placing a volume of business which in ship plates alone will call for more than 50% of the production by the steel manufacturers of the country.

3. The Government offered to pay the steel manufacturers 2½c. per lb. on account, the remainder to be according to the prices decided upon by the Federal Trade Commission, which is investigating the cost of actual production, and which are expected to be announced the second week in August.

4. The steel manufacturers refused this offer, declaring it was too low and would result in their being out of pocket.

5. Owing to the inability of the manufacturers and the Government authorities to reach an amicable agreement relative to what initial payment on account

should be, the steel manufacturers felt that rather than have any dispute as to a fair price to be paid on account they would accept the orders without any payment on account, being satisfied to wait until the Federal Trade Commission concluded its investigation.

6. The steel men who went to Washington informed the authorities that in making this arrangement they were speaking for themselves only and not for any manufacturers who were not directly represented on the committee.

7. The Government proposed that the steel manufacturers accept business for our allies at the same price at which they accept business from the United States Government.

8. The question whether the steel manufacturers will accept business from the allies at the same prices charged the United States Government will depend upon the fairness of the prices at which the Government's business is placed.

9. The manufacturers have accepted promptly what business already has been placed by the Government and are making the shipments as rapidly as possible.

10. The prices on business already accepted and in process of manufacture have been far below the figures of the open market at the time the orders were placed.

Traffic Cut Saves Coal

Fairfax Harrison, chairman of the Railroads War Board, in a recent statement says:

The railroads of the United States report the elimination of passenger trains aggregating 16,267,028 miles of train service a year. Every ton of coal, every locomotive, every mile of track space, every man whose duties are absorbed by an unnecessary passenger train can be put to effective use in freight service, and nothing is more necessary at the moment to insure the safety and prosperity of the country than that the railroads be able to handle the utmost possible amount of freight. The railroads gave in Apil some 15% more freight service, with practically the same facilities, than in the coresponding month last year.

The elimination of passenger service now reported will make available for other purposes over 1,120,000 tons of coal. Many railroads, especially west of the Alleghany Mountains, are still to be heard from.

The railroad systems in the Eastern department have cut out 8,598,696 miles of passenger-train service, thus saving 716,113 tons of coal a year. The Pennsylvania system eliminated 3,300,000 miles of train service, thus saving 186,876 tons of coal. The New York Central plans to save 126,000 tons of coal. The Erie has cut out 1,600,000 passenger-train miles, the Baltimore & Ohio 1,168,596, the Chesapeake & Ohio 850,000.

Roads in New England have arranged to eliminate 4,847,332 passenger-train miles, with a saving of 256,724 tons of coal. The Boston & Maine cuts out 2,118,948 miles of service, the New Haven 1,707,004 and the Maine Central 442,676.

The Pere Marquette and the Wabash, the only roads reporting as yet from the central district, have eliminated together 846,600 miles of service and plan to save 19,555 tons of coal. The Southern Ry. has cut out 1,900,000 passenger-train miles and will save 97,282 tons of coal.

Steel Ships of a New Type

A new type of steel cargo vessel, known as the Whittelsey-Panel type, is described in the New York *Sun* as possessing certain advantages in that it can be built more cheaply and quickly than the ordinary type of steel ship and faster, ton for ton, than a wooden ship. It is proposed to standardize the process so that the steel could be fabricated at plants in the interior, and assembled, like a motor car, at a coast shipyard.

The principle of standardization has run in and out of many plans for constructing cargo fleets at this time, but no other design, it is said, makes it possible to dispense with long ship rolls, necessary to bending the plates. These require something like 11 months to build, and cost about $50,000 apiece. The reason why no steel rolls will be required to bend plates for the vessel in question is that it will have, from stem to stern, but a single bent plate. Every plate can be turned out by an ordinary bridge plant, it is asserted, and, what is more important, can be shipped flat on railroad cars.

In the Whittelsey-Panel type every frame is a straight bar, every plate is flat, about 30 ft. long, forming a 3-ft. panel; every line, which is curved on other models, is drawn on an angle; the bilge panel, rounded on all other designs and requiring steel rolls for the plates, is diagonal and does away with the necessity for bilge keels.

This model, which was patented by H. N. Whittelsey, president of the Southern Shipbuilding Co., has been tested by Prof. Herbert C. Saddler, a scientific naval architect, in the test tank of the University of Michigan and proved to require no greater horsepower or no more coal than the best design of the ordinary form of ship.

Upon these lines it is proposed to construct cargo ships 375 ft. long, with a 52-ft. beam, 31.6 ft. depth, draft 24.6 ft. and with a capacity of 7500 tons. Both the plans and specifications have been approved by Theodore E. Ferris, naval architect of the Emergency Fleet Corporation, and by the American Bureau of Shipping.

Averaged Profits Not Excessive

Another economic consideration which some Washington proponents of price fixing are prone to disregard, says the *Engineering News-Record*, is the fact that the earnings of a given business are not constant in volume over a long period of years. Profits diminish to the vanishing point in many industries during a perod of depression and are brought up to a fair average level by a higher margin when demand is good. Should any action taken now result in shearing some of the industries of the country of the extra margin of income which should serve to establish the surplus they will sorely need during the depression that is bound to follow, incalculable harm might be done to industry.

Of course, on the other hand, no one has any sympathy with a group of men who are determined to squeeze the last possible penny of profit out of a situation which might put the country at their mercy. However, while such undoubtedly exist, it is believed that they constitute a small minority.

Editorials

The Average Price of Copper in 1916

ALL the principal copper-producing companies now having published their reports for 1916, if they do so at all, it is possible to compare their average receipts for copper in that year, and also to make comparison with our quotational average, as we have done in each year through a long period. In publishing the corresponding review last year, we made the prefatory remark that "it should be noted at the outset that 1915 was a phenomenal period, and one in which conditions were extraordinarily confused." In 1916 conditions were even more phenomenal and more confused. This is perhaps the reason why the several copper companies refrained from giving so much data respecting the terms of their sales as they did in the previous year. Except in a few cases it is left to conjecture whether the figures that are given represent the net price, basis New York, received for copper delivered or for copper sold. In most cases, moreover, there is uncertainty as to whether the companies reported net price, basis New York, or gross price, the latter including freight and delivery charges up to the buyers' works. In general, the doubt on the latter point applies only to domestic business. In foreign business the producers in the main adopted in 1916 the practice of selling on the basis of cash, New York.

Figures for 1916 are summarized in the accompanying tables. The first gives the reported sales of electrolytic copper, the second of Lake copper, while the third gives comparative figures over the period of the last 12 years. Referring to the table of electrolytic sales, it appears that upward of 1,200,000,000 lb. of copper realized an average of 25.71c. per lb. This accounts for a very large proportion of the copper produced and sold in 1916. Indeed, we may say that it accounts for all of it, for it may be assumed reasonably that the Anaconda production of upward of 300,000,000 lb., together with the other unreported copper that is sold through its agency, probably realized about the same price as was got for the Inspiration copper, namely, 25.39c.; while unreported copper sold through the American Smelting and Refining Co. undoubtedly realized about the same as was got for the copper of the Hayden, Stone & Jackling companies; taking account, moreover, of the large amount of copper that is sold to consumers on the quotational average, we may assume that the entire production—about 2,300,000,000 lb.—of American refiners in 1916 was sold at an average of about 25.71c. That figure is, if anything, too high, for without any doubt it includes in many cases prices that were gross; that is, including amounts that producers had to pay out for freight in delivering to their customers or allowances that they had to make for bills discounted.

Reports of the Michigan companies show the sale of 257,000,000 lb. of copper at an average of 25.02c. per lb. Their reports represent practically all the Michigan production.

The average realized for all the copper sold in 1916 was far below the quotational average. This is explained by the fact that in 1916 the conditions were, in general, those of a rising market. Copper was sold by the producers in large blocks, after which the market, continuing to rise, was made on relatively small transactions. The difference between the sales average and the quotational average in 1916 is, therefore, the difference between a quantitative and an arithmetical average.

The same condition is reflected in the wide range of price received by the several companies. These averages ranged from 23.18c. in the case of Shattuck Arizona to 27.35c. in the case of United Verde. The low prices were due to the early sale of large quantities of copper at times when the market was relatively low. The highest prices were realized by those companies that did not adopt the policy of selling all their output ahead, but reserved all or a considerable proportion of it and followed the market upward. The concerns that did that realized approximately the quotational average.

Two noteworthy features of these figures are the realization of a lower average for Lake copper than for electrolytic and the relatively slight variation among the prices received by the Lake producers.

COPPER SALES IN 1916 BY ELECTROLYTIC PRODUCERS

Company	Pounds	Proceeds	Av. Price
Braden	42,153,270	$12,648,111	26 350c. (e)
Calumet & Arizona	74,898,788	18,498,503	24 698 (d)
Chino	72,319,508	19,139,269	26 465 (b)
Inspiration	120,772,637	30,667,796	25 393 (e)
Miami	53,433,863	13,072,440	24 465 (c)
Kennecott	108,372,783	28,042,396	25 340 (e)
Nevada Consolidated	90,735,287	23,436,637	25 830 (a)
North Butte	21,505,584	5,009,726	23 295 (f)
Phelps, Dodge & Co	247,303,587	60,539,918	24 480 (d)
Old Dominion	17,654,643	4,734,276	26 810 (b)
Ray Consolidated	74,983,540	20,038,448	26 724 (b)
Shattuck Arizona	18,161,763	4,209,897	23 18 (g)
U. S. Sm., Ref. & Min.	28,888,093	7,886,583	27 297 (b)
United Verde	58,299,573	15,946,145	27 352 (c)
Utah Copper	187,531,824	49,019,308	26 139 (b)
Total	1,217,014,743	$312,889,453	25.710
E. & M. J. Average			27.202

(a) F. o. b., Atlantic Seaboard. (b) Probably price delivered; not stated in report. (c) Price delivered. (d) Sold and delivered in 1916; net price f. o. b., New York. (c) Net price. (f) Probably, gross price. (g) Average for copper delivered.

COPPER SALES IN 1916 BY LAKE COMPANIES

Company	Pounds	Proceeds	Av. Price
Ahmeek Mining Co	24,142,158	$6,210,245	25 72c.
Allouez Mining Co	10,219,290	2,586,011	25.30
Baltic Mining Co	12,425,804	3,141,243	25 28
Calumet & Hecla Min. Co	76,762,240	19,559,019	25 48
Centennial Copper Min. Co	2,367,400	592,269	25 02
Champion Copper Co	33,601,136	8,494,367	25 28
Franklin Mining Co	3,116,566	792,623	25 43
Isle Royale Copper Co	12,412,111	3,209,537	25 86
LaSalle Copper Co	1,380,352	354,409	25 68
Mass Cons. Mining Co	4,752,588	1,248,780	26 27
Mohawk Mining Co	18,468,100	3,496,860	25.28
Osceola Cons. Min. Co	19,586,501	5,040,013	25 73
Quincy Mining Co	21,065,612	5,374,715	25 50
Superior Copper Co	3,034,656	748,732	24 67
Trimountain Mining Co	8,720,558	2,204,557	25 28
Victoria Copper Min. Co	1,127,193	293,297	26 02
White Pine Copper Co	4,207,449	1,062,802	25.26
Total	257,389,714	$64,409,479	25 024

PRODUCTION, SALE AND PRICE FOR COPPER FOR 12 YEARS (a)

Year	Total Production	Pounds Reported	Average Realized	Quotational Average
1905	219,000,000	82,372,955	15 597 c.	15 699 c.
1906	224,071,000	113,411,645	19 146	19 616
1907	220,317,041	66,316,025	18 043	20 661
1908	222,267,444	125,949,248	13 348	13 424
1909	226,602,134	136,005,773	13 221	13 335
1910	221,400,864	126,710,763	12 96	13 039
1911	216,412,867	135,329,098	12 657	12 634
1912	1,228,333,298	552,155,308	15 841	16 341
1913	1,406,448,665	658,533,402	15 222	15 269
1914	1,342,634,206	566,687,750	13 458	13 602(b)
1915	1,411,652,418	619,832,987	17 299	17 275
1916	2,300,000,000	1,217,014,743	25 710	27 202

(a) Up to 1912 the figures represent Lake copper production and sales, but few of the producers of electrolytic making detailed reports in that time. Beginning with 1912, the figures represent electrolytic copper only. The figures for "pounds reported" and "average realized" do not include the United Metals Selling Co. (Anaconda), which does not publish these details. However, it is a reasonable assumption that its results were not very different from those of the other companies, for John D. Ryan has stated that in the 10 years ending with 1913 his companies sold 5,560,000,000 lb. of copper at an average of 14.82c., delivered to the buyers in Europe and America. This would be equivalent to 14.62@14.67 c., net cash, New York. During the same 10-year period, Phelps, Dodge & Co. reported an average of 14.56c. per lb., net cash, New York, actually realized. The arithmetical mean of the quotational averages for electrolytic copper in this period is 15.06c.

(b) Average for nine months. No quotations in August, September and October. However, the bulk of the copper sold in 1914 was disposed of before and after those months, wherefore the comparison on the nine months' basis is approximately correct.

Are We Losing at the Bunghole?

WHILE Daniels and Baker and Denman are fussing about prices and cheese-paring of contracts; while Denman and Goethals are squabbling; while members of the cabinet and of the several bureaus repudiate the acts of each other, exhibiting complete absence of team work; while all these things are happening, does it occur to any responsible heads in Washington that we may be losing at the bunghole while saving at the spigot? What is the use of saving one million dollars, if, by delay over the matter, the war be prolonged one single day? It is estimated that Mr. Denman's performances have set us back to the extent of 250,000 tons in the shipbuilding program, that is, there will be just so much delay in obtaining the necessary tonnage. It is possible, although not probable, that just that thing might spell loss of the war. Mr. Denman ought to be fired summarily.

(Since the above was written, the news has come that Mr. Denman has been fired. We are sorry that at the same time the country has had to lose the services of General Goethals. However, it is a blessing that Denman is going. Would that there were more to go).

The historic failing of our President in his appointments of incompetent men is now coming home to roost, and unfortunately is doing so when our country is in a crisis. There are constant appeals in controversies to the President. He is the only arbiter that is recognized, and consequently he is overworked. No administrator can attend to the multiplicity of details that he is called upon to do. Alas! it is his own fault. The constantly recurring "appeals to Cæsar" are due to the knowledge of the incompetence of many of the men who surround him. If they were of a different caliber, if they were men whose judgment were recognized, there would be no need of going to the commander-in-chief.

The long and short of the matter is that we have entered this great war without any adequate organization and have tried to fashion something on the spur of the moment. The makeshift machine has not worked well, and we shall have a lot more of muddling, as we have had already, until the functioning parts are improved. Other countries had to go through the same thing. We are hopeful that our course of development will not need to be so long as it was in Great Britain. It is a pity, though, that affairs in this country, and especially business, should be under such a cloud of pessimism, three months after the declaration of war, when a few clear and decisive words from Washington would clear up everything. We do not imagine that the administration has any real idea of fighting this war with the people in gloom over business prospects.

Situation in the Copper Market

DURING the period of uncertainty over what the policy of Washington is going to be, the inquiries of domestic manufacturers have been few and far between, and some interests in copper being desirous of selling, the market has been weak. Why should any manufacturer want to buy when he has been given to understand by Washington that the price for copper is going to be "reasonable" and is going to be the same to everybody? Of course, there is doubt as to what Washington means by "reasonable." It is possible that 27 or 28c. per lb. will be pronounced reasonable. However, the idea has been promoted that the price for copper is going to be lower than now, and therefore the manufacturer naturally stays out of the market.

If the price for copper is be lower, it will be, we think, owing to natural conditions and not to any ukase by Washington. Washington may commandeer copper and other things for the purposes of the Government, leaving the price to be determined by the courts, but Washington is not going to abrogate the law of supply and demand, no matter what theories on that subject may be entertained. Manufacturers and other consumers of copper might as well make up their minds to that. The price for copper is going to be determined by the quantity of it that the world requires. The price must be such as will produce that quantity. When unsold stocks begin to accumulate, the signal will be hoisted that the world is not needing so much copper as is being produced, and after a brief period of stabilization the market will commence to go off. It is the natural thing for any market to have the balance wheel of an unsold stock. No market is natural unless it be in that condition.

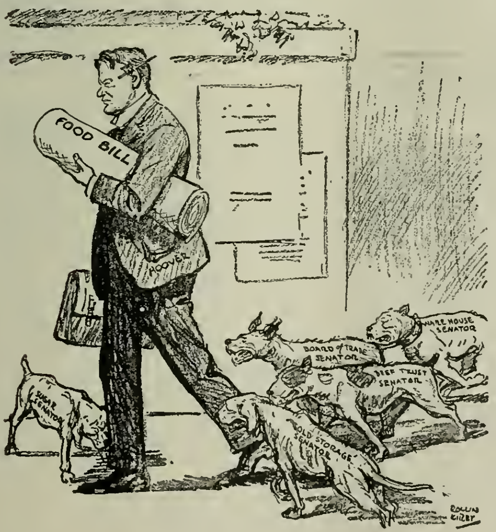
As yet, stocks of copper have not begun to accumulate. If there were signs of any such accumulation, they were but sporadic. The supply of crude copper was in excess of the refining capacity, and undoubtedly there were accumulations of crude copper. However, the check in production by the current labor troubles is rapidly reducing any such accumulation, if complete reduction has not already happened, and the time is in sight when the refiners will not have sufficient raw material. This is not a pleasant prospect either for domestic consumers or the American Government or our Allies.

At a time when all possible production of copper was badly needed, production has been checked. For this, Washington is directly and unqualifiedly responsible. The talk emanating from quarters in Washington to the effect that the price for copper must be reduced was the direct inspiration for the labor troubles in Montana, Arizona and elsewhere. The miners in those regions have been paid according to a sliding scale based on the price for copper. If the Government were going to reduce the price for copper, there would be a reduction in wages. Therefore, the strikes. The men said that they would keep their wages on the basis of 30c. for copper, no matter what might happen to the price, and in view of the shortage of labor they had the whip hand.

Why should copper be singled out as a target for Washington to shoot at? The price for copper has not experienced the fantastic advances that have happened in other metals. The price for copper is high, to be sure, but considering the major market it has not been materially higher than the prices realized in 1906-07, which was a period of purely industrial boom, and the present price for copper is actually lower than then, although conditions of production are far more adverse.

Subscriptions to Belgian Kiddies, Ltd., up to date have reached a total of $98,965.69.

BY THE WAY



ALL YELPING AT HIS HEELS

The cartoon reproduced here was published by the New York *World*, July 18, 1917, by the courtesy of which paper we republish it. It is an essay in itself, and tells the whole story.

The largest ore carrier was launched on July 10 at the Sparrows Point yard near Baltimore. The vessel is owned by the Bethlehem Steel Co. and is to carry iron ore from Cuba to the United States. Her carrying capacity is 18,000 tons of iron ore, which is one-half more than the biggest carrier on Lake Superior can take. The size of the Lake boats is limited by the draft through the locks at the Sault Ste. Marie and over the Limekiln Crossing near Detroit. The ocean steamer is limited only by the depth of the harbor channel.

We have been hearing a lot about gages, how many are required for the proper measurement of guns, ammunition, etc., but it is doubtful if it is appreciated with what great accuracy they must be made. As an example gages are now being manufactured with fiber finger-grips so as to prevent expansion due to the heat of the hand. In a gage made of cast iron, the coefficient of expansion is 0.0000122 per degree C., or 0.00000542 F.

The Labor Situation at Butte

BUTTE CORRESPONDENCE

A telegram from Butte, Mont., under date of July 24, conveys the information that all mining companies of the Butte district have joined in a new scale of wages for miners, by which all classes of underground employees will, under present price of copper, receive $5.25 per day of eight hours. Minimum wage remains at $3.50 per day regardless of price of copper. Companies will also grant weekly payday to go into effect Sept. 1. By the new scale, when copper sells at 15 to 17c. per lb., rate of pay is $4 instead of $3.75 as now; from 17 to 19c. the wage will be $4.25; 19 to 21c., $4.50; 21 to 23c., $4.75; 23 to 25c., $5; 25 to 27c., $5.25; 27 to 29c., $5.50; 29 to 31c., $5.75; 31 to 33c., $6, and so on. All other classes of employees will get increase of 25c. on each 2c. increase in price of copper. Miners engaged in shaft work, winzes, station cutting and station tending will receive 50c. a day in addition to the scale for ordinary miners.

The new scale goes into effect July 25, but for men now at work it dates from July 1. Men reporting for work before July 30 will be taken on without formality of rustling card, but after that applicant will have to go through the usual course to get employment. The rustling-card system has been greatly modified, and some of its most objectionable features removed. It is believed that the concessions made by the companies will spell the end of the I. W. W. movement and strikes, although a majority of other crafts have voted against acceptance of the new wage scale offered by the mining companies. However, those crafts which are in a state organization are working in Anaconda and Great Falls to accept the proposition, which may force the minor Butte unions to abide by the result of the state vote, although Butte agitators threaten to withdraw from the state organization and go with the I. W. W. (which is hardly probable).

The I. W. W. people are apparently growing desperate and are making threats that they will attempt to picket the mines tomorrow to prevent men from going to work and committees have been waiting on boarding-house keepers to warn them not to put up lunches for men going to work. The mines today are working about 40% of their normal force.

Personals

O. B. Perry has a commission as captain in the Engineer Officers Reserve Corps.

F. LeRoi Thurmond will open an assay and engineering office at Anchorage, Alaska.

E. W. Westervelt has been appointed superintendent of the Hobson Silver-Lead Co., at Ymir, British Columbia.

J. F. Worley has been assigned as surgeon to mine-rescue car No 1, at Reno; R. C. Williams, car No. 2, Raton; R. R. Sayers, car No. 5, Butte.

J. Morgan Clements is in Hokkaido, Japan, visiting the coal mine there He recently visited the Kosaka mine, Japan's third largest copper mine.

Franklin W. Smith, of the firm of Smith & Ziesemer, mining engineers of Bisbee, is in Pittsburgh and expects to remain in the East until the middle of August.

Warren Lawson Kluttz, who has had an extensive experience in the operation of blast furnaces in the South, has been appointed general manager of the Sheffield Coal and Iron Co., Sheffield, Alabama.

Francis C. Shenehon, for the past eight years head of the College of Engineering of the University of Minnesota, has resigned and is now giving his exclusive attention to his practice as consulting engineer.

P. L. Williams has become superintendent at the works of the Empire Steel and Iron Co., Mt. Hope, N. J., succeeding H. M. Roche, who has become superintendent of the Wharton Steel Co., Dover.

J. E. Spurr, of Philadelphia, and ex-Governor Charles F. Millar, of Delaware, have returned from a visit to the mining region north of The Pass, Manitoba, where they are interested in the Otonopaw mine.

S. H. Chauvenet, formerly with the Robesonia and Sheridan furnaces in eastern Pennsylvania, will act as manager at the Island Park furnace, Easton, Penn., recently purchased by the Northern Ore Company.

R. Hirota and **K. Y. Shiga**, representing the Metallurgical Research Institute of Tokyo, recently visited Pittsburgh to study methods of electrical precipitation of smoke. Mr. Hirota is a lecturer on mining machinery at Tokyo University.

D. B. Dowling, of the Canadian Geological Survey, is pursuing his investigation of the coal resources of Alberta and Saskatchewan, and will exercise a general supervision of geological work in the oil, gas and coal fields of western Canada.

E. F. Burchard, of the United States Geological Survey, recently made a five weeks' trip during which he visited cement manufacturing districts in Pennsylvania, New York, Illinois, Kansas and Oklahoma and iron ore areas in Iowa, Missouri and Texas.

William Cockfield, of the Canadian Geological Survey, will take up the work of the late D. D Cairnes in the Yukon territory, continuing an examination into auriferous gravels with special attention to areas in which tungsten-bearing minerals occur.

Forest Rutherford resigned his position on June 1, as general superintendent of reduction works of the Copper Queen Consolidated Mining Co., at Douglas, Ariz. He will go into business for himself as a consulting metallurgical engineer. His present address is c/o First National Bank, Pueblo, Colorado

M. Cochrane Armour recently withdrew from the firm of Rogers, Brown & Co., of which he has been a partner for almost 27 years He has had a prominent career as a producer and distributor of pig iron, especially in Chicago territory He has been vice president and director of the Rogers, Brown Iron Mining Co, director of the Rogers, Brown Ore Co., Chicago Short Line Railway Co, and the Lake Superior Iron and Chemical Company

Brig. Gen. William H. Bixby was recently elected president of the American Society for Testing Materials. He was born in Massachusetts in 1849 and was graduated from the United States military academy at the age of 24 During the long period of professional duty following, he was promoted to the rank of captain In 1886 he was delegated to report on the stability of buildings injured by the Charleston earthquake, and shortly after took charge of the Cape Fear bridge In 1897 he was given charge of the river and harbor improvements of the entire Ohio River from Pittsburgh to Cincinnati From 1902 to 1904 he held a similar position on the St Mary's River He was made brigadier general and chief of engineers in 1910, retired from active service in 1913, and was again placed on the active list on May 21, 1917

Obituary

N. L. C. Kachelmacher, chairman of the board of directors of Bessie Furnace Co., New Straitsville, Ohio, died at Philadelphia recently. He organized the Bessie Furnace Co., and was at one time president of the Hocking Coal and Iron Co., Columbus, Ohio. He was prominent in the effort to bring together several eastern companies about two years ago, including the Thomas Iron Co., Empire Steel and Iron Co., and Wharton Steel Company.

J. C. Kennedy, a retired veteran of the iron trade, died in Youngstown, Ohio, July 14. He was born Sept 16, 1829, in the district in which he died After the war he entered the iron business, and became prominent in the development of the industry in the Mahoning Valley. He operated the old Brier Hill furnace and furnaces in Struthers and Lowellville, all in the Mahoning Valley, and in the Pittsburgh and Buffalo districts. He was the uncle of Julian Kennedy, engineer, of Pittsburgh.

Societies

Association of Iron and Steel Electrical Engineers will hold its 11th annual convention at Philadelphia, Penn., Sept. 10 to 14. Wednesday, Sept. 12, is to be devoted entirely to a patriotic program, with addresses by army and navy engineers on vital subjects concerning industries. A. H. Swartz of the Westinghouse Electric and Manufacturing Co., Cleveland, is chairman of the entertainment and convention committee.

American Chemical Society will hold its annual meeting at Boston on Sept. 11, 12, 13, preceded by a meeting of the Council on Sept. 10. The Northeastern Section has been requested to omit the usual banquet and excursions and to arrange a simple and serious program bearing as fully as possible on questions concerning the activities of chemists in Government service and in the industries during the war.

Engineering Society of Northern Minnesota, composed of mining engineers of the Mesabi Range, held its annual outing on July 14, at Coleraine, the Coleraine members acting as hosts. The visitors were welcomed by a committee headed by William Curley and R. P. Weiderfeller of the Oliver Iron Mining Co.'s engineering staff. The Hill Annex and Arcturus mines at Marble were visited, also the Holman mine at Taconite, and the Canisteo and Walker pits, the trip finishing at the Trout Lake concentrator.

American Committee of Engineers in London is holding weekly meetings at which various plans and devices suggested by members for aid in the successful prosecution of the War are discussed. Recently a preliminary proposal was read for increasing the platinum output in the Ural field in Russia from 80,000 oz to 150,000 oz. next year, by the use of the materials and equipment now on the properties but subject to government (Russian) control. It is recognized that under present private methods of production no increase is possible The scheme implies the elimination of private interests with certain compensation both in producing and selling platinum, and the creation of a monopoly of it as a war measure by the Allied Governments.

American Association of Engineers unanimously elected the following officers during its annual convention on July 13: President, Edmund T. Perkins, president, Edmund T Perkins Engineering Co, Chicago, first vice president, W H Finley, chief engineer Chicago & Northwestern Railroad, Second vice president, Isham Randolph, president, Isham Randolph & Co, Chicago Directors for two years, Paul P Stewart, Keller-Elliott Erection Co, Chicago, R C Yeoman, dean of engineering, Valparaiso University, Valparaiso, Ind; W W DeBerard, western editor, McGraw-Hill Publishing Co, Chicago, C A Soans, with Alfield, Powell, Graver & Alfield, Chicago; H G D Nutting, consulting engineer, Armour Institute, Chicago, G C Dooge, designing engineer, American Bridge Co, Gary, Ind Directors for one year, F H Newell, consulting engineer, University of Illinois, Urbana, Ill.; L L Sherman, president, L K Sherman Engineering Co, Chicago, H W Claussen, Engineering Bureau, City of Chicago J F Gayton, president, Utilities Engineering Co, Chicago, A D Whipple, consulting engineer, Milwaukee, Wis, A P Cunningham, engineering department, Illinois Central R R, Chicago Auditing committee, chairman, Samuel Morrell, Bridge Engineering Department, City of Chicago; G. A. Gaenslen, Bridge Engineering Department, City of Chicago; J. T. Mullin, Wisconsin Steel Works, South Chicago, Ill. The proposed new constitution was adopted unanimously Its main provision is the enlargement of the Board of Directors from 5 to 15 members, but the board may appoint five members to actively manage the affairs of the association. A clause to include associates is provided in the constitution. This membership pertains to men who are not necessarily engineers but interested in engineering affairs and may be admitted up to 10% of the certified membership.

Trade Catalogs

Elevating, Conveying, Crushing, Screening, Power Transmission Machinery. The Jeffrey Manufacturing Co., Columbus, Ohio. General Catalog No. 84 Pp. 352; 6 x 9 in.; illustrated.

Automatic Injector. The William Powell Co., Cincinnati, Ohio. Booklet. Pp. 12; 3½ x 6 in.; illustrated.

Duriron Pipe, Valves, Fittings, Centrifugal Pumps. Duriron Castings Co., Dayton, Ohio. Bulletin No. 100. Pp. 24; 8 x 10½ in.; illustrated.

Allen Concentrating Cone. Allen Cone Co., P. O. Box 299, El Paso, Texas. Bulletin No. 4 Pp. 32; 6 x 9 in.; illustrated.

Secondhand Equipment—Electrical, Steam. Hydraulic, Gas. MacGovern & Co., Inc, 114 Liberty St., New York. List of equipment on hand. Pp. 58; 3½ x 8½ in.; illustrated.

Electric Hoists. Lidgerwood Manufacturing Co., 96 Liberty St., New York. Bulletin No. 20. Pp. 32; 9 x 12 in.; illustrated.

"Stanley" Cotton Belting. Stanley Belting Corporation, 32-40 S. Clinton St., Chicago, Ill. Booklet. Pp. 8; 3½ x 6 in.; illustrated.

Emerson Steam Pumps, Quick-Cleaning Foot Valve and Strainer. The Emerson Pump and Valve Co., Alexandria, Va. Catalog. Pp. 56; 6 x 9 in.; illustrated.

Filtros—The New Porous Mineral Medium. General Filtration Co., Inc., Cutler Building, Rochester, N Y. Booklet. Pp 32; 6 x 9 in.; illustrated This contains detailed information regarding the manufacture, composition, shapes, grades, uses and applications of this material.

New Patents

United States patent specifications listed below may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

Aluminum—Method of Treating Alunite Frank K. Cameron, Washington, D. C (U S. No. 1,233,977; July 17, 1917)

Aluminum—Process of Manufacture of Aluminum Nitrade. Ottokar Serpek, Paris, France, assignor to Société Generale des Nitrures, Paris, France. (U S. Nos. 1,233,925; 1,233,926; July 17, 1917.)

Concentrator. James B. Freeman, Los Angeles, Calif. (U. S. No. 1,232,783; July 10, 1917.)

Cyanidation—Cyanide in the Form of Granules. Fritz Abegg, Perth Amboy, N J., assignor to The Roessler & Hasslacher Chemical Co., New York, N. Y. (U. S. No. 1,232,471; July 10, 1917.)

Copper—Apparatus for Production of Copper by Electrolysis Marcel Perreur-Lloyd, Boulogne-sur-Seine, France. (U. S No. 1,233,906; July 17, 1917)

Copper—Process of Extracting Copper from Oxidized Ores Noak Victor Hybinette, Christiania, Norway. (U. S. No 1,233,580; July 17, 1917.)

Electrolysis—Apparatus for Electrolytically Recovering Metals. George A James, San Francisco, Calif, assignor, by mesne assignments, of one-half to James H Alling and one-half to Francis M Wright, San Francisco, Calif (U S No 1,233,363, July 17, 1917)

Excavating Apparatus. Frederick E Allen, Oakland, Calif., assignor to The International Excavator Company, Oakland, Calif (U S No. 1,232,749; July 10, 1917)

Magnetic Separator—Robert D Pike, San Francisco, Calif. (U S No 1,233,804; July 17, 1917)

Smelting Process. Nils Testrup, London, England, and Thomas Rigby, Dumfries, Scotland, assignors to Wetcarbonizing Limited, London, England (U S No. 1,233,111, July 10, 1917.)

Editorial Correspondence

SAN FRANCISCO—July 21

The Comstock is Exploring for the first time in 33 years, on the 2700-ft. level. The Union Consolidated is now the deepest working shaft in Nevada. On July 15 the 2700-ft. station was finished and the reopening of the 2700 level completed. On the following day exploration was started. The next deepest shaft on the Comstock is the C. & C. on the Con. Virginia, one mile south. The work of reopening the 2700 level was carried out from the so-called east vein, which is the east fork of the Comstock at the north end, or what is commonly termed the Virginia district. Although ample pumping capacity was installed on the 2700 level some time ago and the 2900 level is now drained, a large amount of work was required to reopen the old 2700 workings from the east vein back to the main Comstock. A large volume of hot water came from the workings near the Union shaft, which has now been caught up, and the east crosscut from the Union shaft is protected by "snowsheds" composed of bulking planks that keep the water from dropping down from the roof. of the drifts and crosscuts. These watersheds, which are locally termed "snowsheds," are provided on the 2200 and the 2300 levels. The work of exploration is now going forward on the main Comstock vein from the 2000 to the 2700 level of the Union and the same work has just been started on the Mexican. The old east winze in the Union will be reopened from the 2700 to the 2900 level. The water will be pumped from the 2900 by means of air-lift and delivered to the main 2900-pumps of the Mexican-Ophir winze. Comstock exploration and development will now go forward in a way that will prove the policy of the present operators of the north end mines, under the superintendency of Whitman Symmes, to be in accord with the best practice in dealing with complex problems which require the handling of large volumes of water and reopening and exploring old mine workings. Every step made has been in the line of advancement since the present policy was adopted.

BUTTE—July 21

Labor Conditions have greatly improved in Butte during last week. An agreement has finally been reached between the mining companies and the Montana Power Co. on one side, and electrical workers and metal trades council on the other. The international unions and all organizations connected with the American Federation of Labor have concluded terms that are satisfactory to both employers and employees. These agreements were brought about largely through the efforts of W. H. Rodgers, the Federal mediator sent to Butte by Secretary Wilson of the Department of Labor. International President Frank McNulty of the Electrical Workers, as well as representatives from the head offices of the machinists, carpenters, engineers and other organizations were also instrumental in bringing about the agreements. The only union which has not concluded terms of peace is the Metal Mine Workers Union, with which the mining companies have refused to conduct negotiations. This organization is generally supposed to be affiliated with the Industrial Workers of the World, although its leaders deny this. It has issued a call for a convention of delegates from all the metal mine workers in America to be held in Denver, Colo., the first week in August. It has sent out invitations to the different miners' organizations to send delegates to this convention, and it openly announces its purpose of organizing a rival to the A. F. of L. and fighting that organization to a finish. Men who have been active in the I. W. W. in years past are among the leaders in this movement. This organization is still carrying on its strike. It has made an open attack upon the International Mine, Mill and Smelter Workers' Union, and the latter has come back by sending a large force of its organizers into the Butte field. During the past few days the Mine, Mill and Smeltermen have made tremendous gains in membership, and at the present time the two rival unions among the miners are of almost equal strength. The metal mine workers took a vote upon the question of affiliating with the A. F. of L., and going back into the Mine, Mill and Smeltermen's Union. This proposition was defeated by an overwhelming majority. The reason assigned for its defeat was that William Davidson, member of the executive board of the Mine, Mill and Smeltermen, announced that the Metal Mine Workers would have to join that organization as individuals, and that the first thing that would be done would be to order them all to go back to work and that later demands for a raise of wages and better working conditions would be taken up. At a meeting of the Metal Mine Workers last Friday federal mediator Rodgers went before them and urged them to return to work. He pledged them that if they would do so he would use his influence to secure a substantial raise in wages for them. His advice fell on deaf ears. Instead of paying heed to it, they adopted resolutions demanding his recall by Secretary Wilson. The electricians, machinists and other crafts returned to their old posts Tuesday morning. Several hundred miners who have been on strike went back to work at the same time. The mining companies report that at present they have about half of their normal force at work. Every day in the past week they have had an increase, and they look for a still larger addition to their force in the coming week. The companies it is understood are considering granting a raise in the miners' wage scale, which will have an immediate effect in restoring normal conditions throughout the district.

DENVER—July 21

The Leadville Strike is on, despite all efforts at mediation. The labors of Federal mediators—Verner Z. Reed and former Justice George W. Musser—resulted in reasonable concessions on part of miners who agreed to recall strike if wages were raised but 50c. per shift instead of the desired $1, and at same time to relinquish demand for recognition of the union. Samuel D. Nicholson, prominent mine operator, agreed to the miners' proposal, but his action was repudiated by the other operators who stand absolutely firm in their refusal to conduct any negotiations emanating from or presented by union officials. The opinion prevails generally that this is the crucial point in the controversy, owners preferring to close their properties down rather than yield, in the slightest degree, to the demands of organized labor. The request for a reasonable increase in wage would probably have been granted if such request had come from the unorganized miners instead of from the local union. The strike was in effect at midnight of July 20. The operators declare they will keep their properties closed indefinitely or until such time as the strikers offer to return to work upon prevailing wages. This determination presumably implies that plans have been arranged for preventing the flooding of the wet mines. On the other side, the union officers assert that the strike will be pushed relentlessly, although they have issued a warning to their members to conduct themselves as law-abiding citizens. Public sentiment, in this instance, is largely with the miners because it is conceded that $3.50 is not a sufficient wage, under prevailing conditions, to meet the necessities of life. Even $4 would not be a high wage when compared with the wages in other Western districts. Of course, anyone who was acquainted with the bloody struggle of some years ago that terminated the dominion of unionism in the district will appreciate the attitude of the operators who feel that to now yield the slighest attention to the local union would simply be offering an opening for future demands from the same or some similar source. Of the several thousands of mine and smeltery employees in the district, perhaps not more than 800 have any allegiance to the union. It is further pretty well established that the majority of the unionists are of the transient class. The strike will, therefore, work especial hardship upon the non-union miners who have been long-time residents of, and own their homes in, Leadville. Unless they now become members of the union, they will receive no share in the monetary benefits that are to be extended to the striking unionists; and this phase of the situation is unquestionably being relied upon by the officers of the union to secure an increased and stronger membership in the district. As a rule, the miners of Leadville are of the better class. The closing down of the mines and smelteries will probably result in the exodus of most of the undesirables. There is one thing of noteworthy significance in this affair, viz., that there is not the slightest suspicion of any I. W. W. influence. An analysis of the situation at present leads to the belief that the strike can be settled only by a concerted organization of the non-union laborers making overtures to the operators.

SALT LAKE CITY—July 21

Salt Lake Stock & Mining Exchange Clearing House will probably be established in the near future. The rules committee and the governing board of the exchange has issued a circular letter advocating the establishment of such an institution, providing mining companies whose stocks are listed on the exchange will publish a quarterly financial report for the benefit of the public and establish transfer offices in Salt Lake City, in order to facilitate the clearing of all trades made on the exchange.

Shipments from Coal Mines in Carbon and Emery County, cut off by flood on Price River, are being resumed. One track of the Denver & Rio Grande main line is in operation between Kyune and Castlegate. and the railroad within a day or two will be furnishing the mines with from 65 to 75% of cars needed. Mines on Pleasant Valley branch will be cut off somewhat longer, as damage there was especially great. The railroad will make use of lull in traffic to make repairs to locomotives, store cars, etc. There is said to be an adequate supply of rolling stock. The railroad is stated to be contemplating filing suit for $1,000,000 damages against the Price River Irrigation Co., the breaking of whose reservoir dam was the cause of the flood. The loss caused by the flood is equivalent to shutting down the coal mines for a month.

WALLACE, IDAHO—July 16

Annual Assessment Work suspension until the close of the war is decidedly in favor throughout the Cœur d'Alene district. This sentiment is based upon the difficulty in getting men to perform labor, high cost of labor and supplies, and heavy contributions the people have made and will make for the support of the Government through the purchase of bonds, payment of special war taxes and subscriptions to the Red Cross. For these reasons, and the further fact that assessment work is of slight importance so far as actual mining development is concerned and is required chiefly to show good faith of claim owners, the feeling here is opposed to substituting any other method of exacting the expenditure, such as depositing $100 for each claim in the land office to be used subsequently in development of the ground, or making an equal expenditure in production of something of value in prosecution of the war. The feeling here is that exemption from assessment work during the war should be absolute.

Pine Creek Railroad Agreement was formally closed between the Oregon-Washington Railroad and Navigation Co. and the mining companies of Pine Creek, which will result in the construction of branch railroad into that section without further delay. The branch will be 10 miles in length and the railroad company estimates the cost at $300,000. The mining companies are now paying from $3 to $4 per ton for hauling ore from the mines to the railroad, and as an inducement to get the railroad, the principal operators, a few months ago, offered to pay $1.50 per ton on all shipments over the proposed branch until the original cost of construction has been covered. Following the report of Albert Burch on the actual and prospective ore tonnage in sight, the railroad company last week notified the mining companies that the construction of the railroad had been favorably considered and that the company was prepared to begin construction at once, the surveys having been completed last year. As a condition, however, the mining companies were asked to enter into an agreement to pay $1.50 per ton on the first 100,000 tons of ore shipped and $1 per ton on the second 100,000 tons, the rate thereafter to be established by the state utilities comm-sion. Representatives of the mining companies and a representative of the railroad company immediately met at Kellogg and entered into the agreement. Contractors are preparing to begin work at once and the road will be completed before bad weather this fall. With the railroad assured, Pine Creek is certain to advance rapidly to a position of importance as a producer of both lead and zinc.

JOPLIN, MO.—July 21

Black Diamond Core Drilling being tried at Ramage mine at Century, and reported as successful Machine is of the Sullivan type and first hole now down to depth of about 150 ft. Core drilling has been tried only once or twice previously in this field, and scarcity of drill rigs has brought about this tryout.

Dry Concentration for chunk zinc blende being tried out successfully by Montreal Mining Co. at Century, Okla When mine was originally opened several carloads of chunk blende were shipped to the smelteries, but chunks were too large to handle without crushing and smelteries were not equipped to do this. Consequently ore did not receive top price. Recently the Montreal company encountered more of the chunk formation and is keeping it separate from remainder of ore and crushing it dry to save losses that occur where almost pure ore is sent through wet concentration process.

Largest Mining Deal in history of the district, with the exception of purchase of Granby holdings by American Zinc, was consummated last week, when L. C. Church and associates, of Joplin, sold part of their holdings known as Welsh properties, to L. S Skelton and associates, of Okmulgee, Okla., for consideration of $2,000,000. The Welsh holdings consist of three mills in operation with fourth nearly completed, and several hundred acres of land near Century, Okla. The land was first developed by L. C. Church of Joplin and E. C. Mabon, of Miami, about two and one-half years ago. Mabon sold his interests for $85 about eight months ago, but Church, who was the original promoter and one of the pioneers in the north Oklahoma field, has steadfastly refused to sell any but comparatively small sub-leases up until this deal The Welsh mines now have come to rival in production those of the Eagle-Picher Lead Co., and the three mills are making close to 500 tons of concentrate weekly. L. S. Skelton, purchaser, has large interests in coal and oil. He purchased the Tar Creek mine at Tar River, Okla., early in the spring, and later the Wyrick. F. J Childress, of Galena, Kan., has been made manager of the five concentrating plants for the present.

SPOKANE, WASH.—July 20

Magnesite Mining is a new industry that has sprung up in the State of Washington as a result of the restriction of imports, consequent upon the war. At Valley, in Stevens County, the American Mineral Production Co. is mining several hundred tons per day and is installing calcining equipment to treat 9000 tons monthly. This is a crystalline magnesite said to equal the Austrian in purity. Some of the quarries can produce material containing less than 1% CaO and 2% SiO_2 and the company can regularly guarantee shipments containing less than 3% of these impurities. The deposits are extensive and present production is only limited by inadequate railroad facilities. The United States Magnesite Co., organized by C. P. Oudin, president of the American Fire Brick Co., of Spokane, has been developing quarries about 17 miles west of Springdale and three miles from the logging railroad of the Phoenix Lumber Co. Two calcining furnaces are contemplated and some material already calcined in a test ran 86.66% MgO and not over 3% of any impurity. The manufacture of magnesite bricks is to be undertaken in Spokane at the old brick plant of the Clay Products Co., lately bought by C. B. Stowe & Co., of Cleveland, Ohio, and leased to the American Fire Brick Co. Near Chewelah, Wash., the Northwest Magnesite Co. has bought 20 acres for a calcining and manufacturing plant. The quarries, five miles distant, are being worked day and night for an output of about 300 tons daily and an aërial tramway is to be installed to deliver the crude material to the calcining plant, which will contain two 7½x125-ft. furnaces with the necessary crushers, screens and rolls. Grain magnesite is to be produced for Eastern steel furnaces and powdered magnesite for the plastic trade. The company was recently incorporated for $1,000,000 and is adequately financed, its officers including men of prominence on the Pacific Coast as follows: President, R. S. Talbot; vice-president, F. B. Morse, manager of the Pacific Improvement Co.; consulting engineer, B. L. Thane, manager of Alaska Gastineau Mining Co.; secretary, Seabury Merritt; treasurer, D. J. Murphy, assistant cashier of Crocker National Bank of San Francisco; manager, R. D. Adams. William H. Crocker, of San Francisco, is also stated to be interested in this enterprise.

TORONTO—July 21

Increase in Wages of the Cobalt miners by the additional bonus of 25c. per day, following the increase in the price of silver to upwards of 80c. per oz., has dissipated any lingering apprehension of further serious labor troubles. At a special meeting of miners held on July 15, a resolution was adopted declaring that the men are as a whole satisfied with the pay at present received, and recommending that the strike vote of June 24, be not put into effect "until changed conditions necessitate such action."

Lignite in Saskatchewan may be utilized. According to a statement made by Prof. Ruttan, of the Canadian Advisory Council of Scientific and Industrial Research, to the Canadian Manufacturers' Association at their annual convention, held in Winnipeg, this week, the coal difficulty can be solved for the western provinces of Canada by utilizing for fuel the extensive lignite deposits of Saskatchewan. He claims that a process has been discovered, through the researches of the council, by which the lignite can be converted into briquette form at a cost of about two-thirds the price of anthracite in that market, and that the briquettes are equal in heating power to the imported coal. The research council has advised the government of Canada to establish a plant in Saskatchewan at a cost of $400,000 to carry out the process.

The Mining News

ALASKA

LABOR SITUATION at Kennecott, according to recent reports, developed nothing new, quiet and order prevailing among miners Some I W W agitators and few pro-Germans present, but unable to influence miners.

ALASKA COPPER CORPORATION (Stretna)—Being developed by Philadelphia men. Has taken in auto trucks to haul ore to railroad in the autumn. Mill to be erected. H. W Du Bois, of Philadelphia, consulting engineer.

MOTHER LODE COPPER (McCarthy)—Installing here 500-kw. electric plant to supply power to mine. Contemplate concentrator this year During winter shipped 37 carloads of ore, averaging about 30% copper Mine about 16 miles from Copper River & Northwestern Ry.

IN COPPER RIVER REGION, George C Baldwin has optioned the Big Four group of J. J Miller and Oscar Hanson, on the Chitystone, about 20 miles from the inland terminus of Copper River Ry P. J. Bonner is developing group of claims near the Lakinaw Placers on Dan and Chittitu creeks are being worked day and night In Bering River coal field, Clark Davis is developing 160 acres, after years of litigation, and expects to bring coal to Controller Bay, next autumn.

ARIZONA

Cochise County

LABOR SITUATION in Douglas shows smelteries running at capacity with full supply of ore

Gila County

STRIKE SITUATION in Globe shows no improvement. all miners still out Mechanics and electricians have gone back. Pumps running

Mohave County

CROW CANYON SECTION of Cedar Valley mining district, a vein of wulfenite, 18 in. wide recently been opened up by O T Flynn and Martin Hamilton

EMPIRE ARIZONA (Parker)—Eagle's Nest shaft recently reached 240-ft. mark to be continued to depth of 1000 ft. Other development stopped while sinking is in progress.

DIAMOND JO (Kingman)—Vein which has never been found below lower tunnel picked up at the south end of property. New tunnel to be driven to tap vein at greater depth.

SCHUYLKILL MINING CO. (Chloride)—Confining operations to providing additional boiler capacity and lowering pumps to 800 level. Nearly ready to begin drifting on 800 T J. Torpey, superintendent.

CHLORIDE & TELLURIDE (Chloride)—Fire destroyed shaft house, necessitating sending east for machinery parts Taking out ore from 175 level when accident occurred. H L. Heath, superintendent

PAYROLL MINE (Chloride)—Leased to L. F Martin of Chloride Delivered 50 tons ore from 200 level to Steffy custom mill Principally zinc content Raising from 100 to 200 and drifting south on 100 A W. Henning, superintendent

Pinal County

GILA DEVELOPMENT (Kelvin)—Pump installed in shaft and sinking resumed.

PINAL DEVELOPMENT (Kelvin)—Raise started from main tunnel to cut ore recently discovered in winze. Raise will be driven 125 ft

TROY ARIZONA (Kelvin)—New Climax shaft nearly reached 300 ft level. Good shipping ore being opened in work tributary to Rattler shaft.

Yavapai County

DEL MONTE (Wenden)—Formerly owned by Ridgley estate purchased by Gov. Meikeljohn, D Wiggers and associates.

CRITIC (Wenden)—Recent shipment of over a car load of ore to Humbolt showed high copper-gold contents

ARKANSAS & ARIZONA (Jerome)—Water power temporarily shut off by electrical storm. Mine flooded on 1640-ft level for several days. Drilling stopped Expect to continue drilling flat hole from face of east crosscut.

HULL COPPER CO. (Jerome)—Will attempt to secure redistribution of stock by stockholders' suit for injunction and judgment against S. F. Denison, administrator of late G. H. Hull estate. C. W. Clark also sued as trustee is general manager of United Verde Copper Co. and son of ex-Senator W. A. Clark, owner of United Verde. Intimated that Clark interests are close to having possession of Hull Copper Co.

CALIFORNIA

Amador County

KENNEDY (Jackson)—G. Shoni was killed on July 13, while barring down rock in the 2400-ft level Details of the accident not at present available

SIMONDS & LATHAM (Jackson)—T. Miller, working in tailing cyanide plant on Argonaut mine, caught in belt and thrown against timbers, being seriously injured before fellow workman could shut off electric power Few months ago W Bell, an engineer, met with similar accident at this plant and was instantly killed.

Calaveras County

COLUMBIA (Angels Camp)—Owner, John Ferraris, will reopen under organization of new company Formerly productive, but requires new development

LUCAS (Mokelumne Hill)—High-grade ore developed in small stringers, averages 6 ft wide High-grade is black and white quartz with free gold. Being developed by Robert Irvine

Eldorado County

WATER USERS ASSOCIATION (Placerville)—Filed with State Railroad Commission petition that Western States Gas and Electric Co., who recently acquired properties of Placerville Gold Mining Co., that water be furnished for irrigation and that the company be prohibited from using water for hydro-electric plant. The 235 members in the association will demand irrigation water whether mines and other users of electric power be supplied or not.

BALD MOUNTAIN (Placerville)—High-grade chrome ore being shipped to railroad by animal teams; 250 tons already shipped and large amount to be extracted. Six-animal teams haul 2½ tons per load.

Inyo County

MINARETS (Mammoth)—Drilling equipment arrived at Bishop and will be shipped and installed immediately. Mr. Eddy is manager and principal owner.

CERRO GORDO (Keeler)—Suit of Susie C. Simons for damage for use of waters of Crohn springs, part of the Cerro Gordo holdings disputed by the plaintiff, resulted in verdict awarding her $4000. Suit was for $9000. Case will probably be appealed.

Kern County

TUNGSTEN being produced from old dumps of Consolidated mine in Randsburg. Ore came from 60-ft. level and not considered of sufficient gold contents to pay for milling. The 3-ft. vein from which ore was taken was mined and milled until it was no longer pay ore at time when demand for tungsten did not encourage much effort on the part of leasers and prospectors.

Mariposa County

SWEETWATER (Merced) — Property owned by Taft oil men, being operated by small force of men. Equipped with mill.

EARLY (Jerseydale)—Resumed operation with 30 men, after 18 months litigation. New mill contemplated. George M. Hook, superintendent.

Modoc County

VALLEY VIEW MINING CO. (Alturas) —Property at Copper Peak said to contain high-grade copper ore carrying gold, averages about 5 ft. wide. New adit level will be started to connect with shaft and cut orebody at 1200 ft. Reported ore also contains nickel.

Mono County

BENTON TOWNSITE title being contested by United States in hearing before land office. Particular land in contention contains 120 acres was located in 1907 and came into possession of State of California and transferred to L. S. Brown. In 1913 Government started proceedings to recover title on ground that land was occupied by Indians and more than 40 acres was mineral land. If Government wins town of Benton will be without a legal site, but it is probable that occupancy will not be denied owners of homes.

Nevada County

ALLISON RANCH (Grass Valley)—New mill ready for operation. Test run satisfactory. Equipment consists of 40 stamps and concentration tables. Mill bins full of ore and extraction progressing.

PITTSBURGH (Nevada City) — High-grade ore encountered in crosscut. Ore is refractory and will have to be treated by other than milling method Superintendent Oates believes recent disclosure is lead to main orebody.

DELHI (Columbia Hill)—Leased to A. A. Codd of Reno, Nev., and eastern associates. Exploration and development will be carried on with view of large production. Mine has produced about $3,000,000. Hamilton Eddy, superintendent.

San Bernardino County

TWO HIGH-GRADERS sent to jail for 120 days recently for stealing tungsten ore from Atolia mill. High-grading has not been general in tungsten camp for year or more.

Shasta County

NOBLE ELECTRIC STEEL CO. (San Francisco)—W. H. French of Judson Manufacturing Co. of Oakland, elected vice-president and general manager. H. H. Noble, who developed electric plant at Heroult, Shasta County, retires from active management, but retains stock in company. W. W. Clark remains superintendent of operating plant. Heroult smeltery manufactures ferromanganese by electrolytic process and is said to have passed experimental stage and manufacturing a commercial product.

COLORADO

Gilpin County

EUREKA (Central City)—New machinery for mill received. Shaft sinking under way.

GOLD CUP (Central City)—Good-grade oreshoots opened on 85- and 165-ft. levels; shipments being made. Shaft, now 216 ft. deep, will be sunk 200 ft. and crosscut driven to Keystone vein.

PEARCE (Central City)—Mine in Lake district opened second vein in crosscutting on 300-ft. level. Drifting to junction now under way.

HOMER (Central City)—Jackson lease taken over by M. T. Chestnut and A. Clark. Shaft 200 ft. deep will be sunk 200 ft. more. Mine has produced good-grade gold-copper ore.

GOLD CUP (Central City)—Electrically operated air compressor, hoist, and machine drills will be installed. Colorado Power Co.'s line extended from Grand Army mine. Shaft will be sunk to 500-ft. level. One opened on 165-ft. level shows 2- to 12-in. shoot shipping-grade ore in 6-ft. shoot of milling-grade ore.

Hinsdale County

BUCKEYE (Lake City)—Gold-silver ore opened by lessee W. E. Mendenhall. Size of oreshoot not yet disclosed by development work. Discovery caused rush of prospectors to district.

Saguache County

SHAWMUT (Bonanza) — Satisfactory progress being made in driving lower tunnel to cut bottom of old shaft workings; tunnel to serve for drainage and transportation. Electrical power being installed.

RAWLEY (Bonanza)—Raise from 1200-ft. to 600-ft. level holed through; will make economic working of ore on upper levels. Tramway construction delayed by non-delivery of supplies; survey completed. Tramway will be over 6 miles in length. Regular shipments of heavy pyrite ore, carrying copper, gold and silver being made from 1200-ft. level.

San Juan County

SHIPMENTS FROM SILVERTON during the month of June were as follows: To outside smelters from the Sunnyside, 34 cars; Iowa-Tiger, 18; Gold King, 15; Pride of the West, 9; Silver Lake Custom Mill and S. D. & G. Leasing Co., 6 each; Highland Mary, 5; Silver Ledge and Mayflower, 4 each; Dives Leasing Co., 3; St. Paul, Hamlet and Anti-Periodic, one car each; miscellaneous small shipments, 9 cars; total, 116 cars. The following shipments were made to the Silver Lake Custom Mill for concentration, from Champion, 6 cars; Lackawanna, 2; Allen & Fattor, 2; Frank Waller, one; total, 11 cars. The North Star Custom Mill received 11 cars from the Detroit-Colorado property.

SUNNYSIDE (Eureka) — Contract for building new 4-mile aerial tramway from mine to new milling plant let to Harry Doyle, of Telluride.

GREEN MOUNTAIN (Silverton)—Being operated under lease by American Smelting and Refining Co.; ore shipped to Silver Lake mill.

LACKAWANNA (Silverton) — Compressor plant and electric power to be installed and tram built from mine to mill. Mill will be finished by autumn.

PRIDE OF THE WEST (Silverton)—Six cars concentrate shipped during June. When tramway to Green Mountain mine is completed, mill will be operated three shifts instead of one as at present. A. W. Harrison, manager.

San Miguel County

CARRUTHERS (Telluride)—Active operation of Inama & Perino Leasing Co., keeping 60-ton mill working at full capacity.

Summit County

EXCELSIOR PLACER (Breckenridge)—Tunnel being driven to open vein of lead ore on lode claims.

PIONEER CONSOLIDATED (Breckenridge)—Twenty-stamp mill now running full capacity.

LEE MINING CO. (Breckenridge)—Shaft sinking resumed. Shaft house burned several weeks ago.

LENAWEE (Breckenridge) — Mine will be reopened; tunnel now in 600 ft. to be driven 200 ft. further. Mill will be remodeled.

WELLINGTON (Breckenridge)—Recent development work opened on lower levels, ore assaying higher than former average grade.

ORO EXTENSION (Breckenridge)—Leasing company has completed unwatering shaft; catching up caved ground preparatory to development. Pumps handling 400 gal. per min.

EXCELSIOR (Breckenridge) — Mine workings being reopened and mill being remodeled. Fine-grinding machinery and flotation plant to be installed. Has own electrical power plant.

Teller County

CRESSON (Cripple Creek)—Oreshoot recently opened on 14 level showing up better. Drift on 16 level will not reach oreshoot until October.

IDAHO

Custer County

EMPIRE COPPER CO. (Mackay)—Contract for 16,300-ft. aerial tramway given to American Steel & Wire Co. Will begin laying foundations for towers shortly. Developing large mineral resources in oxidized zone suitable for steam-shovel operations in future.

Shoshone County

YUKON GOLD COMPANY (Murray)—Dredge shipped from Alaska being reconstructed on Prichard creek about a mile below Murray. Barge about ready to launch and expect dredge ready for operation about Sept. 1. Same date electric power line of Washington Water Power Co. will be completed.

AMBERGRIS (Wallace)—Crosscut from No. 4 tunnel of Hercules, near Burke, cut Ambergris vein at depth of 1000 ft. below shaft 200 ft. deep from surface. Vein shows ft. of good ore, lead-silver, and drifting started. In shaft is 2 to 3 ft. shipping ore, carrying silver. Hercules owns half of Ambergris through settlement of litigation years ago. Property lies along north side line of Hercules and ore struck in shaft near Hercules line. Will be developed through Hercules tunnel and ore transported to railroad over old Hercules tramway.

MICHIGAN

Copper

CALUMET AND HECLA (Calumet)—June production of C. & H. and its subsidiaries was: Ahmeek, 2,530,848; Allouez, 755,399; C. & H., 6,346,446; Centennial, 143,907; Isle Royale, 1,240,000; La Salle, 157,546; Osceola, 1,327,773; Superior, 193,050; Tamarack, 241,703; White Pine, 410,803.

SENECA (Calumet)—Will start sinking new shaft near Mohawk No. 2. Delays in delivery of material prevented rapid progress in preparatory work. Wagon road from county highway to mine is well advanced. Roadbed for spur of Keweenaw Central railway being constructed. Trying to have all equipment on ground before autumn.

Iron

CLEVELAND-CLIFFS (Ishpeming)—New hospital to be erected for miners of the Ishpeming district. Oliver company will assist with upkeep.

PRINCE OF WALES (Negaunee)—Oliver company suspended operations on June 30. Property taken over by Breitung interests. Ore in stock will be shipped within 30 days.

ROLLING MILL (Negaunee)—Closed down July 1. Large stock non-bessemer ore carrying sulphur on hand. Few sales made. Not desirable at this time. Jones & Laughlin Ore Co. has not one property working in Michigan at present time.

MINNESOTA

Mesabi Range

CARSON LAKE (Hibbing)—The General Contracting Co. of Chicago, erecting large concrete smokestack for new power plant being put in.

YORK MINE (Nashwauk)—Great Northern spur into property completed; will commence ore shipments to docks when washing plant is ready. Stanley Way, superintendent.

KEVIN AND PATRICK MINES (Nashwauk)—Great Northern enlarging ore yards preparatory for increased shipments when Butler Bros. get new concentrator working at these mines.

HANNA ORE CO. (Hibbing)—Have steam shovels cleaning up stock piles in Dale and So. Uno mines (open pits), and in large Harold and North Uno (underground). Stock piles left by Arthur Iron Mining Co. when leases were turned over to the Hanna people.

SCRANTON MINE (Hibbing)—Operated by Picands Mather Co., Robert Murray, superintendent, has purchased the Forty lying south for dump purposes, indicating mine will be opened up as open pit. Scranton originally opened up in 1917 as underground proposition but on account of large amounts of low-grade ore, mine was closed.

MISSOURI

Joplin District

BUFFALO (Quapaw, Okla.)—Installing machinery in new 200-ton mill. Mining at 165 ft.

FLANNERY (Sarcoxie) — To increase sludge department by additional 6 to 10 tables. Plant making 10 to 15 tons concentrate daily.

RAMAGE (Joplin)—Completed two new mills in Oklahoma field, one at Century and the other near Picher. Both plants capable of handling 400 tons per 10-hour shift of rich ore. Steam power. H. H. Hartzell, Joplin, manager.

SCOTT-EAGLE (Century, Okla.)—New 150-ton mill completed and placed in operation during week. Rich ground at 160 ft. Adam Scott, Joplin, one of principals.

PRAIRIE DOG (Quapaw, Okla.) — Moved New State mill from Commerce to new shaft, where rich ore found at 150 ft. S D. Newton, Quapaw, manager.

J T. WHALEY and associates, of Holdenville, Okla., purchased 40-acre lease adjoining Prairie Dog lease near Quapaw. Reported consideration, $20,000.

PARAMOUNT (Quapaw, Okla.)—Carrying on successful drilling campaign, having 12 good holes out of that many put down. Will start construction of mill soon. E. C. Naity, president.

BROWN & CO. (Joplin)—Started sinking 2 shafts on Renzenhausen farm southwest of Joplin: good ore found while drilling last Autumn. Is out of regular field, but fine ore run disclosed Company known as Live Wire; H E. Gerke, Joplin, principal.

EAST HAMPTON (Wentworth)—Planning to reopen ground Ran tailings over big mill recently. Instead of using usual scraper to supply mill, 15 to 20 men employed to shovel tails into surface cars, and hoisted to mill hopper. Frank Waddell, superintendent. Mrs. Sarah Matlack, owner.

VINEGAR HILL (Baxter)—Getting rich ore from 150-ft. level for recently completed Barr mill, near Blue Mound, west of Baxter, Kan Two other shafts being put down to 300 ft. On lease of 60 acres, 30 drill holes show cuttings averaging better than 10% blende and lead Blue Mound mine, opposite, producing heavily for months. S. H Davis, Baxter, manager.

MONTANA

Broadwater County

HYANTHA MINE (Winston)—Two car loads a week of silver-lead ore from 300-ft. level. C. S. Muffly, superintendent.

IRON MASK (Townsend)—Unwatering 350-ft. shaft. Complex lead-zinc ore. Extensive operations projected.

INDIAN CREEK PLACER (Townsend) —Taking up bedrock and lowering flume to correspond with gravel depth at head of open cut. Gravel 60 ft. deep. Hydraulic. J. H. Smith, manager.

Lewis and Clark County

STANTON MINE (Rimini)—Shipments lead-zinc ore being made. Worked by tunnel.

TRUE FRIEND (Helena)—New gasoline hoist in place. Shaft 150 ft. deep. Ore, low grade.

STEMWINDER MINE (Helena)—New steam hoist soon to be in place. Ore, high-grade silver. Deepening shaft.

PRODUCER MINE (Helena) — Two-stamp gold mill, crushing ore from tunnel. Low grade, large tonnage in sight.

HELENA MINE (Helena)—Ore shipments to smeltery from 300 level. Ore from one to three feet wide of silver-lead.

ROCK ROSE CO. (Helena) — Vertical shaft 300 ft. deep and drifting begun. Virgin ground from 100 to 300-ft. level. Good ore in drifts on 200 level.

SCRATCH GRAVEL GOLD (Helena)—Nearly $1000 to car load net smeltery returns received for ore shipments to East Helena smeltery. Ore stoped from 300-ft. level.

Silver Bow County

TOULUMNE (Butte)—Resumed operations at Toulumne mine and Main Range properties. Closed down during last month, account of strike. Now has full force on day shift and partial force on night shift; expect to have normal output in 10 days.

DAVIS-DALY (Butte)—Labor difficulties with electricians, blacksmiths, machinists, engineers and other crafts settled. Butte-Detroit mill completed to handle manganese ores; will rush work at Hibernia and new Republic mines in western district where manganese orebodies are opened. Expect to turn out concentrates by Aug handling 200 to 400 tons per day from mines.

BARNES-KING DEVELOPMENT (Butte)—Company's statement for June production shows total amount gold bullion for all properties was $15,773, about $15,000 less than May because of labor shortage. The following productions were recorded: North Mocassin, 1124 tons, averaging about $8 per ton, totalling $11,311; Shannon mine, 2108 tons, averaging $13.69 per ton, Gloster, 1212 tons, averaging $6.65 per ton Total amount ore treated at Pegan-Gloster mill was 3767 tons, value of bullion produced, $34,432 Good ore struck on 500 level of Shannon, 30 samples showed average assay of $76.60 per ton Payment of $15,180 made on Shannon title from Juno proceeds, unpaid balance is $61,412.

NEVADA

Esmeralda County

TONOPAH ORE PRODUCTION for week ended July 14 was 8902 tons, valued at $160,238, comparing with 6923 tons for previous week. Producers were: Tonopah Belmont, 2532 tons; Tonopah Mining, 2100 tons; Tonopah Extension, 2380 tons; Jim Butler, 700 tons; West End, 895 tons; Rescue, 187 tons; Montana, 108 tons.

Nye County

WHITE CAPS EXTENSION (Manhattan) — Jackhamer drills being used in sinking 3-compartment vertical shaft; ground is a soft shale. Shaft now sunk 28 ft. and three sets of timbers in place.

MANHATTAN-MUSTANG MINING CO. (Manhattan)—New orebody exposed on the Mustang, about 150 ft. south from the Train, Chase Lease workings. Cross fissure running north and south in the schist has been developed from surface which shows good assays in gold across 2 ft

Storey County

ALPHA (Gold Hill)—North drift in 200 level started and advanced 8 ft., total 176 ft., toward Exchequer. Face in soft quartz.

OPHIR (Virginia)—Old drifts on 2000 and 2700 levels reopened, work continued to total of 268 ft. on 2000, and 656 ft. on the 2700.

SIERRA NEVADA (Virginia) — Old north drift 2500 level cleaned out and repaired 12 ft., making total distance 895 ft.; timbered 17 ft., making total 100 ft.

MEXICAN (Virginia) — On 2900 level continued reopening main lateral drift; total distance repaired 346 ft. Air connection made at this point with M. & O. winze.

UNION CON. (Virginia)—Opening of 2700 level completed on July 15 and mining begun on this level on July 16 for first time in 34 yr. Extracted 70 tons of ore from 2300 level, car samples averaging $12.95 per ton.

YELLOW JACKET (Gold Hill)—Repairs to shaft continued. Sent 500 tons of ore to gloryhole from shaft bins. Saved 140 cars from workings; 429 cars drawn from chutes. Mill repairs completed and ready to resume operation July 19.

CON. VIRGINIA (Virginia)—Drift following hanging wall of vein on 2700 level advanced 5 ft., making total of 137 ft. The 2-compartment winze started in ore below sill floor of stope sunk 7 ft. From opening extracted 68 cars of ore assaying $25.61 per ton; 7 cars from second floor assaying $11.60 per ton; 17 cars of ore sent to gloryhole.

UTAH

Beaver County

MAJESTIC (Milford)—Fifteen cars low grade copper ore shipped during June from Old Hickory. Hoosier Boy being developed chiefly on 700 level. Ore is lead-silver.

Juab County

CHIEF CONSOLIDATED (Eureka)—June shipments were 130 cars, estimated at 6500 tons. First 6 months of 1917, output 828 cars, estimated at 40,000 tons.

IRON BLOSSOM (Silver City)—Reported net earnings for June, $31,000; shipped 130 cars. Much ore being shipped to Tintic Milling plant. Total output for first six months 1917, was 761 cars or about 35,000 tons.

Salt Lake County

KENNEBECK (Salt Lake)—Work to be resumed at old mine in Big Cottonwood; air to be furnished by the Cardiff.

CARDIFF (Salt Lake)—This Big Cottonwood property stated to be shipping up to 100 tons daily Shipments hindered by haulage difficulties.

UTAH COPPER (Bingham)—Estimated June output will exceed May, which amounted to 19,262,856 lb. Treating 35,000 to 38,000 tons daily at milling plants; extraction averaging 1.5% copper.

OHIO COPPER (Bingham) — Treating ores by flotation and expect to erect larger plant. Stated mine has 610,000 tons of ore ready for extraction, and calculated there are 20,000,800 tons of ore averaging over 0.75% copper, which can be treated

BINGHAM AMALGAMATED (Bingham) —Water coming into workings from surface during recent flood, now 20 ft below collar of inclined shaft; work will be resumed when this is 300 ft below Two cars copper ore shipped recently from 300 level. Shaft down 600 ft

Tooele County

GARRISON MONSTER (Gold Hill)—This Deep Creek property has 11 men working and force to be increased Said to be 20 cars of lead-silver ore on dump

WISCONSIN

Zinc-Lead District

VINEGAR HILL (Platteville)—Resumed construction of new two-jig mill at Jefferson mine, at Hazel Green.

WISCONSIN ZINC CO (Platteville)—New two-jig mill is under construction on the Copeland lease near Shullsburg.

DICKINSON (Platteville)—E. R. Brown and others have taken over this prospect and will complete shaft to the 85-ft. level, where lead ore was found by churn drill.

G. O. P. (Platteville)—M. B Huntley and Milwaukee men have purchased this mine, on the old Raisbeck range at Cuba City; the Roosevelt mill has been bought by them and will be moved to the mine.

NEW SURVEY (Dodgeville)—Made first shipment of zinc concentrates to the Mineral Point Zinc Co.

CANADA

Ontario

HUDSON BAY (Cobalt)—In June produced 28,000 oz. of silver.

CHARETTE CLAIMS (Boston Creek)—Vein varying in width from 2 in. to 4 ft. uncovered carrying free gold in places.

NATIONAL POTASH CORPORATION (Gravenhurst)—Erecting plant capable producing about 36 tons potash per day.

DOME LAKE (Porcupine)—In winze below 400-ft. level, ore shoot about 7 ft. wide carrying $9 to ton in gold opened for 50 ft.

CHAMBERS FERLAND (Cobalt)—Digging sewer on property workmen encountered vein carrying cobalt, niccolite and some silver.

DOMINION MOLYBDENITE (Wilberforce)—Orebody of favorable size proved up, and management has decided to erect mill.

ELLIOTT-KIRKLAND (Kirkland Lake) —Heavy flow from water seam encountered at 165 ft., caused suspension of work pending installation of steam equipment.

PETERSON LAKE (Cobalt)—Vein on Susquehanna leasehold after narrowing to 1 in. has faulted, and further exploration abandoned. Another vein being opened up.

GENESSEE (Cobalt)—Main shaft now down 465 ft.; ruby silver showing in narrow vein. When 500-ft. level reached, will crosscut to pick up veins coming in from Chambers-Ferland.

BUFFALO (Cobalt)—Purchased group of 13 claims in McElroy township directly east of Boston Gold Leaf and have started work. Development on Brisboise and Mondean properties, two of those acquired, reported to have exposed some exceptionally promising veins.

TECK HUGHES (Kirkland Lake)—Decided to sink from present level of 400 ft. on No. 1 vein to 600 ft. Veins found on surface persist to 400-ft. level; lateral work will be done at 600-ft. level. During June mill heads ran $9.66, but tonnage treated was low owing to labor shortage.

LAKE SHORE (Kirkland Lake)—Workings will be continued downwards to 400-ft. point, where crosscut will be driven under the lake to cut high-grade vein on 200-ft. level, after tapping which raise will be made to upper level. Most of machinery for mill now on ground.

MEXICO

GREENE CANANEA (Cananea, Son.)—Production of copper for first 22 days of June was 3,210,000 lb. Mines closed on June 22, on account Mexican troubles.

CHILE

CHILE COPPER CO. (Chuquicamata)—June copper output was 6,114,000 lb.

BELGIAN CONGO

UNION MINIERE DU HAUT KATANGA (Elizabethville)—June production of copper was 5,246,948 lb, comparing with 5,643,775 lb. for May

PERU

CERRO DE PASCO (La Fundicion)—June production 5,032,000 lb copper, comparing with 4,670,000 lb. for May

CHOSEN

ORIENTAL CONSOLIDATED (Unsan) —May bullion amounted to $116,330 divided as follows: Tabowie mill, $24,598; Taracal, $21,137; Malbong, $18,139; Taracal cyanide plant, $44,283; Malbong tube mill plant, $3872 Messrs. Okura & Co.'s electric power plant shut down for repairs several times during month caused 22 hr. loss to company. Company's own hydro-electric plant ran without stoppage. Reported leader and another of 9 bandits who attacked returning bullion train on Oct. 6 last captured by police.

The Market Report

Metal Markets

SILVER AND STERLING EXCHANGE

July	Sterling Exchange	Silver New York, Cents	Silver London, Pence	July	Sterling, Exchange	Silver New York, Cents	Silver London, Pence
19	4.7550	79½	40⅜	23	4 7550	78⅝	39⅞
20	4.7550	78⅜	39 15/16	24	4 7550	78⅜	39⅞
21	4.7550	78½	39 13/16	25	4.7556	78⅜	39¾

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

DAILY PRICES OF METALS IN NEW YORK

July	Copper Electrolytic	Tin Spot.	Lead N. Y.	Lead St. L.	Zinc St. L.
19	24 @25	62½	10 @11	10¼ @10¾	8 @8¼
20	24 @25	62⅝	10 @10¾	10¼ @10½	8 @8¼
21	24 @25	62⅝	10 @10½	10 @10½	8⅛ @8⅜
23	24 @25	62½	10 @10½	10 @10½	8⅛ @8⅜
24	24 @25	62¼	10 @10½	10 @10½	8¼ @8⅜
25	24 @25	62½	10 @10½	10 @10½	8⅛ @8⅝

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

The quotations for electrolytic copper are for cakes; ingots and wirebars. Electrolytic copper is commonly sold on "regular terms" (r.t.), including freight to the buyer's works and is subject to a discount for cash. The difference between the price delivered and the New York cash equivalent is at present about 0.25c. on domestic business. The price of electrolytic cathodes is 0.05 to 0.10c. below that of electrolytic. Quotations for spelter are for ordinary Prime Western brands. We quote New York price at 17c. per 100 lb. above St. Louis.

Some current freight rates on metals per 100 lb. are: St. Louis-New York 17c.; St. Louis-Chicago, 6.3c.; St. Louis-Pittsburgh, 13.1 cents.

LONDON

July	Copper Standard Spot	Copper Standard 3 Mos.	Copper Electrolytic	Tin Spot	Tin 3 Mos.	Lead Spot	Zinc Spot
19	130	129½	142	239	235¾	30½	54
20	130	129½	142	240	236½	30½	54
21	.	.				. .	. .
23	125	124½	137	239	236½	30½	54
24	125	124½	137	238½	236	30½	54
25	125	124½	137	239½	236½	30½	54

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2,240 lb. For convenience in comparison of London prices, in pounds sterling per 2,240 lb., with American prices in cents per pound the following approximate ratios are given, reckoning exchange at 4.80. £15 = 3.21c.; £20 = 4.29c.; £30 = 6.43c.; £40 = 8.57c.; £60 = 12.85c. Variations, £1 = 0.21⅜c.

NEW YORK—July 25, 1917

Lead was a little softer than in the previous week and zinc was a little stronger. Copper was steadier in tone.

Copper, Tin, Lead and Zinc

Copper—This market was in a good deal of confusion, there being reports of very low offers, down to 23c., regular terms, for the fourth quarter, and lower still for delivery in the first quarter of 1918. The facts of the situation, so far as we could determine them, are that at the low point reached at the close of last week the market seemed to have found bottom, some buying interest being developed; discerning which, the interests that had previously been offering copper down withdrew their pressure. Lower offers continued to be made by second-hands, either in behalf of speculative holdings or of consumers who desired to resell, but in general the quantities that they had to offer were trifling and buyers who wanted to take round lots found themselves obliged to pay higher prices and did so. There was distinctively more inquiry, but this did not result in much business, although several lots of half-million and million pound size were turned over. The premium on near-by copper has now all but disappeared and it makes no great difference whether anybody wants to buy July, or August, or August-December.

Advices from Butte this morning, as reported elsewhere in this issue, were to the effect that the companies had made to the striking miners a proposition that has fair chances of acceptance. Reports from Arizona indicate an improvement in the situation at Bisbee, Globe and Morenci. However, the check to production during July is a serious matter. All of the refiners have been eating into their stock of blister copper, while at Great Falls the stock has been exhausted and that refinery, which has a normal production of 20,000,000 lb. of refined copper monthly, is closing down.

Copper Sheets are quoted at 37@38c. per lb. for hot rolled, and 1c. higher for cold rolled. Wire is quoted at 33c. per lb., f.o.b. mill.

Tin—There was very little business and very little inquiry. Total transactions were probably less than 300 tons. Changes in price were but trifling. Banka tin, however, was relatively weak, the discount from the price for Straits tin rising to about 3⅜c. per pound.

Lead—Our intimation last week, that producers would meet the lower prices, if they could get business, was borne out, and certain of them accepted prices around 10⅜c. for round lots, prompt delivery, while there were sellers of September-October lead at 10c. At the close, however, persons who had purchased at 10@10⅜c., were reported as saying that they could not obtain additional supplies at less than 10½c., though probably they might have done so if they had tried all quarters.

The labor situation in southeastern Missouri is about in statu quo. Production of pig lead has not yet been affected, there having been sufficient stocks of ore to keep the furnaces going, although the production of ore by the mines has been reduced about 50%. However, it is estimated that even if the labor difficulties be ended right away, there will be inevitably som falling off in pig lad production in August.

Zinc—On July 19, there were transactions at 8c. and later at 8⅛@8.15c., the bulk of the business being around the latter figures. During the remainder of the week, a fair volume of business was done, partly with speculators and partly with consumers at a slight advance in price.

On July 25, the Zinc Committee reported that the following transactions had been consummated with the Ordnance Bureau of the War Department: 8,250,000 lb. of Grade A spelter at 13½c.; 15,000,000 lb. of Grade B at 13c.; delivery to be made in approximately equal quantities monthly during the next 10 months. This is the same transaction that was previously reported, but has been hanging fire during several weeks. In order that confusion may be avoided, it should be noted that this is the second transaction that the Zinc Committee has made with the Government, the first having been in April last. There is no truth in the rumor circulating today to the effect that the Government is negotiating for 25,000 tons of Grade C (prime western) spelter.

Zinc Sheets—Price of zinc sheets has not been changed. Market is still at $19 per 100 lb. f.o.b. Peru, Ill., less 8% discount.

Other Metals

Aluminum—The aluminum market continues extremely quiet. Quotations are about as noted last week, quick delivery being offered at 55@57c. per lb. for No. 1 ingots at New York; futures slightly lower.

Antimony—This market is very dull. Quotations here are lower than in China, this situation being the result of speculative buying that was entered into with the expectation that a rise in the market would happen at about this time, owing to Government buying. Such buying not having materialized, speculative holders have been realizing. We quote 14½@15c. for spot, which is a decline of more than a cent from the previous week. The price for futures is uncertain, producers not quoting. We quote August shipments from China, nominally, at 14@14½c., c.i.f., in bond.

Bismuth—Quoted at $3.50 per lb.

Cadmium—Quoted at $1.45@1.75 per lb.

Cobalt—Quoted at $1.70 per lb.

Nickel—Steady at 50@55c. per lb., with premium of 5c. per lb. for electrolytic.

Quicksilver—The market is somewhat stronger than reported last week. The stocks in New York continue light, and quotations are made here at $115. San Francisco reports by telegraph $105, strong.

Gold, Silver and Platinum

Gold—Coin amounting to a considerable sum has been withdrawn from the New York subtreasury for shipment to Spain. Additional withdrawals during the week were $200,000 for shipment to Canada and $20,000 more for Spain.

The Indian Government has prohibited the import of gold into India except by special license. It has also strictly forbidden the melting of gold coins for any purpose whatever.

Silver—The silver market has had a sagging tendency the past week, falling from 40⅜ pence in London on the 19th to 39¾ pence on the 25th, and closing steady at that price. The prohibition of imports of silver into India, except on Government account, has had a tendency to lessen the demand for shipments to India. The stock of silver held by the Indian Treasury has recently shown a substantial increase.

A compilation by the National City Bank, of New York, shows that the United States is now the world's premier silver producer, its output being double that of Mexico and three times that of Canada.

The Indian Government has increased its holdings of silver coin lately and on July 10 had in the treasury reserve 202,400,000 rupees. Silver stocks in Bombay have increased and at latest date were 2300 bars. Stocks in Shanghai have also increased and are reported at 14,800,000 in dollars and 20,900,000 oz. sycee.

Mexican dollars at New York: July 18, 63c.; 19, 62½c.; 20, 62½c.; 21, 61⅝c.; 23, 61⅞c.; 24, 61⅝c.

Platinum—Market quiet and steady at $105.

Palladium—Firm at $115. One producer reports having had to decline an offer at that price, owing to not having the metal.

Zinc and Lead Ore Markets

Platteville, Wis., July 21—Blende, 60% Zn, $70 for premium ore down to $65 for medium grade. Lead ore, basis 80% Pb, $120 per ton. Shipments reported for the week are 2676 tons of zinc ore, 199 tons of lead ore, and 569 tons of sulphur ore. For the year to date the figures are: 77,964 tons of zinc ore, 3725 tons of lead ore, and 16,352 tons of sulphur ore. Shipped during the week to separating plants, 3604 tons of zinc ore.

Joplin, Mo., July 21—Blende, per ton, high $77.80; basis 60% Zn, premium $75, medium to low, $70@65; calamine per ton, basis 40% Zn, $42@40; average selling price, all grades of zinc, $68.10 per ton.

Lead, high $128.50; basis 80% Pb, $125@115; average selling price, all grades of lead, $123.29 per ton.

Shipments the week: Blende, 9845 tons, calamine, 572 tons, lead, 2152 tons. Value all ores the week, $974,950. Following two quiet weeks, the past fortnight has shown a resumption toward heavier shipping. Prices, however, continue to show an average decline, and for two weeks a drop of $5 in base price has been expected by local buyers. There is no question but that the Oklahoma field can produce cheap ore, and large quantities of it, but whether they will or not remains to be seen. It is said the bulk of the large producing mines are owned by Oklahoma oil capitalists who can hold their ore or shut down at will. They are mining, some assert, for the sport of it and to make all the money they can out of it.

Other Ores

Antimony Ore—Nothing reported done.

Chrome Ore—Unchanged. Considerable business was done at $1 per unit, f.o.b. California, for ore of 45 to 46% chromic oxide.

Manganese Ore—Market seems willing to absorb all the high grade metallurgical ore that is offered at $1.20 per unit. Chemical ore is quoted at 5@7c. per lb., according to grade.

Molybdenum Ore—Unchanged at $2.10@2.25 per lb. of molybdenum sulphide in concentrates assaying 90%. Whatever ore comes into the market finds ready sale.

Iron Ore—Prices, delivered lower Lake ports are for old-range bessemer, $5.95; old-range nonbessemer, $5.20; Mesabi bessemer, $5.70 and Mesabi nonbessemer, $5.05.

Pyrites—Spanish lump quoted at 15½c. per unit on basis of 10s. ocean freight, buyer to pay war risk, excess freight and any duty. Ocean freights are 42s. 6d. from Huelva to southern ports, contracts having been made at that figure lately.

Tungsten Ore—Market strong. The best grade of wolframite on the spot in New York sold at $25 per unit; scheelite at $26.

Iron Trade Review

NEW YORK—July 25

Buyers of pig iron and of all forms of finished steel continue for the most part to hold aloof from the market, says "Iron Age," and their fear of what may happen to prices as the result of Government action is in sharp contrast with their willingness only lately to pay any price the producer might name.

PITTSBURGH—July 24

The volume of transactions in pig iron, unfinished steel and finished steel has dropped to almost nothing. In pig iron, purchases are confined to small lots for early delivery. In steel products there is little demand, and this little is confined to early deliveries which the mills can scarcely compass. Specifications on current contracts, which are chiefly at prices much lower than those now quoted as representing the market, have undergone a further decrease.

The large steel interests are making no effort to book business and seem to welcome the clearing of order books which is in progress. While the Steel Corporation's unfilled obligations decreased 500,000 tons in June estimates of the July decrease run up to 750,000 tons.

Production is curtailed by hot weather, as is usual in July and August, and coke continues scarce. While car supplies in the Connellsville coke region are much better the operators now complain of labor shortage.

There is no expectation that the present stagnation in the pig iron and steel markets will yield to really active conditions until there is a general readjustment downwards in prices. Some think this will start when prices are fixed for Government requirements, upon the Federal Trade Commission making its report as to present cost of production, a report expected a fortnight hence. Others think nothing of importance will occur until order books become relatively clear, some months hence. The pressure for deliveries of steel is keen, but reduced consumption is in prospect, particularly in the building trades and in railroad work.

Pig Iron—The market has been stagnant, transactions being confined to small lots for early delivery, and some resale iron has figured, particularly in the case of bessemer, at cut prices. Minimum prices on bessemer and basic are quotable $1 a ton lower than formerly. We now quote: Bessemer, $55@57; basic, $53@55; foundry and malleable, $53@56, f.o.b. valley furnaces, 95c. higher delivered Pittsburgh.

Steel—There have been no important transactions. Sellers are calling for heavier specifications on contracts, suggesting an easier position, and an authority expresses the opinion that billets forced on the market would not bring over $80. Former quotations, based on sales, were $95@100 for billets and $105@110 for sheet bars.

STOCK QUOTATIONS

N. Y. EXCH.†	July 24
Alaska Gold M	5½
Alaska Juneau	4
Am.Sm.& Ref.,com.	101¼
Am. Sm. & Ref., pf	113
Am. Sm. Sec., pf, A	99½
Am. Sm. Sec., pf. B	92¼
Am. Zinc	24½
Am. Zinc, pf	62
Anaconda	76½
Batopilas Min	1½
Bethlehem Steel	130
Bethlehem Steel, pf	115½
Butte & Superior	36½
Cerro de Pasco	34¼
Chile Cop	19½
Chino	53¼
Colo.Fuel & Iron	48½
Crucible Steel	79½
Dome Mines	10½
Federal M. & S	14
Federal M. & S., pf	41½
Great Nor., ore ctf.	33
Greene Cananea	41½
Gulf States Steel	115
Homestake	100½
Inspiration Con	54½
International Nickel	38¼
Kennecott	42¼
Lackawanna Steel	91
Miami Copper	40
Nat'l Lead, com.	55
National Lead, pf	110
Nev. Consol	22
Ontario Min	5¼
Quicksilver	1¼
Quicksilver, pf	1¾
Ray Con	26½
RepublicI.&S.,com.	89½
Republic I. & S., pf	102½
Sloss-Sheffield	52
Tennessee C. & C.	17½
U. S. Steel, com	120½
U. S. Steel, pf	117¼
Utah Copper	102½
Va. Iron C. & C	67

N. Y. CURB†	July 24
Big Ledge	1⅛
Butte & N. Y.	1½
Butte C. & Z	9
Caledonia	70
Calumet & Jerome	1 1/16
Can. Cop. Corpn.	2 1/16
Carlisle	4
Cashboy	06½
Con. Ariz. Sm.	2 1/16
Con. Coppermines	7¼
Con. Nev.-Utah	1/16
Emma Con	11/16
Ferber	‡60
First Nat. Cop	2½
Goldfield Con.	52
Goldfield Merger	05
Greenmonster	½
Hecla Min	8 11/16
Howe Sound	5½
Jerome Verde	1½
Kerr Lake	5
Magma	49
Majestic	42
McKinley-Dar-Sa	53
Mohican	75
Mother Lode	27
N. Y. & Hond	12½
Nipissing Mines	7½
Ohio Cop	1 1/16
Ray Hercules	3½
Richmond	57
Rochester Mines	48
St. Joseph Lead	20
Standard S. L.	11/16
Stewart	1/16
Success	29
Tonopah	6½
Tonopah Ex	2 1/16
Tribullion	25
Troy Arizona	22
United Cop	75
United Verde Ext	36
United Zinc	4½
Utica Mines	22
White Knob, pf	1½
White Oaks	‡2
Yukon Gold	1½

SAN FRAN.*	July 21
Alta	04
Andes	13
Best & Belcher	02
Bullion	01
Caledonia	19
Challenge Con	01
Confidence	05
Con. Virginia	24
Gould & Curry	02
Hale & Norcross	03
Jacket-Cr. Pt	06
Mexican	08
Occidental	65
Ophir	09
Overman	‡02
Savage	05
Seg Belcher	01
Sierra Nevada	10
Union Con	09
Utah Con	01
Belmont	4 25
Jim Butler	70
MacNamara	16
Midway	09
Mont.-Tonopah	19
North Star	10
Rescue Eula	21
West End Con	65
Atlanta	09
Booth	07
Comb. Frac	04
D'Field Daisy	03
Florence	16
Jumbo Extension	26
Kewanas	12
Nevada Hills	21
Nevada Packard	34
Round Mountain	31
Silver Pick	10
White Caps	1 25
Big Jim	65
United Eastern	4 00

BOSTON EXCH.*	July 24
Adventure	2½
Ahmeek	98½
Algomah	75
Allouez	61
Ariz. Com., ctfs	12½
Arnold	25
Bonanza	20
Butte-Ballaklava	60
Calumet & Ariz	76
Calumet & Hecla	533
Centennial	17
Copper Range	58
Daly West	1½
Davis-Daly	5
East Butte	10½
Franklin	6
Granby	76
Hancock	14
Hedley	16
Helvetia	35
Indiana	2
Isle Royale	30
Keweenaw	2½
Lake	11
La Salle	3½
Mason Valley	6½
Mass	13
Mayflower	2
Michigan	2¼
Mohawk	80½
New Arcadian	3½
New Idria	‡14
North Butte	17½
North Lake	1
Ojibway	1½
Old Dominion	55
Osceola	83
Quincy	84
St. Mary's M. L.	76
Santa Fe	1
Seneca Mines	10
Shannon	7½
Shattuck-Ariz.	24
So. Lake	3¼
So. Utah	.15
Superior	8½
Superior & Bost.	4
Trinity	6½
Tuolumne	1
U. S. Smelting	56½
U. S. Smelt'g, pf	49¼
Utah Apex	2¼
Utah Con	15
Utah Metal	4½
Victoria	3½
Winona	2½
Wolverine	44½
Wyandot	45

BOSTON CURB*	July 24
Alaska Mines Corp	62
Bingham Mines	12½
Boston Ely	40
Boston & Mont	63
Butte & Lon'n Dev	14
Calaveras	3
Calumet-Corbin	01
Chief Con	2½
Cortez	20
Crown Reserve	27
Crystal Cop	1 1/16
Eagle & Blue Bell	02½
Houghton Copper	75
Intermountain	1½
Iron Cap, Com	15½
Iron Cap Cop., pf.	15½
Mexican Metals	.28
Mines of America	1½
Mojave Tungsten	61
Nat. Zinc & Lead	.55
Nevada-Douglas	1
New Baltic	1½
New Cornelia	17½
Oneco	50
Pacific Mines	30
Rex Cons	25

SALT LAKE*	July 21
Bannack	1 00
Big Four	27½
Black Jack	.06
Cardiff	6 75
Colorado Mining	20
Daly-Judge	8 00
Empire Copper	1 25
Gold Chain	18
Grand Central	60
Grand Gulch	19
Iron Blossom	87
Lower Mammoth	03
May Day	05½
Moscow	12
Prince Con	1 07½
Silver-King Coal'n	2 97½
Silver King Con.	3 75
Sioux Con	10
So. Hecla	1 42
Uncle Sam	02½
Wilbert	22
Yankee	07½

TORONTO*	July 21
Bailey	‡03
Beaver Con	33
Buffalo Mines	1 25
Chambers Ferland	13½
Coniagas	3 75
La Rose	47
Peterson Lake	12
Right of Way	05
T. & Hudson Bay	‡38 00
Temiskaming	32½
Wettlaufer-Lor	05½
Dome Exten	16
Dome Lake	18
Foley O'Brien	60
Hollinger	4 50
McIntyre	1 51
Newray	60
Porcu. Crown	48
Schumacher	42
Teck Hughes	48
Vipond	30
West Dome	19

STOCK QUOTATIONS—Continued

COLO. SPRINGS	July 24
Cresson Con.	5 93¼
Doctor Jack Pot	.04½
Elkton Con.	.06
El Paso	29
Gold Sovereign	04½
Golden Cycle	2 14½
Granite	50
Isabella	10
Mary McKinney	16
Portland	1 45
United Gold M	22½
Vindicator	.70

LONDON	July 12
Alaska Mexican	£0 10s 0d
Alaska Tre'dwell	1 0 0
Burma Corp.	4 3 9
Cam & Motor	0 7 9
Camp Bird	0 6 6
El Oro	0 10 0
Esperanza	0 9 6
Mexican Mines	4 7 6
Nechi, pfd.	0 12 6
Oroville	0 16 3
Santa Gert'dis.	0 10 6
Tomboy	0 18 6

* Bid prices. † Closing prices. ‡ Last Quotations.

MONTHLY AVERAGE PRICES OF METALS

Silver	New York			London		
	1915	1916	1917	1915	1916	1917
January	48 855	56 775	75 630	22 731	26 960	36 682
February	48 477	56 755	77 585	22 753	26 975	37 742
March	50.241	57 935	73 861	23 708	27.597	36 410
April	50.250	64 415	73 875	23 709	30 662	36 963
May	49 915	74 269	74 745	23 570	35 477	37 940
June	49 034	65.024	76.971	23 267	31 060	39 065
July	47 519	62 940		22 597	30 000	
August	47 163	66 083		22 780	31 498	
September	48 680	68 515		23 591	32 584	
October	49 385	67 855		23 925	32 361	
November	51 714	71 604		25 094	34 192	
December	54 971	75 765		26 373	36.410	
Year	49 684	65 661		23 675	31 315	

New York quotations cents per ounce troy, fine silver, London, pence per ounce, sterling silver, 0 925 fine

Copper	New York		London			
	Electrolytic		Standard		Electrolytic	
	1916	1917	1916	1917	1916	1917
Jan	24 008	28 673	88 083	131 921	116 167	142 895
Feb	26 440	31 750	102 667	137.895	133 167	148 100
Mar	26 310	31 481	107 714	136 750	136.000	151 000
April	27 895	27 935	124 319	133 842	137 389	147 158
May	28 625	28 788	135 457	130 000	152 522	142 000
June	26 601	29.962	112 432	130 000	137 455	142 000
July	23 865		95.119		125 500	
Aug	26 120		110 283		126 304	
Sept	26 855		113 905		134 071	
Oct	27 193		122 750		142 523	
Nov	30 625		134 659		155 432	
Dec	31.890		145 316		162 842	
Year	27 202		116 059		138 281	

Tin	New York		London	
	1916	1917	1916	1917
January	41 825	44 175	175 548	185 813
February	42 717	51 420	181 107	198 974
March	50 741	54 388	193 609	207 443
April	51 230	55 910	199 736	220 171
May	49 125	63 173	196 511	245 114
June	42 231	62 053	179 466	242 083
July	38 510		168 357	
August	38 565		169 870	
September	38 830		171 345	
October	41 241		179 307	
November	44 109		186 932	
December	42 635		183 368	
Av. year	43 480		182 096	

Lead	New York		St. Louis		London	
	1916	1917	1916	1917	1916	1917
January	5 921	7 626	5 826	7 530	31 167	30 500
February	6 246	8 636	6 164	8 595	31 988	30 500
March	7 136	9 199	7 375	9 120	34 440	30 500
April	7 630	9 288	7 655	9 158	34 368	30 500
May	7 463	10 207	7 332	10 202	32 967	30 500
June	6 936	11 171	6 749	11 123	31 011	30 500
July	6 352		6 185		28 137	
August	6 244		6 088		29 734	
September	6 810		6 699		30 786	
October	7 000		6 898		30 716	
November	7 042		6 945		30 500	
December	7 513		7 405		30 500	
Year	6 853		6 777		31 359	

Spelter	New York		St. Louis		London	
	1916	1917	1916	1917	1916	1917
Jan	16 915	9 619	16 745	9 449	89 810	48 329
Feb	18 420	10 045	18 260	9 875	97 762	47 000
Mar	16 846	10 300	16 676	10 130	95 048	47 000
April	16 695	9 459	16 525	9 289	99 056	54 632
May	14 276	9 362	14 106	9 192	94 217	54 000
June	11 752	9.371	11 582	9 201	68 591	54 000
July	8 925		8 755		50 750	
Aug	8 730		8 560		51 587	
Sept	8 990		8 820		52 095	
Oct	9 829		9 659		54 159	
Nov	11 592		11 422		56 023	
Dec	10 665		10 495		55 842	
Year	12 804		12 634		72 071	

New York and St. Louis quotations, cents per pound, London, pounds sterling per long ton. ‖ Not reported

Pig Iron, Pitts.	Bessemer‡		Basic‡		No. 2 Foundry	
	1916	1917	1916	1917	1916	1917
January	$21 60	$35 95	$18 78	$30 95	$19 70	$30 95
February	21 16	36 37	18 93	30 95	19 51	30 95
March	21 81	37 37	19 20	33 40	19 45	35 91
April	21 65	42 23	18 95	38 90	19 45	40 0
May	21 78	46 94	19 11	42 84	19 58	43 6
June	21 95	54 22	18 95	50 05	19 34	50 14
July	21 95		18 95		19 20	
August	21 95		18 95		19 22	
September	22 88		19 58		19 53	
October	24 61		21 26		21 51	
November	30 07		28 18		26 55	
December	35 16		30 95		30 79	
Year	$23 88		$20 98		$21 15	

‡ As reported by W. P. Snyder & Co.

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The Massey Copper Mine, Ontario, Canada

BY FRANCIS CHURCH LINCOLN
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In a territory 50 miles west of Sudbury the Massey mine has produced a siliceous flux that is susceptible to flotation treatment. Geological history of the district and description of vein formation are noted in detail.

NORTH of Lake Huron and west of the Sudbury nickel-copper district lies a region in which there are many chalcopyrite veins. These veins have been known for some time, having been exploited to provide flux for the Sudbury ores, but their commercial importance has recently been considerably increased as a result of the introduction of the froth-flotation process and of the rise in the price of copper. Among the mines of this region are the Bruce mine of the Mond Nickel Co., which is supplying converter flux from a quartz-chalcopyrite vein; the Dean Lake mine of the Sudbury Nickel Co., which is now under development and is said to have opened a 1500-ft. vein from 4 to 6 ft. in width, containing chalcopyrite, calcite, feldspar and quartz, with the copper content running from 4 to 6%; the Cheney mine in Haughton Township, which shipped 16% copper ore last winter and is now under development; the Hermina mine in Salter Township, which is at present idle; the Massey mine in the same township, which is described in the present article.

NO. 1 SHAFT—500 FT. IN DEPTH NO. 4 SHAFT—OPEN CUT

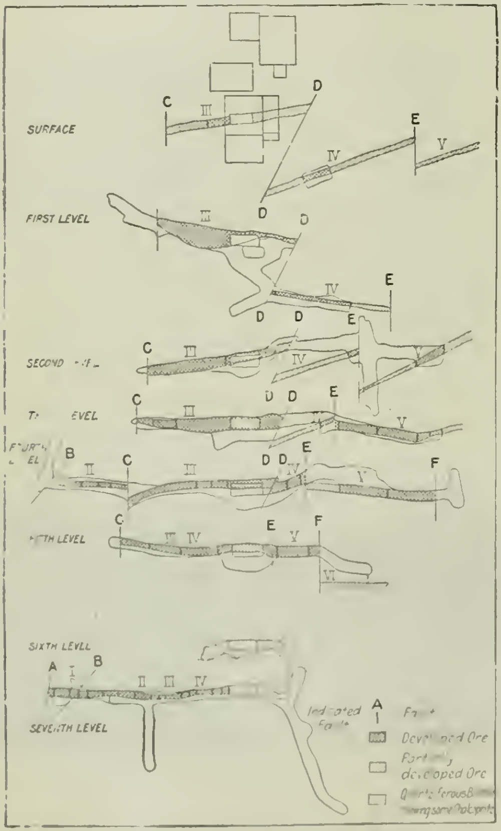
VIEWS OF PORTIONS OF THE MASSEY COPPER MINE, ONTARIO

The Massey copper mine was discovered in 1900 and in succeeding years produced several thousand tons of copper ore. Part of this was shipped to Copper Cliff and to Victoria Mines, to be smelted with nickel ore. Then, in 1904, an Elmore oil-flotation plant was erected at the mine, but there, as elsewhere in America, the process was a failure and in 1907 the mine was shut down. At the opening of the present year the property was acquired by the Kenyon Copper Mines, Ltd. This company has erected an experimental Callow flotation plant in the old Elmore mill and is planning to develop the mine, build a large flotation mill and install a hydro-electric plant.

The town of Massey is on the Sault Ste. Marie branch of the Canadian Pacific R.R., 58.4 miles west of Sudbury. It is a small but thriving town with post office, bank, hotel and stores, and is mainly supported by the lumber industry, which is now active at a considerable distance from the railroad. The Massey copper mine is three miles by branch railway northwest of the town of Massey.

The topography of the region is glacial, with many low rounded hills which rarely exceed a hundred feet in height, rising like islands from the sea of drift. Except for occasional farm clearings, the ground is covered with a thick second growth of birch, poplar and pine. The district is drained by the Sable River. Two miles to the northwest of the mine this stream, flowing southward, makes a sudden 3½-mile detour to the east and then continues on its southerly course, entering the Spanish River near the town of Massey. The Spanish River is a navigable stream flowing into the not far distant North Channel of Lake Huron. Falls on both the Sable and Spanish Rivers afford excellent hydro-electric power sites, and it is at Cameron Falls, on the Sable River just before it makes the detour described, that power for the Massey mine is to be developed.

The country rock of the Massey mine consists of greenstone-tuff schists and quartzite schists which are believed by Coleman[1] to belong to the Sudbury Series, but which may be of Keewatin age since they differ materially from the rocks of the locality type as exposed fifty miles to the eastward. These rocks were originally beds of medium-basic volcanic ash and of sand, which were formed in very early geologic time, consolidated into tuffs and sandstones, and finally metamorphosed into schists having a general east-and-west strike and a steep northerly dip to their schistosity.



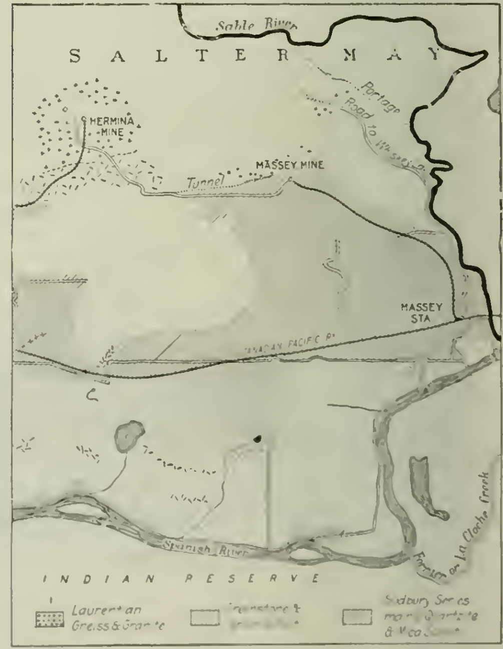
LEVEL PLANS OF THE MASSEY MINES SHOWING THE FAULTS

The copper deposits at the Massey mine, having a length of nearly a mile, occur in an east-and-west zone in these schists. A mile to the westward of the most westerly workings, across a drift-covered plain, is Shaft No. 1 of the Hermina mine, which is said to disclose a deposit similar in character to those at the Massey mine. It is therefore probable that the Massey and Hermina mines are on the same ore-bearing zone and that copper deposits occur beneath the glacial drift between them.

The Massey ore deposits are parallel to the schistosity and have more or less well-defined walls. It is quite possible that at one time a continuous orebody extended the full length of the property and that this has since been broken up by minor faulting into a series of smaller orebodies. However true this may be, the outcrops at the western end of the ground are of such a character as to indicate that there were originally several parallel orebodies.

Copper ore has been found in the lowest workings at a depth of 530 ft. from the surface, and its general character is such as to make it seem probable that the ore will extend to considerable depth.

The ore deposits have been metamorphosed. This metamorphism has occurred, in part at least, subsequent to the minor faulting mentioned, and has erased the planes formed by this faulting. So thoroughly has this been done that the casual observer is led to conclude that the orebodies are distinct lenses in the schist, and their true character of faulted and metamorphosed veins only becomes clearly evident when the orebodies on different levels are plotted. This may be seen in Fig. 1, which shows the ore occurrences at the main shaft. The faults are lettered A to G, and the fault-blocks numbered I to VI. It will be noticed that the western fault-blocks are displaced toward the north;



GEOLOGICAL MAP OF THE DISTRICT SURROUNDING THE MASSEY COPPER MINES or in other words, in walking west along the vein the faults are found to displace the ore toward the right hand. These displacements are also seen to decrease with depth, indicating that the faulting is either dying out or is pivotal in character and will reverse in direction with greater depth. That the latter is more probable seems likely when one considers the crushed zone between the fifth and seventh levels, which strongly suggests that this portion of the deposit was the pivot of many faults, a conclusion that is strengthened by the apparent reversal of the indicated fault G on the seventh level.

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[1] 22nd Ann. Rep. Ontario Bureau of Mines (1913), p. 155.

The primary ore mineral is chalcopyrite. Associated with this is a very little silver and a trace of gold. Since these do not concentrate with the copper, they are evidently present in some other mineral than chalcopyrite. The chalcopyrite was deposited together with pyrite, magnetite, specularite and white milky quartz. These minerals have all suffered metamorphism. A large proportion of the filling material is country rock that has undergone a comparatively slight mineralogical change where quartzite and a most profound one where greenstone-tuff. In the latter case, only the small amount of original quartz has been preserved as such, but the other original minerals have almost completely disappeared, the feldspars having been changed to epidote and the ferromagnesian constituents to chlorite.

NO. 1 SHAFT AND 100-TON FLOTATION MILL
MASSEY COPPER MINE

Although the ore deposits belong to a remote geological age, the gossan development and secondary sulphide enrichment are extremely superficial, never extending downward for more than a few feet and at times being altogether lacking. This is due to the geologically recent glaciation of the region, which took place in Pleistocene time and completely removed what gossan and secondarily enriched ore may have been formed in previous geological ages. Limonite is the principal constituent of such little gossan as exists, chalcocite distinguishes the zone of secondary enrichment, and below that the primary ore minerals make their appearance.

Thus the geological history of the Massey mine may be summed up briefly as follows: In early Archæan time beds of sand were deposited in the vicinity of what is now Massey and volcanoes discharged medium-basic ash to form interstratified beds in the sands. After the sand had consolidated to sandstone and the ash to tuff, copper-bearing mineral veins were formed in these rocks possibly as an after-effect of the intrusion of Laurentian granite, which occurs in the near neighborhood. Metamorphism ensued, and before it was complete, the veins were subjected to minor faulting, the fault planes later vanishing as a result of continued metamorphism. Then came Pleistocene glaciation, since which only a negligible amount of gossan formation and secondary enrichment have occurred. This leads to the conclusion that any variation in the value of the ore with depth, aside from that encountered with the first few feet, must be due to variation in the original deep-seated deposition of the ore and can have no relation to the present surface.

The present developments on the property constitute three groups separated by 1500-ft. intervals of unprospected territory. The branch railway from Massey extends to the No. 1 shaft at the eastern end of the property. Here the greatest amount of development work has been done. The shaft has been sunk to a depth of 530 ft. at an inclination of 76°, and seven levels have been run from it. Practically all the ore produced by the Massey mine has come from between the first and fifth levels in this shaft. In the center of the property are situated No. 4 shaft (which is 50 ft. in depth) and two long opencuts. On the western end of the ground is a 100-ft. tunnel gaining a back of 50 ft., and another long opencut. Elsewhere on the mine are numerous small pits and cuts disclosing ore. The ore that has been developed by these workings has an average width of about 4 ft. and contains about 3½% copper.

The general conditions affecting mining and milling are good. The branch railway line solves the transportation problem. The town of Massey offers good business facilities, and the mine telephone may be used for long-distance connections. Plenty of wood suitable for fuel and for mining purposes is available. Several water-power sites that can be easily and cheaply developed exist in the vicinity. Among the drawbacks should be noted the cold and snow of winter and the fact that there is no custom copper smelter in eastern Canada.

Miners are paid $4 per 8-hr. day. This enables the management to obtain picked men, since the scale at Sudbury—the nearest large mining camp—is $3.50. The ground is hard and stands well without timbering, but requires machine drilling.

The ore is well adapted to froth flotation, it being found possible to produce heads containing from 20% to 25% copper with a recovery of 95%. The freight on these concentrates to New York City is $5.78 per ton.

Iron-Ore Shipments

Shipments of iron ore from Lake Superior in June were 9,639,991 tons, an increase of 132,415 tons over last year. For the season to July 1 shipments were, in gross tons:

Port:	1916	1917	Decrease
Escanaba	2,602,824	2,205,297	397,527
Marquette	1,154,140	625,949	528,191
Ashland	2,204,263	1,909,268	294,995
Superior	3,878,915	3,526,082	352,833
Duluth	6,325,990	5,128,894	1,197,096
Two Harbors	3,449,435	2,739,645	709,790
Total	19,615,567	16,135,135	3,480,432

The decrease this year was due to the late opening of navigation on the Lakes.

Remedies for the Petroleum and Gasoline Situation

By FREDERICK G. CLAPP
Consulting Petroleum Engineer, 120 Broadway, New York

The country's annual production of petroleum is decreasing although consumption of gasoline is increasing alarmingly. The development of gasoline substitutes will take time. Of the many remedies proposed, utilization of oil shales and the discovery of new fields are the only ones that can furnish more than a temporary relief. The latter can be accomplished with certain success if the petroleum geologists of the country are organized under a central bureau for the systematic examination of all possible fields in the most rapid and efficient way and with a minimum duplication of work.

AMONG the unusual situations existing at the present time, one of the most serious is that relating to petroleum and its chief refined product, gasoline. The dangerous elements in the situation are accentuated by the fact that the decline of the supply is not due mainly to the war, but to the natural laws of supply and demand which were leading toward a serious decline in production and an increase in consumption even before the outbreak of war in 1914. Let us examine the situation.

The exact computation of the supply of petroleum remaining in the earth is of course impossible. Arnold[1], in 1915, estimated the fields of the United States as 36% exhausted. In February, 1916, a report was made to Congress[2] by the United States Geological Survey showing the quantity of petroleum produced and the estimated future production on that date. These figures are as follows:

ACTUAL PRODUCTION AND POSSIBLE FUTURE SUPPLY OF PETROLEUM IN THE UNITED STATES

Field	Production (1859-1915) (in Millions of Bbl.)	Estimated Percentage of Total Exhaustion	Possible Future Production (in Millions (of Bbl.)
Appalachian	1,150	70	481
Lima-Indiana	438	93	31
Illinois	251	51	244
Kansas-Oklahoma	617	25	1,874
North Texas	44	8	848
Northwest Louisiana	58	22	124
Gulf Coast	236	13	1,500
Colorado	11	65	6
Wyoming-Montana	12	2	540
California	835	26	2,345
	3,652	32	7,993

According to these estimates the oil fields of the nation were 32% exhausted.

We are now brought to the ways and means of finding new fields. In the early days of the oil business these were discovered by blind chance; during a later period they were found mainly by the weight in numbers of wells drilled in advance of known fields. Within the last few years, however, this condition has been improved by the introduction of geological science in prospecting. As long ago as 1885 White[3] discovered the structural relations between petroleum, gas and salt water, and from his observations evolved the anticlinal theory, which was modified from time to time during the succeeding 25 years by various investigators, until it is now recognized in the structural classification[4] of oil fields, by the understanding of which their discovery is greatly facilitated.

It is impossible to make a general statement of the absolute value of geology to oil development, since this factor varies in different fields with structural, petrographic, hydrologic and topographic conditions. In some fields the writer has had 100% of success, but this should not be uniformly expected. In the only extended developments, over a series of years, where a careful comparative record was kept of successes prior to and subsequent to the introduction of geology, it was found that the proportion of dry holes prior to the introduction of geology was 47% while in those wells located by geology the percentage dropped to 33. This was a difficult new field and one in which little accurate geological work was done. The total proportion of geological dry holes is much less than this, even including wildcat territory, and noticeably so in a region known to be petroliferous. An excellent paper by Hager[5] has recently appeared, in which he classifies all fields of Oklahoma and Kansas and shows that 94.7% of them correspond with identifiable geological structures, and that in 1913, 66⅔% of the pools were found by geologists.

Many factors besides structure govern the occurrence of petroleum, as explained by the writer in 1909[6], so that a careful study of them all is necessary to assure complete success. The point which must be made here is that geology has come to occupy a prominent part in the oil business and that few large companies now do without it. Those which pretend to do so are, as a rule, awake to all opportunities of accumlating territory in proximity to that reported on by another company's geologists, and of taking full advantage, in an informal or semi-scientific way, of whatever can be learned of the structure and underground conditions. There are in the United States at least 250 true petroleum geologists, according to late estimates, who may be classified somewhat as follows: United States Government Survey, 5; state surveys, 10; educational institutions, 5; employ of oil companies, 200; consulting petroleum geologists, 30; total, 250.

So widely has the term "geologist" come to be accepted that this number would probably be increased to 500 should we include all geologists, engineers, surveyors, scouts, promoters, pseudo-experts, etc., who call themselves oil geologists or are so called by their employers. The number is not large, except in a relative sense. In reality, even the minimum estimate is in numbers equal to about half the membership of the Geological Society of America, which includes all geologists of recognized standing in the country. There are in the oil business single companies that now employ more geologists than does the United States Geological Survey.

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[1] Ralph Arnold, "Econ. Geol.," Vol. X, 1915, p. 710

[2] Senate Document 310

[3] I. C. White, "Science," N. S., Vol. V, 1885, pp. 521-2, and other writings.

[4] F. G. Clapp, "A Proposed Classification of Petroleum and Natural Gas Fields Based on Structure," "Econ. Geol.," Vol. V, 1910, pp. 503-21

[5] Dorsey Hager, "The Evidence of the Oklahoma Oil Fields on the Anticlinae Theory," Bull. Am. Inst. Min. Engr., February, 1917, pp. 195-8

[6] F. G. Clapp, discussion of a paper by M. J. Munn; "Econ. Geol.," Vol. IV, 1909, pp. 565-70

The activities of government, state and educational geologists will not be discussed here, as their duties are fully laid out for them. These men, however, are in a sorry minority, and besides them are two or three hundred petroleum geologists, who are either in the employ of particular oil companies or doing consulting work for various companies. One consulting geological firm has over a hundred clients, has reported in detail on over 100,000 square miles of prospective oil territory, and in a reconnaissance way on several million square miles, at times being employed to report on the oil possibilities of entire nations. Its staff includes some of the best-known experts, its library and equipment rival those of the leading government surveys and exceed those of most oil companies. Such firms as this are not merely geologists, but act as advisory experts on all phases of petroleum engineering from the advance examination of the property to the completion of the wells. They have the confidence of the principal oil producers, as well as of national and state geological surveys and the general public, and have become a recognized accessory of the world's oil industry.

PETROLEUM PRODUCTION OF THE NATION

Beginning with the discovery of oil in Pennsylvania in 1859 and during its consequent development in that state and in many others during the latter half of the Nineteenth Century, the production increased with few setbacks. The year 1916 witnessed a high point in marketed production of 295,000,000 bbl., and a person unfamiliar with the business might readily suppose that 1917 and succeeding years would continue to show an increase. If, however, we examine the production of individual fields or states, we find that most of them have long since passed the high point in their production and are on the down swing.

During the years 1859 to 1891 the production of Pennsylvania and New York increased, with fluctuations, to a maximum of 33,000,000 bbl., and since 1891 has dropped to less than 9,000,000 bbl. In the same way the production of the Ohio fields was at its maximum in 1896, West Virginia in 1900, Indiana in 1904, Illinois in 1910 and California in 1914, while it appears probable that Oklahoma and Kansas will have passed their combined maximum by 1918. Nearly all fields have long since started on their decline. On the basis of existing fields, therefore, the nation's supply may be expected to reach its maximum in the present year, and henceforward we may expect a decline.

RELATION BETWEEN PRODUCTION AND PRICE

It is true that the production of no state has increased or diminished at a regular rate, and all of them have shown certain reversals during even their best years. This is due to the fact that within an oil-producing state every individual field has its rise and fall, even as in a given field every individual well starts out with a certain production and then drops off to the minimum amount that can be extracted profitably. The habit of oil producers, like gold seekers, farmers and lumbermen, is to follow the crowd to the most productive field and to develop it fully; then, when a serious decline manifests itself, to move on to another field. Many companies are so large that they are able to operate successfully in various fields and to prospect far in advance of where production is known; but this does not belie the statement that the centers of development are always where results are believed to be best, and that when valuable wells cease to be discovered in a given field, the operators flock elsewhere.

During the period when prices paid for crude oil were comparatively low, drilling was considerably curtailed in years of greatest production, because crude-oil prices repeatedly declined under the influence of increased production, so that less encouragement existed for additional drilling. It was generally not until a decline in production occurred, and additional oil was needed to replace the deficiency, that prices were raised as an incentive to additional drilling in search of new pools, and sooner or later these efforts were rewarded by success. The oscillations between periods of rising prices of crude oil with intense activity in drilling, followed by an increased production with consequent lowering of price, manifest the law of supply and demand, as in other commodities. While a certain amount of price manipulation may have taken place in the past, as inferred from Government investigations and other agitations, it is true that the underlying cause of all fluctuations is the law of supply and demand.

CONSUMPTION OF PETROLEUM AND GASOLINE

Though the decline of petroleum production is not a material exception to that of many other minerals and natural resources, we are now experiencing an added danger in the fact that at a time when this decline is imminent, the consumption of gasoline—which is the most important product of petroleum—has been greatly increasing and shows no signs of letting up. In 1916 there were 2,350,000 more automobiles than in 1910, using 1,000,000,000 gal. more of gasoline; and the number of automobiles is constantly increasing.

The danger in the present emergency was recently outlined by Manning[7], who mentioned the following figures as paramount in importance:

STATISTICS SHOWING THE RAPID INCREASE OF GASOLINE CONSUMPTION OVER PRODUCTION

Oil stocks held by pipe lines and transportation companies:	
Jan. 31, 1916	170,000,000 bbl.
Dec. 31, 1915	150,000,000 bbl.
Representing a decline of . . .	20,000,000 bbl. in 11 months
Number of automobiles in 1916 .	2,750,000
Number of automobiles in 1910	400,000
An increase of	2,350,000 in 6 years
Total gasoline-engine horsepower built and sold in United States:	
1915 . .	22,500,000
1913 . .	11,200,000
An increase of	11,300,000 horsepower in 2 years
Increased amount of gasoline used in 1916 over that used in 1910	28,000,000 bbl.
	%
Proportion total gasoline production of United States used in automobiles in this country.	55 to 60
Proportion exported .	20 to 25
Proportion used in stationary engines, motor boats, tractors, etc. . .	25 to 35
Increase of crude petroleum consumption:	
1915 over 1914	12%
1916 over 1915.	13%

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[7] Van. H. Manning, an address on "The Petroleum and Gasoline Situation," delivered before Editorial Conference of Business Publishers Association, Washington, May 25, 1917

Although the increased use of petroleum and gasoline is due largely to the enormous increase in the number of automobiles, it is also due, to a limited extent, to that of tractors, motor boats, etc., and a future increased demand may be attributed to the automobiles, motorboats and airplanes that will be needed in the war. We have no way of estimating the demands that will be made on us for war purposes, but we know they will be great. Consequently, there is every reason to believe that the increase in consumption in 1917 and 1918, both of crude petroleum and of refined gasoline, will far outdistance that in past years. At the same time there is every probability that the total production of petroleum in the United States in 1917 will be less than in 1916; and Manning estimates that the consumption this year will so far exceed the production that 60,000,000 bbl. must be drawn from storage, out of a total of 150,000,000 bbl. that was in storage on Jan. 1, 1917.

As stated by Manning, "We should not pass the situation with an optimistic statement that when the time comes new fields will be discovered, as has happened in the past, or that new methods will be found whereby this threatened shortage will be overcome. We should undertake to anticipate this problem as best we can, for we certainly will encounter it in the not distant future. . . . The fact we must face is that the production of petroleum is not increasing as rapidly as the production and consumption of gasoline. The petroleum in time will reach its maximum production and start to decline."

In view of the imminence of this probability and of the disastrous effect of a real petroleum shortage while we are at war, it behooves us to take as radical steps, if necessary, for the solution of the petroleum and gasoline problem as we do in that of raising an army, of increasing our output of munitions or of conserving the food supply. The following are some of the remedies that have been suggested in the past or are suggested now: (1) Decrease in certain uses; (2) possible discovery of substitutes; (3) more efficient methods of oil production; (4) extraction of more gasoline from equivalent amount of crude petroleum; (5) increased extraction of natural-gas vapors; (6) utilization of oil shales; (7) use of foreign petroleums; (8) increase in efficiency of petroleum prospecting.

DECREASE IN CERTAIN USES AND POSSIBLE DISCOVERY OF SUBSTITUTES

There is little likelihood of a general and voluntary decline in the utilization of either crude petroleum or gasoline on an extended scale. One method that has been suggested is that the burning of crude petroleum under boilers for the generation of steam, as has been done by many railroads and industrial plants in the West, might be stopped; since, in this way large quantities of byproducts of great value for refining are consumed with the crude oil. This use of petroleum may be as dangerous to the petroleum supply as the use of natural gas in smelteries, glass works and other industrial establishments is to the natural-gas supply[*], but there is little chance that it will or can be stopped, especially as fuel in ocean transportation, to which it is especially adapted. Certain railroads using crude oil in their locomotives have recently discovered that this was not economical, owing to the increasing length of haul, rising prices, etc., and have commenced to reduce the number of oil-burning locomotives in favor of coal locomotives. It is believed that natural causes will tend toward a total reduction of their practice within a few years, but we may fairly question whether this ought not immediately to be done through purely patriotic motives, and whether the proposed emergency control by the Government of all commodities ought not to be extended to that of oil, under which such a ruling could be made.

As to the discovery of substitutes for gasoline, it is, of course, inevitable that they will come into use in this country in time, as they have to a certain extent in Europe. In view of the imminence of a gasoline shortage and of the greater imminence of prices beyond the reach of the consumer, we, as a nation, must fully investigate this question. It will, however, involve changes in carburetors and in other mechanical details, which have not been perfected, and some delay must elapse before a satisfactory and economical substitute can be utilized. Meanwhile we must continue to investigate the other possible remedies for the approaching shortage.

MORE EFFICIENT OIL PRODUCTION AND HIGHER EXTRACTION OF GASOLINE

In the past there have been some inefficiency and losses in the production of oil, as in that of other resources, due not so much to waste as to a lack of understanding of condition in the sands. The ignorance has now been dissipated in part by the petroleum work of the United States Bureau of Mines, which, starting in 1911 with work of the writer, and continued by various individuals, has extended to many of the details of the business.

Of late something has been done, with apparent success, toward removing a greater proportion of the oil from individual wells; as, for instance, the process of forcing air or gas into the sand in order to drive out a greater amount of oil than formerly was obtained. In other places the employment of water to concentrate the oil in a field has been successful in increasing the yield of certain wells. Methods of increasing the efficiency of production are commendable; but they can only delay the ultimate decline of any field, and we must look beyond for a radical remedy.

In recent years a considerable saving has arisen from the improvement in refining methods, more particularly from the so-called cracking process. The cracking of petroleum last year "furnished 7½% of the total gasoline production." The process is being rapidly developed and more extensively installed and will still further increase the gasoline supply over what it would otherwise have been, even during the present year. The problem still remains, however, to forestall and delay as long as possible the ultimate shortage and its consequent prohibitory prices.

For some years it has been possible to extract gasoline from so-called casing-head gas in certain fields, the gases directly accompanying the oil being most suitable and available. The process involves compression and refrigeration of the natural gas, and about 3,000,000 bbl. of gasoline was produced (including naphtha mixture) by it during 1916. It has been possible to operate profitably on gases carrying only one gallon of gasoline per 1000 cu.ft. of gas. By the absorption process it is now possible to extract as low as one pint of gasoline from 1000 cu.ft. of certain gases. This use of casing-head gas has been valuable in keeping down the price of gasoline and in supplying the increased demand, and can be somewhat expanded; but in most cases the native gasoline, which is more volatile and considerably more dangerous than refined gasoline, must be diluted to render it usable. Gasoline from natural gas will necessarily be continued in use; but its employment, like other factors, cannot prevent the final exhaustion of the oil fields.

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[*] Ralph Arnold and F. G. Clapp, "Wastes in the Production and Utilization of Natural Gas and Means for Their Prevention"; United States Bureau of Mines, Technical Paper 38, 1913, 29 pp

Utilization of Oil Shales and Foreign Petroleums

We now come to the consideration of a radical departure in the oil business, and one that has been carried on profitably in Scotland for many years and to a limited extent elsewhere. The process in question is the distillation of certain shales, of which enormous deposits exist in various parts of the United States, whose value has already been foreseen. But even at the past prices of crude petroleum, the oil in shales has hitherto not been extractable with profit on a commercial scale. The day is coming when this departure must be taken up on a large scale, and at least one firm of geological engineers is prepared to report on the possibilities of any district and to plan the development of those that are found to be commercially valuable. This utilization of oil shales is the first process that appears to offer a chance of largely increasing the production of refined petroleums.

The question of foreign oils was discussed for the Americas by Arnold[9] before the Pan-American Scientific Congress in 1915 and for the world at large in a pamphlet recently issued. The present writer is, however, more optimistic than Arnold regarding certain countries. From the viewpoint of the increased cost and from the accompanying loss of prestige to American oil business, it will be unfortunate to be obliged to import petroleum or the refined product from other countries; but this must ultimately be necessary, unless the cost of shale oil can be made lower than that of foreign oil. We must expect to develop and buy oil from Mexico, Canada, South America, and perhaps from Asia, in all of which extensive deposits exist. Much of this petroleum is of excellent quality for fuel in ocean transportation.

Several experienced American geologists are ready to say definitely where foreign oil explorations shall be made, and American petroleum engineers are prepared to plan these undertakings when capital is ready to proceed with them. One large firm of consulting engineers has explored extensively in Canada, Mexico, South America, Europe and Asia; and individual geologists have explored in such countries as Mexico, Colombia and Venezuela, where prominent seepages and other well-known forms of surface indications exist; but little work has yet been done in the innumerable favorable areas where few seepages are known. There is no doubt that unsuspected areas in Brazil, Argentina, Bolivia, undeveloped parts of Peru, and many in Asia and the islands of the Far East compare in promise with the best fields of Ohio, West Virginia and Oklahoma, where oil seldom appeared on the surface until tapped by the drill; yet where geological conditions formed an almost perfect guide when studied by an expert.

Several objections are raised to the exploration and prospecting for petroleum in South America and the Eastern Hemisphere, namely: That no oil is definitely known in particular localities; frequent remoteness from transportation routes.

Both these objections are respected by a petroleum engineer, but they do not constitute as real an obstacle as would be inferred. We must remark, first, that most of the great oil fields of Pennsylvania, West Virginia, Ohio and Oklahoma would not have been discovered if operators had waited to find seepages, since these do not exist in any quantity in those states; and, secondly, that localities in South America and Asia that are now inaccessible will be easily reached when railroads are constructed in the next few years. Moreover, a railroad would prove profitable if built to practically any great oil field, considered with the other potential resources of the respective countries.

Increase the Efficiency of Petroleum Prospecting

The eighth and last remedy in mind has not been previously suggested. It is to increase the efficiency of the prospective stage of the oil business, which includes activities from the preliminary geological explorations to the drilling of the wells. It will here be discussed at some length.

In petroleum prospecting we include not only the drilling of test wells, but also the leasing of the property and the making of the accompanying geological and other surveys and reports. The actual drilling has come to be done in a fairly efficient way. Indeed, this is true of leasing and geologizing if applied to an individual company or group. There is, however, a class of inefficiency that comes from intense competition, and this is perhaps nowhere more noticeable than in the business of oil production. As witness of this fact, we may remark that little inefficiency exists in those fields that are entirely controlled by a single experienced company. Inefficiency in prospecting may be grouped as follows: Disastrous overpayments in competition for leases; unnecessary drilling where no chance of oil exists; wastes due to drilling wells in close proximity; duplication of geological investigations.

These inefficiencies are the fault of no particular individuals or groups. They arise from the intensity of commendable competitive industry and in the expansion of the demand for petroleum. In order to obviate the trouble, the system must be modified. Let us therefore consider the respective inefficiencies.

Disastrous Overpayments and Unnecessary Drilling

Searchers for oil have the faculty of great optimism and easy delusion, so that a showing of oil discovered in a new well, even in a remote field, starts a rush of scouts, geologists and leasers in that direction, very much like an old-time gold rush. Indeed, history will liken the present-day oil rushes to the gold fevers of last century. It is very easy to build air castles of great wealth about some insignificant seepage or oil showing or report. Consequently, we see prices of real estate and of leases increasing five-, ten- and frequently one-hundred-fold within a wide area surrounding every field or new well or promising indication of oil. Land formerly worthless will sometimes be leased with a bonus of $25, $100 or even $1000 an acre when indications of oil are discovered on it, if several companies are after territory in the same region.

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[9] Ralph Arnold, "Conservation of the Oil and Gas Resources of the Americas," "Econ. Geol.," Vol. XI, 1916, pp. 203-22; 299-326.

There is no particular economic loss to the community through payment of high bonuses, since this stimulates a healthy monetary circulation and fixes a value (even if fictitious) on land otherwise worthless. There is, however, a decided loss due to the duplication of time and energy and of overhead charges by many companies in fighting one another for supposedly favorable tracts. It is this time and energy and overhead loss that we now seek to eliminate as a war measure.

Formerly a large amount of drilling was done in localities entirely unfavorable geologically for oil, owing to widespread ignorance of conditions under which it occurs. Mistakes of this nature are not made so often now, yet they do occur, and it would be well if an efficient scientific bureau existed whose duty was not only to recommend against, but to prohibit, the drilling of wells where not one chance in a million exists of finding oil in paying quantities.

In thousands of instances in the oil fields, ordinary custom, competitive pressure and even state laws require the drilling of offset wells on property adjoining wells in which oil is found. For many years this was supposed to be a business necessity in fairness to the adjoining land owners, from whom the oil otherwise would be drawn away. The time has now come when we must recommend perfect conservation—not in the sense of hoarding up oil resources, as formerly supposed, but of eliminating waste of oil, time and funds. During the present shortage of labor and casing, we ought not to allow the sinking of offset wells except in cases where they are sufficiently far distant to increase the total oil supply materially, considering the whole life of the field.

In a financial sense, too, where the result of a well is in doubt, the time and labor are of more value to the nation if utilized in an outlying and promising territory than on an offset well 100 to 600 ft. distant from neighboring wells. This matter of drilling ought, in the present emergency, to be controlled by a Government bureau in charge of an expert competent to decide these difficult matters. The proper interval between wells differs according to depth and geologic formation; but wells in general are drilled too close together for ultimate economy.

Duplication of Geological Investigations and the Proposed Remedy

This brings us to the fourth and perhaps most expensive class of collective inefficiency in oil prospecting, namely, the geological explorations. In order to be efficient, one or at the most three geological reports (if corroboration be necessary) should be made on an area. Under the prevailing system, however, every company is a competitor for promising oil territory wherever it may be found, and this leads to a five-, ten- or one-hundred-fold duplication of geological reports on some areas. Localities as yet untested are known to the writer of this article, which have been examined or studied in detail by geologists of practically every important oil company in the United States. Few fields exist where only a single examination has been made.

The matter of expense in these investigations is not the chief evil, but the waste of time and energy is serious, comprising, as it does, one of the causes of the high price of oil and gasoline. For instance, if 10 geologists or geological groups (all of whom may be presumed, for the purpose of this exposition, to be properly qualified) report on a given tract of 100 square miles, as is true in many cases, they could, if controlled by some central authority, be collectively instructed to report once only on a tract of 1000 square miles. Or, if necessary, the most competent geologist for the particular field could be instructed to report on the 100-square-mile tract, setting the other men free for some other national service. All this would doubtless be accomplished under the German system; and if we are to defeat the Germans, we must first learn from them the best of their own system and organization.

The main point is that we are confronted by a serious petroleum and gasoline shortage. We must have these substances in order to win the war, just as we must have powder, men and food. The oil and refining companies are at their wits end to prevent the shortage, and our only hope is to discover new fields, and the duty falls on the geologists to replete the declining production. Assuming that 230 qualified geologists are available for searching for new fields and that they can average two square miles of detailed work per day (a fair average for work accurately done), they can then, if properly organized and controlled, work and report in detail on 460 square miles per day, or 167,900 square miles per year.

At present this ideal is nowhere approached, but probably not over 50,000 square miles of new territory per year is studied thoroughly, the rest of the work being duplication or of a reconnaissance nature. If the ideal were realized, we could make a complete appraisal of the probabilities, including individual well locations, in all of Oklahoma, Kansas, and northern Texas in one year, and of the entire country in 15 years.

Instead, however, there is only an area estimated at about 200,000 square miles, out of a total of nearly 1,000,000 square miles, which have oil possibilities, in the United States, exclusive of Alaska and the Philippines, that has been geologically studied in full detail. There remains 800,000 square miles having possibilities that must be studied before we should declare the petroleum situation to be absolutely hopeless.

With this in mind and in view of the present emergency, we ought to have the geologists of the United States properly organized under some efficient and qualified expert with authority to assign them to their respective spheres of operation. Probably 60% of the total number could be set free for employment in other lines of national service. The remaining 100 would constitute an efficient corps with which scientifically to make a "drive," before it is too late, for the discovery of all untested fields that exist.

The detailed workings of the plan for the mobilization of an entire profession can properly be left to the expert intrusted with its fulfillment, but they would not be difficult. The individual oil companies can pay into the central bureau such amounts as they now expend in their explorations and can be assigned to favorable territories, when discovered, proportionately to their investments. Or, more economically still, the central bureau may be intrusted with all geologizing, leasing, testing and marketing and simply pay to the subscribing companies their individual proper shares of the profits.

The proper method of carrying out such a mobilization appears to be Governmental action. Any slight disadvantages accruing to individuals would be excusable in view of the great national service rendered by a comprehensive plan. Even aside from its benefits as a war measure, it would be helpful to all individual companies, since it would investigate all possible undiscovered fields, instead of only a few as at present, with the consequent certainty of finding some new ones of value. Great economies could be expected owing to the systematizing and precaution against duplication, and we might reasonably expect thereby to open up sufficient production to tide us over many years of war.

Iron and Steel in Great Britain

The production of finished steel in Great Britain in 1916 is reported by the Iron and Steel Federation as follows: Bloom, billets and rods, 1,945,000; shet bars, 1,272,000; rails, 271,000; plates, 1,153,000; sheets, 78,000; shapes and angles, 757,000; beams and girders, 346,000; galvanized sheets, 132,000; tin plates, 577,000; total, 6,531,000 gross tons. The production of steel castings was 207,000 tons, of which 18,000 tons were made in electric furnaces. The production of wrought iron (puddled bars) was 960,000 tons.

Graphic Determination of Heat Units in Coal

The thermal values of fuel as determined from analysis are not usually tc be depended upon, as the results so obtained are seldom of sufficient accuracy to be of value. The formula commonly used for computing the heat value from the ultimate analysis is credited to Dulong. The original formula has been modified to suit special applications by W. C. Stripe and is given in *Power*, Jan. 11, 1916, as

$$\text{B.t.u. per pound of dry coal} = 14{,}600\,C + 62{,}000\left(H - \frac{O}{8}\right) + 4000S$$

in which C, H, O and S are the proportionate parts by weight of carbon, hydrogen, oxygen and sulphur. It is customary to determine ultimate analysis on the dry-coal basis, and this formula is correct only with reference to analysis so determined. The thermal valuations determined by calculation are only approximate, and equally satisfactory results may be obtained by graphic representation, as shown by Fig. 1.

Assume a coal having the following ultimate analysis: Carbon, 79.90%; hydrogen, 4.98; oxygen, 4.31; nitrogen, 1.85; sulphur, 1.13; ash, 7.83; moisture, 2.91%.

Referring to Fig. 1, the upper arrowed line shows that the carbon represents approximately 11,660 B.t.u. The lower heavy dotted line shows that approximately 2750 B.t.u. must be added for the 4.98% hydrogen, when 4.31% oxygen is present. The light dotted line shows that approximately 45 B.t.u. will be obtained from the

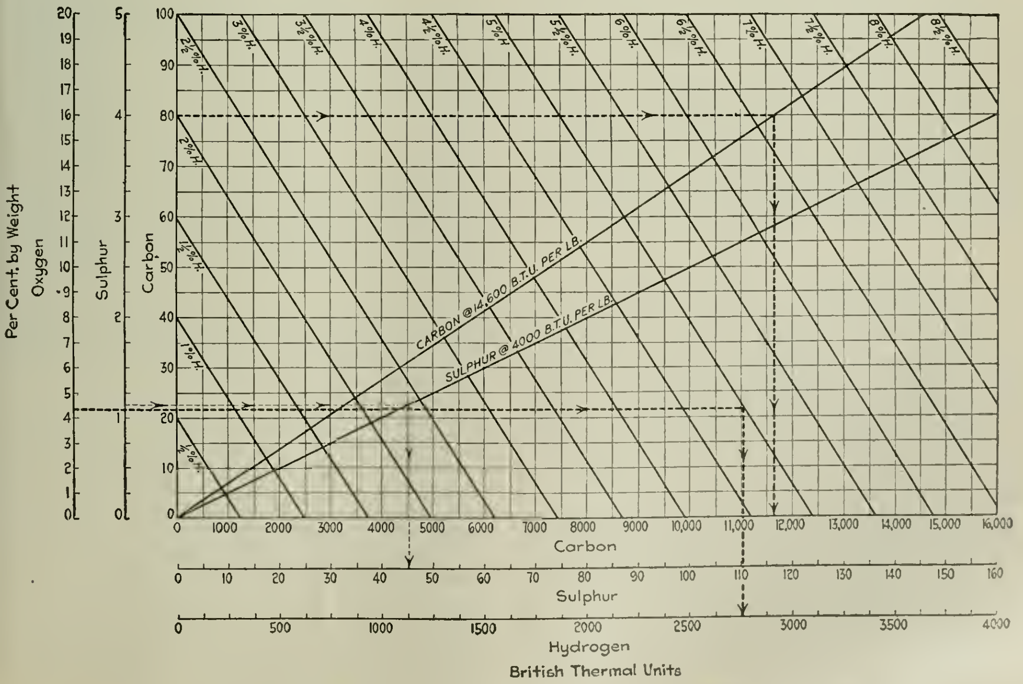


FIG. 1. GRAPHIC REPRESENTATION OF DULONG'S FORMULA FOR HEAT VALUE OF COAL

1.13% sulphur. The summation of these three values gives 14,455 B.t.u. as the total approximate thermal value of this fuel. Calorimeter tests on coal of the foregoing analysis have shown a value of 14,380 B.t.u., hence the results obtained graphically are satisfactory. The curve shown by Fig. 2 represents this relation and was plotted from 66 analyses made by the United States Geological Survey, of coal from 18 different states. Assume a coal having the following approximate analysis, determined on a dry basis: Fixed carbon, 57.5%; volatile combustible, 35.0%; ash, 7.5%; moisture, 4.5%. In Fig. 2 the heavy arrowed line indicates that the fixed carbon is 62% of the total combustible. The light arrowed line indicates that with the fixed carbon and volatile combustible so proportioned, a thermal value of approximately 14,950 B.t.u. per pound of combustible may be expected. Then, if 92.5% of the fuel is combustible, the thermal value per pound of dry fuel is 14,950 times 92.5%, which figures aproximately 13,828 B.t.u.

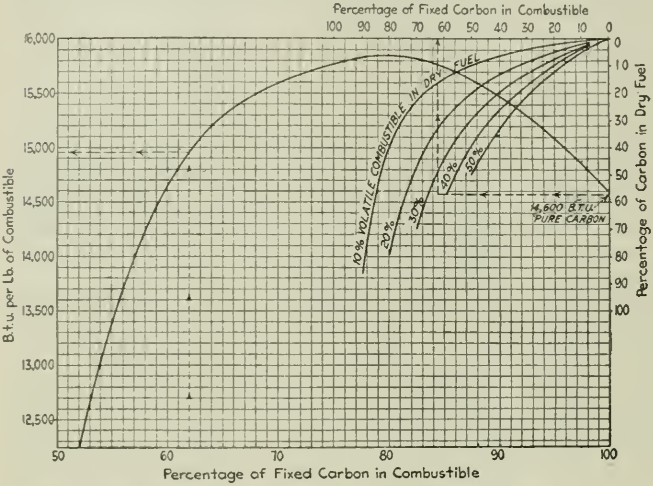


FIG. 2. RELATION BETWEEN FIXED CARBON AND THERMAL VALUE

Reinforced Concrete Ships

The problem that confronts our country of increasing the merchant marine, says a bulletin of the Portland Cement Association, requires the consideration of every possible method or material of construction. Several prominent engineers have suggested reinforced concrete.

A San Francisco paper mentioned in a recent issue the interesting fact that a local firm of engineers was designing a ship with a length of 330 ft., a beam of 44 ft. and a depth of 31 ft., with a capacity of 4500 tons—to be built of reinforced concrete. This is nothing new. A concrete schooner was employed for some years in the north Atlantic coasting trade, having been constructed about 1898. The London *Times* mentions a small boat of reinforced concrete built by a Frenchman in 1849 and still in service after a test of 68 years.

The concrete ship is only a further development of the concrete barge, and such craft have been in successful use for years. A concrete barge has been in service on the Welland Canal since 1910 and has seen hard usage. It has a length of 80 ft., a beam of 24 ft. and is 7 ft. deep. It is interesting that the walls which were constructed between forms are 2½ in. thick, reinforced with steel rods, yet the barge is used for carrying loads of stone, etc., with conspicuous success. Concrete lighters have been used for the last six years on Chesapeake Bay, supplying coal and water to dredges, carrying loads of sand and gravel. With such a craft there is no necessity for calking or painting, the upkeep is small and there is no danger of decay. Barnacles will not collect on a concrete hull. Since 1910 reinforced-concrete barges have been built for use on the various sections of the Panama Canal, and their experience has enabled the engineers to develop a very efficient type of vessel. Recently, concrete pontoons were constructed for service as landing stages for boats up to 65 ft. in length. These pontoons have a length of 120 ft., a beam of 28 ft. and are 8 ft. deep. They are very thoroughly reinforced. Vessels that are more like ships than barges have been built of reinforced concrete in Norway. The following quotations that have been selected from the report of the American Consul General at Christiania indicate the extent of the work under way at that time:

> The inventor, M. Nicolai Fougner, an engineer, claims to be able to construct a ship of any size demanded. He is now building a lighter for a mining company at Sydvaranger for the oversea export of iron ore and the import of coal. The vessel, having a displacement of 3000 tons, is to be ready before the end of the current year. It is stated that these concrete ships can be sailed or engined like other vessels, and experts consider that a new epoch in shipbuilding has arrived.
>
> The ship resembles a large barge and is constructed entirely of concrete with the exception of the ribs, which are of steel. This new method has attracted much attention. The Swedish Minister of Marine, M. Brostrom, one of Sweden's largest shipowners, immediately ordered a lighter of some thousand tons' displacement and was present when the craft was launched at Moss. He was accompanied by four experts, all of whom expressed much satisfaction at the result.
>
> Two other lighters are now on the stocks, and a large slip for a 4000-ton craft is nearly completed. More than 200 men are working in the new yards, and five lighters have been contracted for in addition to the one completed and the two on the slips.

In view of such examples proving the usefulness of concrete vessels of this character, the Cement Association bulletin urges the consideration of concrete in the construction of ships which are to increase our merchant marine to the proportions demanded by the present requirements. If seagoing barges were to be constructed or smaller craft suitable for lake traffic, this would release for other purposes many ships now in use in this capacity. The presence of the necessary materials for a concrete vessel at so many convenient places would make it possible to provide a large tonnage, and progress in construction would be faster than with ships of steel or even wood. The system seems to have advantages of great promise.

The Manganese Ore Market

SPECIAL CORRESPONDENCE

Prior to the war the bulk of the manganese imported into this country came from the Caucasus. The cost of production there was so low that it did not pay to produce manganese ore in this country. Next in importance to the Caucasus came India, then Brazil. On account of the Black Sea being closed to all shipping, no Caucasus ore to speak of has been exported from Russia, though I understand that during certain months some of it was shipped by water through the Caspian Sea, up the Volga River, ultimately to Archangel and thence to Great Britain. The war demand has advanced the price for manganese to such an extent that this complicated way of shipment still left the seller with some profit.

Caucasus ore being practically unobtainable for this market and Indian ore obtainable only under permit, buyers are looking around for other sources of supplies—the more so as the importation of ferromanganese also became more and more restricted. The consumption of manganese in this country is equivalent to 85,000 tons of manganese ore monthly, and this quantity has to be found in order to keep the steel industry going. Brazil has improved its mining to a large extent because of the higher prices paid and a considerable tonnage is now reaching us from that quarter. Costa Rica and Porto Rico are also contributing to our demands, though in a much smaller degree. Cuba, too, has helped to swell the quantities imported. Japan is shipping to this country some manganese ore of high grade suitable for the chemical trade. To ship the furnace ore from Japan and China, where excellent ore can be obtained, is at present impossible, as no freight at reasonable rates is available.

The advance of prices for manganese ore, and the buyers' willingness to overlook impurities or partly to forego penalties for such impurities, also their willingness to accept much lower-grade ore than ever before, have brought into line a number of miners in this country, and much activity is shown in the manganese deposits in California, Montana, Arizona and Arkansas. Considerable business has been entered into with California producers, but I understand that the mining end is principally in the hands of small miners and many of the contracts entered into have not been carried out. Buyers will, therefore, not make contracts for any length of time, but will accept deliveries when actually made upon schedule prices. The schedules have been altered continuously, and high-grade ore running 49% and over, which was quoted around 40c. in the early part of the war, is now offered at $1.10 per unit, f.o.b. buyers' works. Formerly, ore under 38% could hardly be sold—now buyers are prepared to take material from 33% upward. Again, ore containing over 8% of silica was subject to a penalty, and the maximum silica allowed, before the ore was rejected, was 12%. Today some of the buyers are ready to accept manganese ore even if it contains up to 20% of silica. Excess of silica over 8%, however, is penalized at the rate of 50c. per ton for each unit of silica.

The United States Steel Corporation is still accepting manganese ore with a penalty of only 15c. for the excess of silica over 8%. Other buyers deduct 1% of manganese for each 1% of silica in excess of 10. Phosphorus, also, is penalized, and a penalty of 15c. a ton for each point over 0.1% is charged. The maximum allowance for phosphorus is 0.2%. Though these limits have been set, it is possible by actual negotiations to get an otherwise unacceptable ore taken by the buyers, and it is the best for the mine to ship a trial car or cargo since, according to the general and physical character of the ore, a price can often be fixed which is in excess of the actual schedules submitted.

I have always been of the opinion that the scale of prices paid was wrong in proportion to the actual value of ores to the furnace, depending on whether they are high- or low-grade. Assuming that a standard ore running 50% or better in manganese, 5% to 6% silica, under 3% iron, under 0.1% phosphorus, and under 5% moisture, is worth $1 a unit, it could easily be shown by actual figures that an off-grade, which would run 40% manganese, 10% iron and 12% silica is not worth nearly half as much when due consideration is placed upon the excess slag volume and excess amount of stone and fuel.

The Carnegie penalty is 15c. per unit per ton for each unit in excess of 8% silica, with the privilege of rejecting any ore running over 12%. While it is true that this excess of silica would cost only about $2.50 if you ignored the cut in production, yet if that were taken into consideration, it would cost very much more.

By actual demonstration at our furnace it was proved that our production of 80% ferromanganese was cut almost exactly 50% when we changed from standard ores to an ore such as I have described. At today's high prices for finished product, provided you can get standard ores, it can readily be seen that it does not pay to use the low grades, even if they were given to you.

The United States has been producing quite a tonnage of ore during the high-price period. I would not be surprised to see the production for 1917 equal 60,000 to 100,000 tons, but I doubt very much if 10% of this present production would qualify for standard ore, which will mean, when ordinary prices for ferromanganese again prevail, unless something unexpected is discovered, the United States will return to approximately her production prior to the war.

If the war continues for any length of time and shipping conditions become more restricted and complicated, the home industry has a good chance of developing profitable manganese mines, though I am afraid that the nature of the deposits and the high cost of labor in this country will prevent these mines from continuing when ample supplies of foreign ore are again available. This thought has so far kept the larger interests from going into manganese mining in this country to any large extent.

MT. BISCHOFF TIN MINE, TASMANIA, has recently declared its 451st dividend of 2s. 6d. per share, bringing total dividends to date up to £2,464,500. This is a record of steady production that might be envied by any mining company. The Mt. Bischoff Tin Mining Co., Ltd., was registered in 1873 and has a paid-in capital of only £29,600, the company being divided into 12,000 shares of £5 each. The Mt. Bischoff mine is at Waratah and the smelting works at Launceton, Tasmania.

Prominent Mining Engineers Serving in the National Army

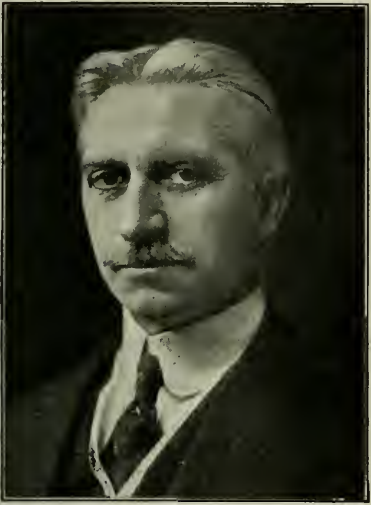
MAJOR GEORGE S. WEINBERG

MAJOR RUCKARD HURD

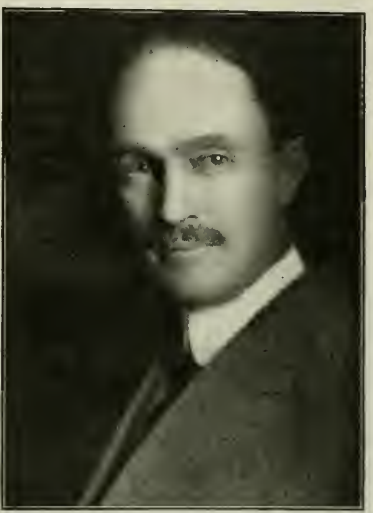
CAPTAIN J. D. IRVING

CAPTAIN H. J. STEHLI

Prominent Mining Engineers Serving in the National Army



MAJOR ARTHUR S. DWIGHT



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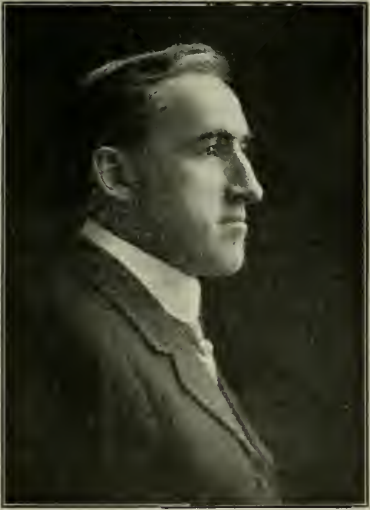
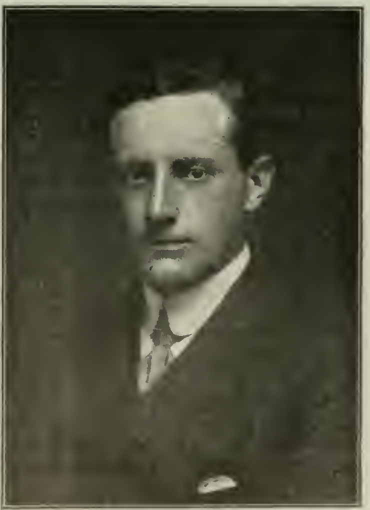


CAPTAIN HENRY M. PARKS



LIEUTENANT WILLIAM HAGUE

Use of Smelting Gas in Chile

BY MARK R. LAMB

We in the States, who know more about everything connected with mining and metallurgy, think of smelting smoke only as an aid in selling a poor farm. In other places, however, where they are belated, a different use is found for smoke—a more commonplace and less imaginative use.

At Potosi part of the gas is used as fuel under boilers and furnishes enough power to run the furnace blower. Part is used to heat the mixture of sulphur and whatever else it is they use in precipitating silver. (Yes, I could look it up, but you probably know, anyway.) Another part of the gas heats and melts the tin in the refining pots. The rest goes to waste. I am sure none of it is used to heat the hotel, because this is not heated by anything except by the guests.

In Chile, Don Gregoria Donoso had much difficulty in smelting his slags clean, while still using a small quantity of coke. He has a difficult ore—all rock and iron and lime and stuff—and besides that, he runs a huge ranch and a prominent bank and his family consists of nine children and a boy, so that as he could not be constantly at the mine, and in order to have the smeltery run when he was not there and continue to make hot, thin slag, he used the smoke.

DISUSED SMELTER STACK, VOLCAN, CHILE

At the time of my visit he casually walked me up to a steel plate almost on the floor level and nearly let me step on it before advising me that it was the charge roof—not floor. I looked around for the furnace as casually as possible, but he was watching me gleefully. "There wasn't any furnace."

This plate had an edge turned down six inches, dipping into a launder making a water seal. To charge the furnace, the plate is swung off and the charge dumped in. You may be sure there is never a "hot top" in this furnace.

Even after seeing this, I kept trying to figure out where the gas went. Where to do suppose? Why, out through the forehearth!

All the heat of combustion of coke, iron and sulphur is used either to melt charge or superheat the slag. See how easy it is? Merely admit enough air to the tuyeres to get a fine fluid melt, and enough air to the forehearth to burn up the gas, and there you are. Try it. Try it on a 19% zinc ore, or try it where you want to run a high-silica slag.

Don Gregorio's mine is at the end of a railway, the construction of which he opposed tooth and nail. Curious that he should oppose it when it relieved him of maintaining hundreds of oxcarts hauling coke and supplies. And his reason for opposing it was simply appalling. He said, "It is not good business for the government to build such a long railway merely to help me and a few agricultural congressmen." The railway runs once a week, returning the same date and continues to cost the government thirteen times the gross receipts.

But to return to smoke—at Chuquicamata the smoke is used for an entirely different purpose; to wit, to harden and make sturdy the children of the camp. There is no doubt about this being done successfully, as any child who has survived the smoke would consider it a picnic to live in Belgium.

Besides the smoke from the cathode furnace, which has a piquancy all its own, an added interest to live in camp is given by the touch of nitrous fumes from the acid plant. Sulphur is not expensive, as it is brought from the mines in Bolivia at Ollague, so that it is unnecessary to take particular pains to prevent the escape of sulphur fumes. Besides, the acid plant was located windward so that the only time when the denizens of this camp are startled by the lack of fume is when the wind is in the other quarter and they get the dust from the tailings pile. While on this topic I would suggest to the management that they are overlooking an important source of revenue. Besides this they could be patriotic and make money at the same time.

In the electrolytic plant an elaborate system of gas-flue exhausters should be installed over the vats and all the fume taken to a compressor house and shipped thence in steel bottles to the trenches. There is no doubt, judging from the results obtained at present with the fumes in a very diluted state, that if it were applied to the Germans in a concentrated form, we would soon again be their good friends.

Electric Steel Production

The production of steel in electric furnaces last year was about twice that of 1915, four times that reported in 1912, and nearly three times that of 1913. The production reported for two years past has been in gross tons:

	1915	1916	Charges
Germany	129,000	180,335	I 51,335
United States	69,412	169,918	I 100,506
Great Britain	22,000	49,256	I 27,256
Austria-Hungary	23,895	47,247	I 23,352
Canada	61	43,790	I 43,729
Totals	244,368	490,546	I 246,178

No reports from France for the two years are available; that country made 18,000 tons of electric steel in 1913. The production of the United States in 1916 was five and one-half times that of 1913. Electric steel was made last year in Sweden, Norway, Russia and Italy, but no figures can be secured for the quantities.

New Army Tables of Organization

The National Defense Act of June 3, 1916, changed the organizations of all the units of the Army, which necessitated the preparation of entirely new Tables of Organization, which give in minute detail the number and amount of personnel and matériel. The new tables were approved by Secretary of War Baker, May 3, 1917. The preparing and issuing of this almost infinite amount of detail in eleven months is a creditable piece of work. The *Army and Navy Journal* gives the following extracts from the tables, which are published in pamphlet form and may be obtained from the Adjutant General.

The aggregate maximum strength of a division of Infantry is 28,334 officers and men, and the total of wagons is 1009, and of motor wagons 493. There are 42 field pieces, 92 machine guns, 20,345 rifles and 8651 pistols. In this division there are three Infantry brigades, one Field Artillery brigade, one regiment of Cavalry, one regiment of Engineers, one Field Signal battalion and one Aëro squadron.

The total maximum strength of an Infantry brigade of three regiments aggregates 6193 officers and men, a total of 83 wagons, 6 motorcycles, 219 riding horses, 18 riding mules, 75 pack mules, while 344 draft mules are required, which makes a total of 657 animals. The number of rifles required is 5473, and 606 pistols and 18 machine guns.

The Cavalry brigade, composed of three regiments, has a total maximum strength of 4756 offices and men, 113 wagons, 6 motorcycles, 4635 riding horses, 18 riding mules, 87 pack mules and 464 draft mules. This makes a total of 5204 animals. Eighteen machine guns are required, 4033 rifles and 4518 pistols.

A Field Artillery brigade (divisional), composed of two regiments armed with 3-in. field guns, and one regiment armed with 3.8-in. howitzers, has an aggregate maximum strength of 4030 officers and men, with 72 guns, 216 caissons, 18 battery wagons, 21 store wagons, 21 reel carts and 6 motorcycles. There are 1233 riding horses and 2160 draft horses, making a total of 3393 horses; 290 mules are required, 13 rifles and 3936 pistols.

The maximum strength of the Field Artillery brigade (Corps) armed with heavy guns or howitzers and horse-drawn, composed of three regiments, aggregates 4135 officers and enlisted men; 72 guns are required, 216 caissons, 18 battery wagons, 21 store wagons, and 30 reel carts; 1326 riding horses are needed, 2862 draft horses, 12 riding mules, 6 pack mules, and 296 draft mules; 13 rifles are required, and 4008 pistols.

A Field Artillery brigade (Corps) armed with heavy guns or howitzers, motor-drawn, and composed of three regiments, has an aggregate maximum strength of 3685 offiecrs and men. It has 72 guns, 108 caissons, 108 ammunition trucks, 27 store trucks, 90 tractors, 9 repair trucks, 21 repair cars, 9 passenger trucks, 9 tank trucks, 37 supply trucks, 297 motorcycles with side cars, and 30 reel carts. There are 723 riding horses, 108 draft horses and 3 pack mules; a total of 834 animals. There are 13 rifles in the brigade and 3558 pistols.

The maximum strength of a regiment of Engineers is 1098 officers and men. It requires 27 wagons, 292 riding horses, 49 pack mules, 112 draft mules, 978 rifles and 348 pistols.

A battalion of mounted engineers has a total maximum strength of 387 officers and men. It requires 12 wagons, 376 riding horses, 37 pack mules, and 52 draft mules, 333 rifles and 363 pistols.

The maximum and minimum strength of a Field Signal battalion aggregates 259 officers and men, with 16 wagons, 170 riding horses, 16 draft horses, 17 pack mules, 36 draft mules, and 251 pistols.

The maximum and minimum strength of an Aëro squadron is 173 officers and men. It is provided with one motor car, 23 motor trucks, 24 trailers, 2 repair trucks, 6 motorcycles, 12 airplanes, 154 rifles, 173 pistols and 12 machine guns.

The total strengths of the regiments of the several arms of the service are as follows: Engineers, 1098, officers and men; Cavalry, 1579; Horse-drawn Artillery (heavy), 1372; Motor-drawn Artillery (heavy), 1222; Light Artillery, 3-in. guns, horse-drawn, 1337; Artillery (horse), 1176, and Mountain Artillery, 1081. An Infantry regiment consists of 2058, officers and men.

"Clinton" Gas Pools in Ohio*

BY L. S. PANYITY*

The Cleveland, Ohio, gas pool is the northern extremity of the great "Clinton" sand-gas development in Ohio. Numerous gas pools have been developed in this formation, which are now more or less connected, link by link, forming an almost continuous gas pool, starting at Cleveland and running thence southward through Cuyahoga, Medina, Wayne, Ashland, Richland, Knox, Licking, Fairfield, Hocking and Vinton Counties. The present southern extremity of these connected pools is in Richland Township, Vinton County. A vertical section of the formations penetrated here by the drill may be constructed from the accompanying table.

FORMATIONS AT THE CLINTON POOLS

"Big Injun" and Waverly shales	In surface outcrops
Berea Sandstone	20 to 80 ft. thick
Bedford (Carboniferous) and Ohio (Devonian)	750 to 900 ft. thick
"Big Lime" (Corniferous and Niagsra)	570 to 675 ft. thick
Interval "Big Lime" to "Clinton"	175 to 210 ft.
Interval "Clinton" to Trenton	1,350 ft. (estimated)

Spirit-level elevations at the mouth of the various wells drilled, and the elevation of the sand calculated from the logs of the wells demonstrate the monotonous monoclinal structure of the "Clinton" sand. Its development has shown few pronounced anticlines, but there remains a great deal of unstudied territory where the pools may be associated with some sort of folding. Work is now under way in another section of the state, where anticlinal structure is expected.

Oil and gas have been struck in various geologic horizons, the first of which is the Berea sandstone which contains water in this territory. Some gas has been encountered in the Ohio shales, and one or two wells produce a little oil from the top of the "Big Lime," but so far no commercial pool has been developed between the Berea sandstone and the "Clinton."

South of Richland Township but two wells are producing gas from the "Clinton" and they are in the immediate vicinity of the southern township line. Numerous tests have been drilled in a southerly direction as far as the Ohio River, but without encouraging results.

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*An abstract of a paper to be presented at the St. Louis meeting of the American Institute of Mining Engineers in October, 1917

The gas pools in the township are described by the driller as very "spotted." All observed conditions indicate lenticular sand bodies, and differential cementation has been a great factor in the accumulation of gas along this monocline. Another important element under consideration is the fact that connate water is rarely met. The stratum is considered free from water by the driller. No doubt where the "Clinton" lies at a greater depth below sea level, connate water will be encountered, when, of course, structural conditions will be of great importance.

In following up "wildcat" wells, tests located along the strike of the formation have been more successful than those located otherwise. The initial open-flow volume of wells is about two to four million cu.ft. per day. The largest open-flow measurements showed eight to nine million cu.ft. of gas per day when they were drilled in. The rock (or closed) pressure of the wells is between 650 and 750 lb. per square inch.

No producing horizon below the "Clinton" has yet been found in this township. In the wells nearest to this locality that have reached the Trenton limestone, which is the producing horizon of northwestern Ohio, it was found barren of oil or gas. The chemical analyses of this limestone in these wells are not known to the writer, but it is doubtful whether the magnesium contents were large enough to create a sufficiently porous rock which might serve as a reservoir for petroleum. In a well drilled north of Mount Vernon, Ohio, analyses of the Trenton limestone showed magnesium carbonate varying from 3.81% to 5.19%. Comparing this with the analyses of the Trenton limestone at Lima, Ohio, where it is a prolific source of oil and gas, and the magnesium contents range from 25 to 45%, the prospects for a Trenton pool in this territory appear to be very slight.

Lake Superior Iron Ore

THE selling prices of Lake Superior iron ores for the present season are the highest recorded for a number of years. These prices are for ore delivered at docks on Lake Erie ports and are for hard Old Range bessemer ores, $5.95; for Mesabi bessemer, $5.70; for Old Range nonbessemers, $5.20, and for Mesabi nonbessemers, $5.05 per gross ton. The selling basis is, as it has been for several years past, 55% iron and under 0.45% phosphorus for bessemer ores; 51.5% iron for nonbessemer ores. These prices apply to all the ores supplied to furnaces which buy their ores, that is, to about 30% of the total output; to those companies which own or lease their own mines the actual cost is the real price which they pay for their raw material. It is probable, however, that this actual cost in most cases approximates nearly the selling prices and it is not unfair to accept them as a standard.

These prices or costs are for delivery at Lake Erie ports, and from them must be deducted the cost of transportation. Under the order of the Interstate Commerce Commision made two years ago, the maximum charge from the mines to shipping ports on the upper Lakes is 60c. per ton. Vessel freight rates, which in recent seasons have been as low as 55c. and even 45c., advanced this season to $1 per ton, at which a number of charters were made; and dock charges are from 5 to 10c. Deducting these transportation charges leaves the amount realized at the mines from $3.35 to $4.25 per ton, which must cover the cost of mining and loading and the value of ore in the ground, or the royalty which is paid to fee-owners in many cases, especially on the Mesabi Range. These amounts are from $1.50 to $2 per ton higher than have been realized for several seasons, and in some years they have been little more than sufficient to cover the cost of mining, leaving hardly anything to cover royalties or depreciation of property.

On the Old Ranges the greater part of the mines are owned by the operating companies. On the Mesabi a large part is leased from fee-owners on royalty payments, and most of these contracts include a minimum clause. The operators are thus impelled to mine at least the minimum quantity for the year, no matter what the prices, so as to avoid an actual loss.

In addition to the cost at Lake ports, the furnaces using these ores must pay the freight to the point of consumption. For the larger part of these furnaces the railroad rate will vary from $0.50 to $1.50 per ton, the average being not far from $1. For furnaces anywhere east of the Pittsburgh district the cost would be higher, in many cases high enough to limit the use of the ores. For the larger part of the furnaces supplied from the Lake Superior district the cost of ore will average—according to the quality used—from $6.05 to $6.95 per ton, or from 11.73 to 12.04c. per unit of iron. With costs of $12 to $14 per ton of iron for ore and $8 to $10 for fuel, the present prices of pig iron do not seem as high as a comparison with those of a few years ago might indicate.

Scientific Meetings in War Times

A number of our scientific societies have deemed it advisable, "on account of the war," to either cancel or postpone their future meetings and conventions. The American Electrochemical Society, writes Colin G. Fink, the president, disapproves of this action, and at its recent board meeting adopted resolutions encouraging rather than discouraging the holding of meetings.

In order to expedite the solution of many of the new problems, he says, that have arisen as a direct consequence of our martial state, unrestricted discussion of the problems (with but few exceptions) at scientific meetings is bound to give a clearer understanding of the real points at issue. Meetings of scientific and technical societies have ever served as a great stimulus for their members and have been a "clearing house" for many of the best thoughts and ideas of our professional men.

Let us follow the good example set us by England. When England found herself confronted with a serious shortage of sulphuric acid, glass, dyes, electrodes, brass, furnaces, etc., the scientific societies arranged symposiums on these subjects and invited not only all the members to attend, but further, urged those factory men who were not members to come to the meetings to give their views and experiences and to learn all they could in return.

Quicksilver production in Italy in 1916 amounted to 1,093,851.5 kg., according to "Rassegna Mineraria." In 1915 the production was 985,514 kg.

Mining at Juneau, Alaska

By Floyd W. Parsons

The condition of the Alaskan gold-mining industry is not particularly good at present, but there is hope that conscientious and skillful management may considerably improve its status. Alaska Juneau is improving steadily.

ALASKA, in a mining way, was once a name to conjure with. Some time it may again come into its own, but today there is much gloom in Uncle Sam's northwestern territory. The United States paid $7,000,000 for this near-arctic empire and has been repaid a hundred-fold for its trouble. King Gold was once monarch, now King Salmon seems to hold sway. The fish run in good form and in regular season. The men who catch them play a fairly sure bet; but not so with the miner who tunnels for the elusive quartz—science and knowledge count, but chance counts also, and there is the lure. It's the gamble that charms the seeker and leads him to suffer much to attain his goal.

Some succeed—many fail. They all go away saying good-bye and promising never to return, but they come back—it's in the blood.

The Government is pushing ahead with the railroad from Anchorage to Fairbanks. Here Uncle Sam has an opportunity to study the labor situation first-hand. The Government has had to enter the market and bid for men, and it has outbid many of the private companies. Still the supply is insufficient. The complexity of the labor problem and certain helpful relief measures may appeal more forcibly to Washington lawmakers because of this Federal railroad building in Alaska. At least let us hope so.

The blueness of Alaskans just now is perhaps more due to the labor outlook than it is to a slowing up in the number of important new discoveries. No district has enough men. Certain localities can pay no higher wages, and in cases where companies are running company boarding houses, such institutions just now are showing net losses, due to high food costs. Mining labor generally in Alaska is not unionized.

THE ALASKA JUNEAU MILL

THE PERSEVERANCE MILL

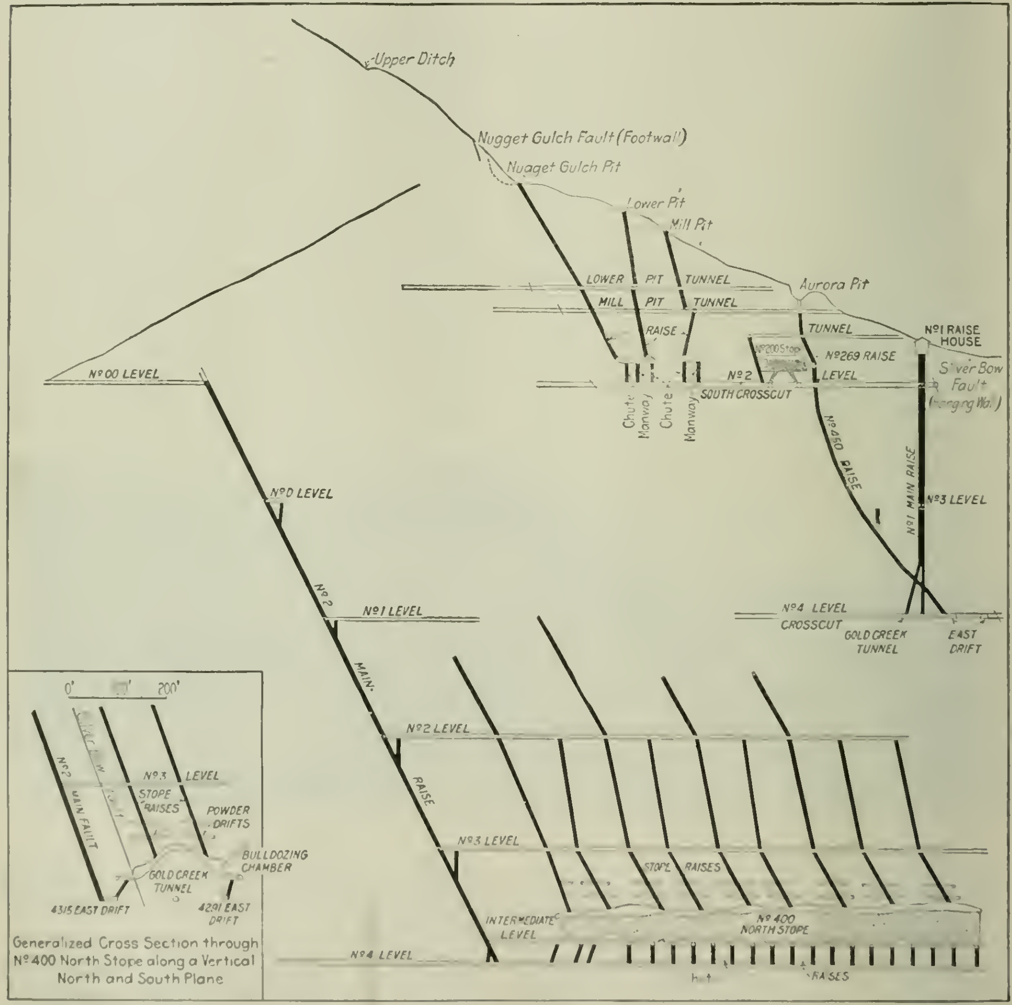
In the Juneau district the gloom has been increased by the Treadwell disaster. Even the fact that but one life was lost when more than a hundred might have perished, has not dispelled the deep sorrow. The Treadwell management deserves great credit for its carefully arranged patrol system that made it possible to get 150 men out of the workings in 90 minutes from the time the trouble was first noted. At 1:10 a.m., 40 minutes after the last man was out, the ground let go and the whole mine was flooded.

The Mexican and Treadwell mines were entirely lost. The Ready Bullion mine, which was connected underground with the Mexican, was saved by a heavy concrete bulkhead built in the connecting tunnel. When the ocean first came in, the water squirted out of the Mexican shaft to a height of 200 ft. This was probably the moment of maximum pressure on the bulkhead. This barrier has been further strengthened. The Ready Bullion is still operating, but is short of labor. It is likely that many miners are afraid to work in this mine.

To show how completely the mines are lost it is only necessary to say that in the Treadwell shaft, which was 1800 ft. deep, soundings indicate that it is now full of waste up to 800 ft. from the collar. The central shaft, which was 2800 ft. deep, is full up to 1400 ft. The Mexican shaft, 2100 ft, deep, is full up to 1100 ft. It is quite certain that but a very small area remained unworked. The Treadwell plants have a large salvage value, and the company is realizing high prices for its extensive equipment.

There is hope in the hearts of many in Juneau that the new Alaska Juneau mine will redeem the situation, and there is some foundation for the hope. Juneau will never be a high-grade mine. The ore will likely not average more than a dollar a ton in the mill run. This is without question a disappointment to many. However, Juneau will certainly average a lower cost than was ever thought possible. If luck has been against the company in the matter of ore values, it has been with the management in other ways.

Here are two bodies of ore separated by a fault known as the Silver Bow fault. The slip has separated the bodies a distance of 2000 ft. The north orebody has been developed; the south orebody has only been tunneled and crosscut in several places. The surface of this south zone shows values rather above the average, and a raise has been driven to daylight through which a small tonnage of this ore will be immediately obtained; in fact, it is being secured now. It is likely that this surface ore, however, will only be available as a summer proposition. However, there is no reason for pushing the development of the south orebody, because the north zone is wholly prepared and has easily available enough ore to feed the mill at maximum capacity for some years.



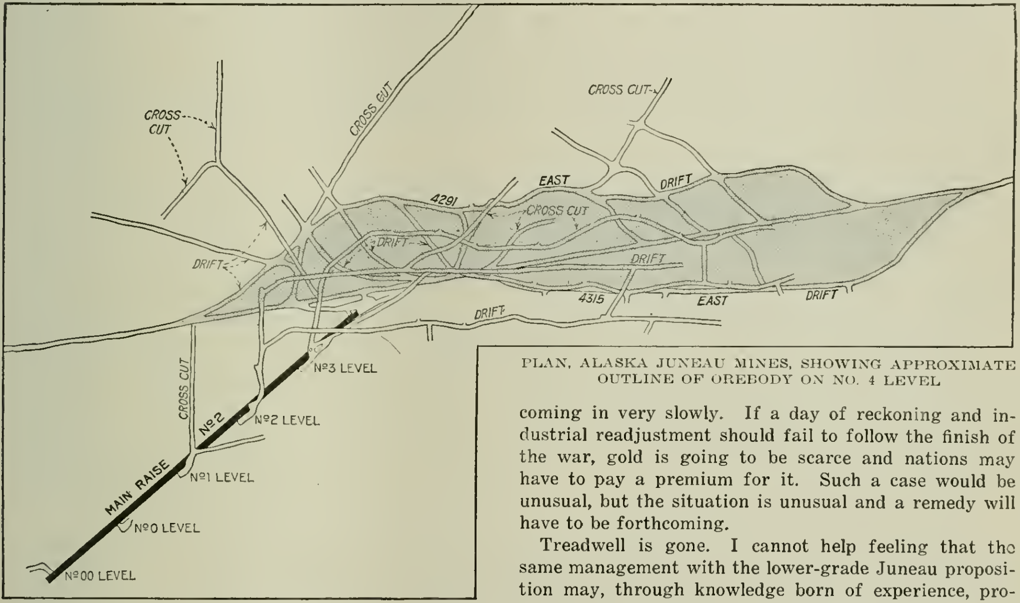
CROSS-SECTIONS THROUGH ALASKA JUNEAU MINE, SHOWING CONNECTIONS THROUGH STOPES AND LEVELS

The mill is on the side of the mountain facing the channel. The portal to the mine is on the opposite side of this mountain. Mine and mill are connected by a substantial double track haulway equipped with 50-lb. rails on loaded track and 40-lb. on track for empties.

The ore is brought to the mill in 10-ton steel cars equipped with air-brakes. These cars are pulled by electric locomotives, the equipment consisting of three Westinghouse 9-ton, two Westinghouse 18-ton and one Jeffrey 10-ton locomotive. From 30 to 50 loaded cars are hauled each trip. Four cars are dumped at a time by a huge cylindrical tipple.

The main haulway extends into the mountain running along the Silver Bow fault and is known as the Gold Creek Tunnel. This tunnel (No. A level on section) traverses the ore zone running east to west. Drifts 4315 and 4291 branch off this tunnel and traverse the limits of the orebody, as well as constitute the main haulage roads for the fourth level. Ore from the upper levels is sent down through raises, 40 in number, to the bulldozing chambers, where unusually large pieces are shot and reduced to a proper size. Heavy T-iron grates spaced about 3 ft. apart form the bottom or screen for the bulldozing chambers.

Levels in this north orebody are 250 ft. apart. The scheme of driving the raises is clearly shown in the accompanying illustrations. No more simple method could possibly have been devised. In addition, the ore has lent itself so readily to this system of working that it has actually mined itself. Much of it requires no shooting at all, so that it is only a matter of drawing it out. I do not see how the cost of mining and milling can be over 40c. a ton when the production gets up to anywhere near a normal tonnage. Tailings should not exceed 20c., so that any mill run above 60c. a ton ought to be profit. These are the figures of F. W. Bradley, president of the company.



PLAN, ALASKA JUNEAU MINES, SHOWING APPROXIMATE OUTLINE OF OREBODY ON NO. 4 LEVEL

The mill is a remarkably fine steel structure equipped up to the minute. The ore goes first to a jaw crusher, then to the gyratory crushers, from here to the ball mills and then part to roughers and oversize to the tube mills. From the tube mills the fines go to the finishing tables, the iron concentrates to the ball mills and the galena concentrates to re-treatment.

The ball mills were designed by the management, and some experimenting has been necessary to get a satisfactory liner. The difficulty has now been overcome, and August should see a material increase in the mill output. Not more than 70 men will be required to operate the mill.

In summer, the power plant uses water power, fuel oil when water is not available. There are four Babcock & Wilcox boilers. There is also a 6000-kw. Curtiss steam turbine, installed by the General Electric Co. Room has been provided and the foundation is ready for a second turbine, should one ever be needed.

Compressed air is carried into the mines at 90 lb. One Ingersoll-Rand, Rogler valve type 4750 cu.ft. and two small Imperial-type Ingersoll-Rand compressors supply all the necessary power for the drills. Various types of Ingersoll-Rand and Sullivan drills are used. Piston drills are employed in the open pits and jackhamers are used for plugging. Battery blasting is employed in all the opencuts; Du Pont 40 per cent. ammonia powder is used.

Alaska Juneau is starting operation at an inauspicious moment. The value of gold was never so low. An ounce of the precious metal today has barely half the purchasing power it had several years ago; however, Asia is hoarding the metal, a large part of the present production is going into the arts and new mines are coming in very slowly. If a day of reckoning and industrial readjustment should fail to follow the finish of the war, gold is going to be scarce and nations may have to pay a premium for it. Such a case would be unusual, but the situation is unusual and a remedy will have to be forthcoming.

Treadwell is gone. I cannot help feeling that the same management with the lower-grade Juneau proposition may, through knowledge born of experience, produce a property that will be as profitable eventually as was the famous old mine across the channel.

Increased Production of Lead

WASHINGTON CORRESPONDENCE

It is to Idaho, Utah and Missouri that the United States must look for the greater portion of the increase in lead production during the remainder of the war, according to C. E. Siebenthal, of the Geological Survey. He points out that Idaho has averaged 46,000 tons more of refined lead yearly during the war than for the four years preceding it. Utah has averaged over 40,000 tons more and Missouri 38,000 tons more. Under the stimulus of the unprecedented high prices of lead, all the lead-producing states should show gains. Oklahoma should make a much larger gain in 1917 than in 1916.

With internal conditions in Mexico reaching a state which will permit of smelting operations, increased imports of lead are expected from the southern republic. Before the war, the only lead bullion exported from the United States was that refined from the Mexican ore, which had the benefit of the customs drawback. From January to March of 1917, 14,970 tons of domestic lead was exported.

Mining Expansion

By Homer A. Guck[*]

During the life of every great mining corporation, with the exception of a few in isolated districts, there comes the time when the management must decide as to whether it is going to confine future operations entirely to the limitations of its properties or to expand, either by the purchase of adjoining properties or by exploration in the same or other districts. Some prominent and successful mining organizations take the stand that when a mine is worked out the organization goes to pot, the machinery ought to be scrapped and the affairs wound up.

Ten years ago the Calumet & Hecla corporation, for many years the largest copper-producing property in the world, decided upon a policy of expansion. A survey of the results are at this time interesting. The company had a wonderfully efficient organization; it had great quantities of copper conglomerate rock still unmined; it had the Osceola amygdaloid, right parallel, showing fairly good results; it had millions invested in its enormous mining, milling and smelting plants; some of the conglomerate shafts were at the end of their usefulness. The management determined that its organization should not only be maintained, but should be improved and brought up to a state of higher efficiency. It likewise determined that its great surface plant should be utilized to the benefit of numerous smaller mines in the immediate vicinity. This determination resulted in the purchase of interests in other properties in the Lake Superior district. At the time of the purchase only two of the properties were making a profitable showing.

Purchases of the Calumet & Hecla

The Calumet & Hecla paid over $20,000,000 to secure part interests in Ahmeek, Allouez, Centennial. Cliff, Gratiot, Isle Royale, La Salle, Laurium, Osceola, Seneca, Superior, Tamarack and White Pine, and a complete interest in other properties, none of which is returning anything to the company, and has paid off every dollar of the indebtedness contracted to secure its varied subsidiary interests. Provided that during the second half of 1917 the copper industry maintains the average price already contracted for for the first six months, the treasury should receive in earnings from its subsidiaries alone a sum of $5,500,000. The actual earnings of the subsidiaries of the company for the year 1916 were $4,200,000. This is not the total earning of these subsidiaries, nor the dividends, but the earnings on the stock held by the Calumet & Hecla company. Two years' actual earnings of the profitable subsidiary stock is equal to one-half of the total amount invested in these same subsidiaries.

By the payment of the last of four large notes given to the Bigelow interests in exchange for their stock in what are now profitable subsidiaries of the company, the entire indebtedness is cleaned up. The books show that, with the exception of two years, the dividends on subsidiary stock held, more than paid the interest charges on these notes. In 1909 the dividends overcame the interest by $7830. In 1910 the interest charge overcame the dividends by $56,800. In 1911 the interest overcame the dividends by $90,355. In 1912 the dividends overcame the interest by $468,540, in 1913 by $716,379, in 1914 by $78,962, in 1915 by $737,816. In 1916 the dividends received were approximately, $2,500,000, so that the total received in dividends to date, over and above interest, is $4,362,372.

The Bigelow notes represented in total $8,519,000. They were paid off out of the earnings and subsidiary earnings much sooner than originally planned. There was one five-year note for $1,700,000, two 10-year notes for $1,000,000 and $1,685,000 respectively, all at 5%, which have been paid; also one note due two years hence and for $4,134,000 at 4%, which has been called for payment. This total did not represent, by any means, the total outlay of the company in its stock ownership. The Bigelow syndicate, which at that time controlled the Osceola Consolidated, really owned a very small amount of Osceola stock, and the Calumet & Hecla company was compelled to buy on the open market more stock than it secured from Bigelow. The Centennial and Allouez, secured from other interests entirely, were paid for out of the Calumet & Hecla treasury, at the time when few of these properties were paying dividends, most of them being exploratory.

Today the market value of these stocks is approximately $22,000,000, the Bigelow group totaling at least $15,930,000, figuring Ahmeek at $10,000,000, Osceola at $3,000,000, Isle Royale $1,155,000, the dividend on Tamarack as $1,000,000, the sale of Seneca and the payment of the outstanding indebtedness carried on the company's books as money loaned for exploring that property at $775,000. Besides these there are the Cliff, Laurium, Frontenac, including the old Central, Manitou and a number of others which have a substantial taxable and actual value, but no market values.

The interest which the company owns in Allouez is $2,800,000, in Centennial $1,000,000, in La Salle $600,000, in Superior $750,000. White Pine and Gratiot can be figured at approximately $1,000,000, for the Calumet & Hecla is assured of the reimbursement of every dollar spent in the White Pine as well as one-half of the profits.

The Gratiot is optioned to the Lewisohn interests, who have taken over the Seneca, and it is likely that the option will be exercised, so that Gratiot will return to the company the half million expended in the effort to secure commercial copper there.

The Value of a Policy of Expansion

Under the circumstances the expansion policy in the case of the company has proved a good thing from every viewpoint. As it now stands, all earnings of subsidiaries are "velvet," and from the viewpoint of the subsidiaries, they have succeeded beyond expectations. Isle Royale, operating under other names before the Calumet & Hecla itself was discovered, never paid a dividend until it became a Calumet & Hecla subsidiary. Three dividends have been paid. Allouez, for 35 years up and down and out with a regularity that made the stock a market figure and little else, is now on a profitable producing basis, good for at least 20 years at at least 10,000,000 lb. a year. These are two brilliant examples. Osceola Consolidated last year earned $29 per share and is far from going to the wall as anticipated a few years ago. The South Kearsarge, its richest mine, is of course nearing its end, but both the North Kearsarge and the old Osceola have potentialities, both in the quality of and the possibility of handling lower-grade rock. Ahmeek has been the best purchase of all, and Tamarack the biggest disappointment, Ahmeek's production having practically doubled since it came under the Calumet & Hecla domination.

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[*] Houghton, Mich

When this policy of expansion was at its most critical point, there were difficulties that for a time made success look a long ways off. When the company proposed a consolidation of all subsidiaries with the main parent company, there resulted long drawn out litigation from shareholders of subsidiaries who did not like the conditions and terms. Ultimately the consolidation was dropped. Then came the Moyer strike with its year of terror and difficulties. But to offset these unfavorable difficulties came the unusual price for the metal, which continues to prevail.

Mining Manganese Ore with Cableway Excavator

A dragline excavator used at the Crimora mines at Crimora, Va., for excavating manganese ore from the pit is described in *Engineering and Contracting.* The excavator has a 1½-cu.yd. bucket of the Schofield-Burkett type. This bucket dumps the material into a revolving bin having a capacity of 50 tons. From this bin the material is transported to the washer by means of an incline gravity railway, two 4-cu.yd. side-dump cars being used. From these cars it is dumped into the main storage bin at the head of the mill. The material leaving the bin passes over stationary grizzlies, spaced 3 in. apart. The fines or under size go back into a 25-ft. McLanahan stone washer, the oversize passing on to a moving grizzly (also spaced 3 in. apart) and are deposited upon a drag conveyor. This conveyor carries the large lumps to a slugger roll crusher. Here the material is crushed to 3 in. and sent into the log washers, making a uniform feed of 3 in. and under; leaving the log washers, the material passes into a revolving screen, perforations, 2-in.; the undersize passes into screen No. 2, perforations ¾-in. and 1-in. The oversize of No. 1 screen is elevated to a picking belt, where the silica and iron are removed and the clean ore goes over the belt into the ore bin. The oversize from No. 2 screen is elevated to a picking belt No. 2, following the same process as No. 1; undersize passing into screen No. 3, perforations, $\frac{3}{32}$-in. This screen acts as a slime screen, removing all the slimes before the material is elevated to two sets of four-compartment McLanahan stone jigs.

The mill is built in two units. It has been found through recent operations that a considerable loss of ore is entailed in No. 3 screen, therefore, the management is planning an additional unit for further recovery. In connection with this unit it is proposed to install a Dorr thickener, by means of which approximately 60% of the water may be reclaimed for further use. The solids made by the thickener will be further treated in the additional unit.

The mill as designed and installed has a capacity for treating 1000 tons of material per 10 hours. The plant as designed can handle over 100 tons of washed ore daily. A recent laboratory test of the material as shown up in the excavator gave an average manganese yield of 5.42. This yield has also been borne out by recent drillings covering the area tested of the known Crimora basin.

The main milling plant consists of buildings and bins, in three sections, 66 x 150 ft., in which the ore-bearing material is received at a 100-ft. elevation. The entire equipment is of the most modern and substantial character, all automatic, with individual electric drives. In the power house there has been installed 500-hp. boiler capacity, Corliss engine, generator, dynamos and auxiliary machinery. This is housed in a building 35 x 100 ft. In addition there has been equipped a modern machine shop, 30 x 60 ft., and other buildings.

A reservoir has been made in the mountains having a storage capacity of 27,000,000 gal. of water. The water from this reservoir is conducted to the mill through a 6000-ft. flume line under a 40-ft. head. In addition, another reservoir is now under construction for impounding about 17,000,000 gal. of water. The mill as designed and when operating full capacity requires about 1,000,000 gal. of water per day, which, if no recovery of water were made, would insure maximum operations for nearly two months; this would extend through the most prolonged period of drought ever experienced in the district.

The refuse from the mill is conducted to the sedimentation basin, which can handle 1,500,000 gal. of water per day.

Determining Copper Costs

WASHINGTON CORRESPONDENCE

Actual work of calculating copper costs has been begun by the Federal Trade Commission. The work is under the direction of Dr. L. H. Haney. Two groups of accountants already are at work. One group is in Utah and another is in New York.

The trade commission feels that is has been particularly fortunate in obtaining the services of several accountants who have had long experience in copper-mine accounting. The speed with which this work will be accomplished will depend upon the ability of the commission to secure the services of men having sufficient experience and ability to undertake the highly technical problem presented. Dr. Haney also is in charge of the investigation to determine the production costs of lead, zinc and aluminum.

British Metal Imports

Imports of metals other than iron and steel in Great Britain for the five months ended May 31, are reported as follows, in gross tons:

	1916	1917	Changes
Copper, metal	48,250	38,460	D. 9,790
Copper matte and precipitate	17,727	10,404	D. 7,323
Total copper	57,114	43,662	D. 13,452
Tin	15,172	12,847	D. 2,325
Lead	76,378	50,715	D. 25,663
Zinc	16,665	26,095	I. 10,030

Zinc is the only metal showing an increase this year. There were decreases of 23.6% in copper, 18.6% in tin and 33.6% in lead; an increase of 60.3% in zinc.

Dangers Accompanying Use of Carbide[*]

The carbide lamp has largely displaced the crude, spouted oil lamp as an illuminator in mines. The handling of the carbide has, however, brought its own problems and dangers. The substance employed is chemically unstable and possesses a strong affinity for water. If placed in contact with any explosive, fulminate, dynamite or powder, provided that explosive carries moisture, grave possibilities are at once developed.

NOBODY regrets the passing of the spout oil lamp. It was a dirty, unsanitary makeshift at best. The marvel is that it remained so long without a rival. Here and there, where naked lights are permitted, isolated individuals still hang on to it, in spite of the scorn of their more progressive neighbors. But their numbers are steadily shrinking, and the day is not far distant when it will have gone the way of the tallow dip and the hemp rope, with none to mourn its mature demise.

"Carbide" has come to stay. It is a convenient, clean and dependable source of an efficient illuminant. The clear penetrating light from the combustion of its acetylene product has wrought a great improvement in mining conditions. More efficient work, greater safety and a cleaner product are among some of the results to its credit. Furthermore, a careful counting of costs, as compared with oil, strikes the balance decidedly in favor of the use of carbide.

SHOULD BE HANDLED WITH REASONABLE CARE

After we have conceded all these advantages to carbide, there are, however, other features to be considered. The product has been introduced and distributed widely throughout the mines of the country as a substitute for oil. In most cases it has been accepted too literally as such. It is handled with the same familiarity, and is stored away in the tool chest, in the niches previously occupied by the lard pail or the oil can. This is usually done with complete disregard of the fact that its introduction to the "collection," which comprises dynamite, blasting powder and detonating caps, may be the last link in a vicious circle that one day may be disturbed with disastrous consequences.

Calcium carbide is produced by the fusion of a mixture of lime and coke, under the tremendous temperature of the electric furnace. The metal calcium in the lime parts with its oxygen and combines with a portion of the carbon present to form the calcium carbide of commerce. The oxygen liberated unites with another part of the carbon to form carbon monoxide, as shown in the following equation:

$$2CaO + 3C = 2CaC_2 + 2CO.$$

The union of the metal with carbon is abnormal, and its affinity for oxygen is unimpaired. When opportunity is afforded, therefore, carbide attacks water in any form, tears its constituents apart and unites itself forcibly with the oxygen. The hydrogen and carbon liberated by this action combine to form the acetylene which is burned in the miner's lamp.

The tremendous chemical activity of calcium carbide may be partly realized in the statement that, in the decomposition of water, it accomplishes a task which can only be accomplished ordinarily with much difficulty.

This article is not intended to alarm, or to discourage the use of carbide, but to direct attention to the fact that some real dangers attend its careless handling.

Put a little calcium carbide into a wine glass, and add as much dynamite as will cover a dime. Cover the glass for a few minutes, then uncover, and apply a light. You will find that a gas has been evolved which takes fire on the application of the light. Before burning itself out the gas ignites the dynamite, which burns fiercely until exhausted.

Again put some calcium carbide into a wine glass, and add a few grains of blasting powder that has been exposed to the air for some time. Cover for a few minutes. Uncover, and apply a light. You will find that a gas has been evolved which takes fire and ignites the powder.

Take the lid off a carbide can at any time, and apply a light. You will usually find that there is enough gas within the can for ignition and temporary combustion.

Now miners are much the same the country over. Familiarity with the handling of high explosives has bred a contempt for conditions that would raise the hair and stagger the equanimity of the intelligent tyro.

MIXING CALCIUM CARBIDE WITH DYNAMITE

Conceive the situation. A miner goes to prime a dynamite charge. He seizes a stick of dynamite, drills a hole through it with the tang of a file, pulls one end of the fuse through the hole, and pushes the fuse into a detonator which he takes from a carbide tin.

Let us see what we have in that detonator now. We have fulminate of mercury, calcium carbide, dynamite adhering to the fuse (this comprises nitroglycerin, moisture, sawdust and, possibly some free acid) also the various ingredients of the fuse—comprising carbon, sulphur and potassium nitrate or sodium nitrate.

I am ready to admit that the mixture may be quite innocuous until the intrusion of the carbide. But the soberest chemical imagination must be profundly stirred on the entry of that disturbing factor into such a shaky mixture of explosive material.

I am not acquainted with the actual temperature resulting from the slaking of calcium carbide with water. But, from experience in handling the lamp in which the operation is effected, I should not be surprised to learn that it exceeds the temperature of boiling water.

There appear to be two stages in the evolution of the heat. The first is that in which the decomposition of water takes place, accompanied by the union of the calcium with the oxygen of the water, and the carbon with the hydrogen, as represented in the following simple equation:

$$CaC_2 + H_2O = CaO + H_2C_2$$

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[*] From an article in "Coal Age," by J. R. Allardyce, Saginaw, Mich.

This reaction being completed, dimunition of the supply of acetylene in the miner's lamp at once takes place, with reduction of temperature. The miner, finding the light failing, instinctively increases the supply of water, an act which is rapidly followed by the steady extinction of the flame and a great increase in the evolution of heat. The temperature at this stage is often so high that it is impossible to hold the lamp in the hand.

What takes place in this second stage may be represented by the equation, $CaO + H_2O = Ca(OH)_2$, which signifies that after the completion of the first reaction, in which acetylene is liberated, what remains as solid residue in the lamp is simply unslaked lime. The addition of water to this, as is well known, results in the liberation of much heat.

This is the real danger point in the contact of calcium carbide with such irritable bodies as fulminate of mercury and nitroglycerin. The slaking of quick lime in contact with easily combustible bodies, such as wood, has often resulted in fire.

It is not beyond the compass of probability that the frequent assembling of the nervously active chemical bodies, already enumerated, may one day, or any day, result in a combination whose reaction will precipitate a disastrous explosion.

Not being in possession of facilities for conducting the experiments necessary to justify or disprove the theory of a possible explosion from such a cause as outlined above, I submitted the matter to the Bureau of Mines. The officials of that department, in their reply, said that they had applied calcium carbide to the fulminate in the shell of the detonator, in 12 separate instances. No explosion, they stated, had resulted. In an oracular postscript, however, they expressed the view that "it does not seem impossible that, under some circumstances, an explosion would occur."

The courtesy of the bureau officials was unmistakable. But in view of the fact that Thomas A. Edison conducted a series of 1400 different experiments in pursuit of a principle, I hope I may be pardoned for remarking that the bureau's dozen odd ventures assume somewhat modest proportions.

The suggestion from me that the bureau include the action of calcium carbide on dynamite and blasting powder in their investigations was ignored entirely. This was possibly due to a lack of knowledge of the habits of miners, many of whom, as I have already stated, stow dynamite, carbide, powder and detonators all in the same box.

One will run in a hurry to that box and grab a handful of carbide, spilling a quantity over an exposed broken stick of dynamite, and close the lid again. Returning, on a similar errand, he opens the lid and jabs his head into the box, with his lamp burning on his cap. Acetylene gas has been accumulating around the dynamite in the interval.

Or, with the powder keg open beside him, another may suspend his labors on cartridge making and hurriedly restock his lamp with carbide, spilling part of it into the keg, where it starts the generation of acetylene.

The average miner is ignorant of the nature of the simplest chemical reaction, even that involved in the case of burning coal. But if he were to understand that in bringing water into contact with carbide he is performing an act similar to blowing air into a coal fire, and that the carbide is then burning exactly as coal does, he might be more careful in handling it.

The resulting temperature, of course, is much lower than in the combustion of coal, but it may be sufficiently high to ignite fulminate of mercury.

Extending Nickel Production

The British America Nickel Corporation is pushing work on the mines which it has acquired in the Sudbury district in Ontario and is preparing to begin work on the smeltery and refining plant which it expects to build near its most important mine. This plant will be under the charge of E. P. Matthewson, recently with the Anaconda Copper Co. The nickel to be made there will be refined by the Hybinette electrolytic process. The Christiansand Nickel Refining Co. in Norway, using the process, has taken an interest in the concern.

The British America Corporation has a capital stock of $20,000,000 and will issue $9,000,000 in bonds. The stock, it is understood, is controlled by the British government. That government will take the nickel made by the company up to the limit of its requirements and will control the sale of any surplus. The company was first organized and promoted by the late Dr. S. F. Pearson, and its operations were delayed by his death.

The company has two distinguished technical men on its staff. One is E. P. Matthewson, already mentioned, whose career at the Anaconda is well known. The other is W. A. Carlyle, who was at one time provincial mineralogist and deputy minister of mines of British Columbia, and later manager of the Rio Tinto Copper mines in Spain. He is one vice president of the company. The president is James H. Dunn, of London; the other vice president is J. Frater Taylor. The directors are: A. G. Anderson and H. M. Hubbard, of London; S. Eyde, V. N. Hybinette and Admiral Borresen, of Norway; Robert Gowan, J. S. Lovell, R. H. Smith and E. R. Wood of Toronto.

Under its present technical and financial management there is no doubt that the new company will become a large and important producer of nickel. The production from the Sudbury district has heretofore been entirely in the hands of the International Nickel Co., with the exception of a small part controlled by the Mond Nickel Co. The Mond process, though technically almost perfect, has never seemed able to compete commercially with the refining plants controlled by the International Nickel Co. here and the Société Le Nickel in France and New Caledonia. Meantime the International Nickel Co. is going on actively with the construction of its refining plant at Port Colborne, Ont. This plant, which will cost in all about $4,000,000, is built in accordance with the company's agreement, made with the Ontario government, that part of the nickel from Sudbury should be refined in Canada. Up to the present time, as is well known, all the nickel matte from the Sudbury mines and furnaces has been refined at the company's works at Constable Hook, N. J.

It does not follow that there will be any sharp commercial competition between the British America and the International companies. The demand for nickel is growing, and there will probably be business enough for both—to say nothing of a possible agreement.

Details of Practical Mining

Large Map Roller

A sturdy cheap and easily constructed table for working on large drawings or maps is shown in the accompanying sketch. The size of the table depends of course on the size of the work in question, but the main features, namely, the map roller and the noncreasing device, may be worthy of mention. By having a wooden roller under each side of the table, fitted with a crank for turning and also a gravity brake that works automatically, the map may be shifted backward or forward at will and will retain the position at which it is set.

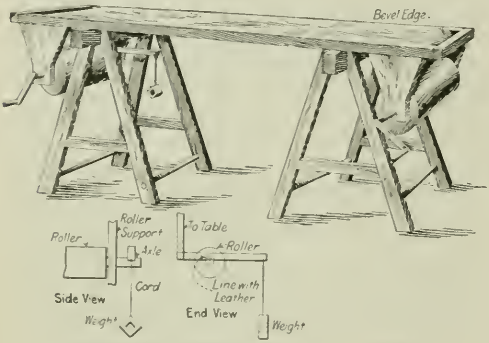

TABLE FOR LARGE MAPS OR PLANS

The noncreasing device consists of a slot in each edge of the table about three inches wide and extending the full length of the table, the inside edge of which is beveled as shown in the sketch. The map or drawing is inserted in this slot and then back to the roller. The draftsman's weight is then on the edge of the table instead of on the map or drawing.

It is advisable to cover the rollers at both ends of the table, as the face of the map or plan is always out or exposed to the dust which is likely to accumulate in the "V" between roller and paper.

Plans may be kept on rollers which may be made in such a manner as to be easily changed, thus reducing the dangers of having them crushed.

Care should be exercised that the brake is not set too tight, as continually stretching the paper, particularly in wet weather, destroys the scale of the drawing.

Record Drift for the Franklin Mines

By H. H. Hodgkinson*

The five-hole cut method is used exclusively in drifting at the Franklin mines of the New Jersey Zinc Co., as it has proved to be the most reliable and practical cut for both the rock and ore at this mine. A great many different types of cuts, such as draw cuts, V-cuts, pyramid cuts and side cuts, have been tried without success. These cuts require more holes to break the ground than does the five-hole cut, without giving near the same advance in feet. The holes, when fired, either leave a long bootleg (bottom) or else merely blow off the collars, burning the bottoms. Besides, the size at which the drifts are driven does not permit the use of the previously mentioned cuts, as there is not sufficient space to give the cut holes the proper spread. Furthermore, the dimensions of the drifts are ample for the purpose for which they are intended, and the ore, which is a granular mixture of franklinite, willemite, zincite and calcite, is extremely tough and does not shatter readily, and can be mined a great deal cheaper by stoping than by drifting. The rock is a crystalline white limestone that is very resilient and equally as hard to break as the ore.

Better results are obtained with the dynamite uniformly distributed over the partial length of the drill holes than with it concentrated in their bottoms as is usually practiced in other methods of placing and loading drill holes. The method of loading drill holes provides sufficient space to permit the placing of enough tamping material to prevent any "windy shots." The holes are drilled of as small a diameter as is possible to accommodate the 1 x 8-in. dynamite cartridges. This not only allows the distribution of the dynamite over the partial length of the hole, but also increases the drilling speed of the machines because of the small gage of bit used.

The record drift was driven in October, 1915, on the 750-ft. level, when an advance in ore of 122 ft. was made by one man in 25 shifts of eight hours each. A round was drilled up and fired each shift which drew an average of 4.88 ft., the size of the drift being 7 x 5½ ft. The drilling labor rated at 0.205 runner shift per foot advance. The drill used was an automatic rotating hammer drill with water tube sending water through the drill steel and with the pneumatic feed mounting attached to the column arm. No repairs whatever were made on the drill, even the replacing of a broken water tube being unnecessary. This was due largely to the faultless steel turned out by the blacksmith and the care the drill received at the hands of the drill runner. There were 19½ drill shifts (eight hours) in which 460 holes were drilled, making a total footage of 2319 ft. The drill averaging 14.9 ft. per hour and 0.159 drill shift per foot advance. An average of 18.4 holes were drilled per round, to a depth of 5½ feet.

The drill steel used was ⅞ in. quarter octagon hollow with a shank of the same section sharpened with six corner or rose bits ranging in gage from a 1½-in. starter to 1¼-in., at which the holes were bottomed. There were 139 drill steels dulled for the entire drift; in other words, each steel drilled 16.68 ft. before being dulled.

The drilling and blasting was all done on the day shift, the night shift mucking out the heading; there being 63 shifts and 3 hours muckers' and trammers' total, or 0.517 muckers and trammers per ft. advance. There were used 2920 sticks of (1 x 8-in.) 50% low-freezing gelatine dynamite, or an average of 6.35 sticks per hole, making 9.06 lb. of dynamite per ft. advance.

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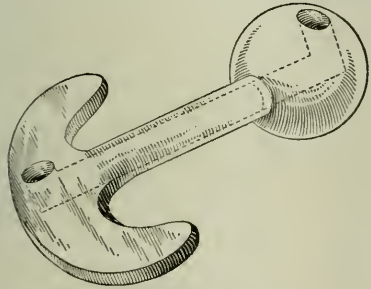
*Box 1536, Jerome, Ariz.

Ear Protector for Millmen

By S. H. Brockunier*

Those of us who have had to work for any length of time in the noise of the stamp mill have seen the ill effects of the deafening roar, and the curious phases of the adjustment of the ear to its unusual surroundings. Many millmen, who have become quite deaf to ordinary conversation in the open air, can hear quite distinctly amid the roar of the stamps, if the voice is only slightly raised and the speaker is quite close. They can also differentiate between the usual crash and pound of the stamps and the slightly different noises resulting from too close feeding of the stamps or a loose stem. The ear adjusts itself to the vibration, and is rather uncomfortable when away from it.

Many millmen protect their ears by stuffing them full of cotton and soap, or even waste. For a number of years I have used the ordinary naval big gun ear protectors, when working in a mill, and find the form herein illustrated the safest and most comfortable; and while they do not prevent one's ears from ringing for awhile after removing the protectors they do furnish a great relief, especially for those who are not continuously in the mill, and whose ears therefore do not get adjusted to the vibration.



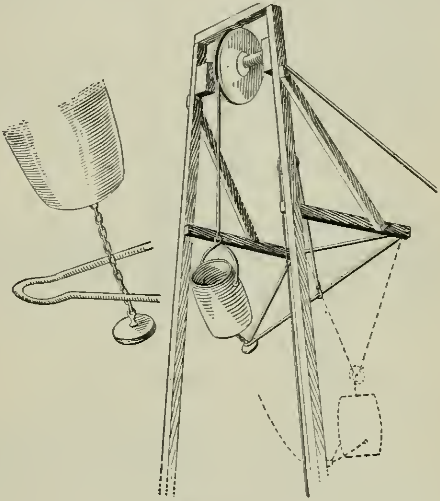
THE EAR PROTECTOR

The protector is made of celluloid, and consists essentially of a ball containing a round hole on one side, and a small duct leading from the bottom of the hole through the stem to another smaller hole in the anchor shaped terminus of the stem. The ball is inserted in the ear, the hole next to the ear drum, and the anchor shaped stem is braced against the lobe of the ear, thus holding the protector in place. The sound now has to enter the small hole in the stem, traverse the narrow passage or duct to the hole in the ball, and thence pass to the drum of the ear. The sound therefore has to pass through a decreased aperture and make two sharp bends before reaching the ear; the effect is to reduce the shock and vibration to the ear drum without preventing one from hearing entirely.

There is nothing in the shape or method of insertion of this protector to injure the ear in any way, which is more than can be said of some of the protectors or remedies adopted by millmen.

Ore-Bucket Dumping Device

Economy and efficiency, many times obtained only at a comparatively large capital investment, was practiced by the prospector in Colorado many years ago, poverty being the prime factor. Many shafts sunk in the early days of Cripple Creek and other Colorado camps were sunk by four or six "pardners" who put in long and varied shifts. It was not infrequent that one man fired the boiler, ran the hoist, dumped the buckets, trammed the dirt and sharpened the steel, and in case no dirt was to be hoisted, even climbed down the ladder and helped drill or timber. A bucket-dumping device was installed at many prospects. Who devised it is not known, but its efficiency is great and its cost low. The illustration shows how it is constructed and works.



GRAVITY-DUMPING ORE BUCKET

The bucket has, attached to the ring in the bottom, a piece of chain six to eight inches in length to which is attached a large cast-iron washer. A bar of 1-in. iron is bent into a V, the point being rounded off so as to allow the chain to engage therein without pinching. Eyes and eye-bolts are welded into the ends of the rod, each leg of which must be as long as the radius of the circle described by the dumping of the bucket; that is, according to the distance from shaft center to the point where the material is to be deposited. Eye-bolts are fastened to stiff legs of headframe or to substantial posts, to carry the weight of the dumping bucket, the V-iron is counterbalanced so as to be moved freely by the lever, and gravity does the rest.

Broken Hill South Silver Mining Co., of Broken Hill, New South Wales, Australia, in its report for the half-year ended Dec. 31, 1916, shows that the first unit of the lead section of the selective flotation slime plant ran continuously during the period; 1924 tons of concentrates were produced, assaying 58.7% Pb, 44.7 oz. Au and 9.3% Zn, effecting a recovery of 82.8% Pb, 88.8% Au and 10.1% Zn, the latter metal being recovered separately. The zinc section of the plant has been completed.

Details of Milling and Smelting

Recovery of Potash from Alunite

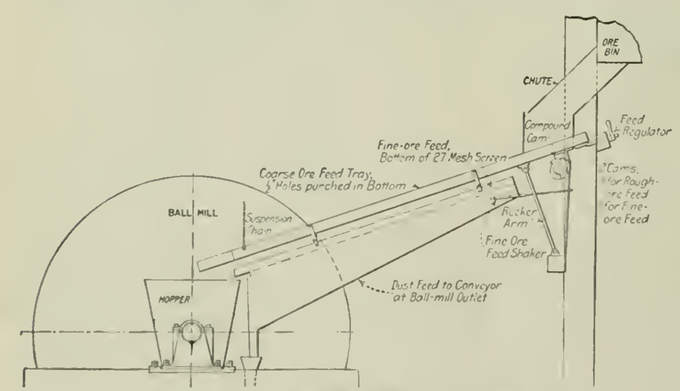
In experimenting on alunite from Marysvale, Utah, W. H. Waggaman and J. A. Cullen have found that the best results were obtained for potash extraction if the calcination was conducted at from 750° to 800° C. Above 800° fixation of potash took place, particularly in the presence of much silica. No gain was shown by grinding the material finer than would pass a 60-mesh sieve (U. S. Dept. Agr. *Bull.* 415, 1916).

It is suggested that it might prove the most economical method of working to ship the raw material East, since alunite takes a low freight rate and the finished products are practically all consumed in the East.

A Ball-Mill Feeder

By A. W. Allen*

The present activity in ball-milling practice suggests the publication of details of a type of feeder that was erected and successfully operated at Kalgoorlie, Western Australia, about 15 years ago. The design may not be widely known, but it possesses several interesting features, and although used in connection with dry crushing in this instance, it would be equally applicable under many other conditions. At the South Kalgurli mine, where this feeder was in operation, it was found that from 10 to 15% of ore was bypassed to the ball-mill outlet, thus effecting a considerable increase in milling efficiency. The upper tray consists of steel plate perforated with ½-in. holes. The fine screen below corresponds in aperture width to the one used in the mill (Krupp type), in this case 27 mesh. A compound cam gives the necessary jar to both screens and provides for a greater frequency in the vibration of the finer screen than in the punched plate. The details and drawings are taken from R. Allen's "West Australian Metallurgical Practice."


ORE BIN
CHUTE
Compound Cam
Feed Regulator
Fine-ore Feed, Bottom of 27 Mesh Screen
Coarse Ore Feed Tray, ½" Holes punched in Bottom
Cams, for Rough-ore Feed for Fine-ore Feed
BALL MILL
Suspension Chain
Rocker Arm
Fine Ore Feed Shaker
HOPPER
Dust Feed to Conveyor at Ball-mill Outlet

A FEEDER FOR BALL MILLS

Device for Filling Air Chambers with Air

By W. A. McCurdy*

Following is a description of a scheme which is simple and inexpensive, but which works wonders on pumps operating against high heads by filling the air chambers with air at a pressure equal to that due to the hydraulic head. This device is not new, but is of value.

When we stop to think that a cylindrical air chamber 30 in. long, filled with air at atmospheric pressure, will have but the top one inch of its length full of air when working under a 1000-ft. head, it is evident that the air chamber is of no use, while with this same chamber full of air at the proper pressure, there is a perfect cushion to absorb the shock due to the sudden thrust of the pump plunger against the end of a long, heavy column of incompressible liquid.

There are in the mines of the Oliver Iron Mining Co. on the Vermilion Range several crank and flywheel pumps of about 1000 gal. per min. capacity, operating against a head of approximately 1000 ft. A speed of 38 to 40 r.p.m. was about the limit of safety prior to the installation of this device. On account of the heavy water-hammer, it was impossible at higher speeds to prevent gaskets from blowing out, fittings from breaking and undue wear and tear due to the excessive vibration of everything connected with the pumping plant. With this device in use, the same pumps can now be operated at 55 to 60 r.p.m. as noiselessly and smoothly as a new sewing machine. In other words, the pumps may be run right up to capacity without difficulties of any sort.

Referring to the attached sketch, the device consists of a length of heavy pipe *B* which may be 8, 10 or 12 in. in diameter and 16 or 18 ft. long, the ends being closed with blind flanges. One flange is drilled and tapped near the bottom for a 1½-in. pipe which will drain the large pipe, and near the top for a 1-in. pipe. From the 1-in. opening pipes lead to the air chambers *AA* and to the compressed air line or atmosphere through *J*. There are 1-in. globe valves suitable for the high pressure at *C*, *D*, *E*, *G*, *H* and *I*. At *F* is a 1½-in. valve. The pipe *B* should be level and the 1-in. pipe *CDE* should be continuously up-grade from *B*. There should be no point in this pipe as high as the point *C*, otherwise the air will be trapped and cause the device to operate slowly or not at all.

Operation is as follows: Valves *C*, *D* and *H* are open. Valves *E*, *G*, *F* and *I* are closed. Now open *F*, *G* and *H* or *F*, *G* and *I*. This will drain or blow all water out of *B*. When *B* is empty, close *F* and *H*, leaving *G* and *I* open till *B* is filled with compressed air at 60 to 75 lb. pressure or with atmospheric air if there is no compressed air handy. Now close *G* and *I* and open *E*. Water will now flow from *AA* to *B* compressing the air in *B* to pump pressure, after which this air will bubble up through pipe *EDC* to the air chambers *AA*. After a few minutes close *E*, open *F* and *G* and repeat operation till air chambers are full of air. This will be known when the valve *F* discharges air instead of water. Two of these operations are sufficient for the pump previously mentioned. It might be well to have a try-cock in one air chamber just above where *C* or *D* enters.

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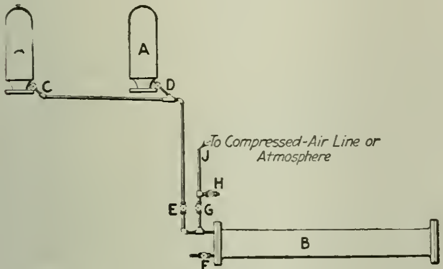
*300 Broadway, New York

*Ely, Minn.



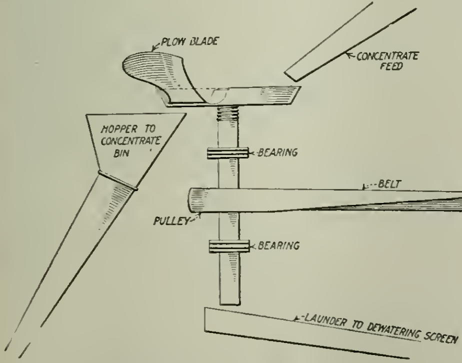
PIPING ARRANGEMENT FOR DEVICE FOR FILLING AIR CHAMBERS

The valves *H* and *I* are not necessary when air is taken from the atmosphere. They are merely a safeguard against water entering the compressed-air system when the device is idle. To prevent this *H* is left open to drain off any water leaking by *G*. Doubtless the device can be still further simplified and improved.

Concentrates Dewatering Pan

A very simple, but effective dewatering pan for mixed concentrates may be put in ahead of the regular dewatering screens, saving much wear and tear.

The device consists of a boiler-plate pan 3 ft. in diameter, made in the shape of a gold pan, with flat bottom and sloping sides. A central cone 1 ft. in diameter and 4 in. high is fixed in the center of the pan. The top of this cone and the bottom of the pan are bored and tapped for a 4-in. pipe so that the pipe, when threaded, may extend above the top of the cone.



CONCENTRATES DEWATERING PAN

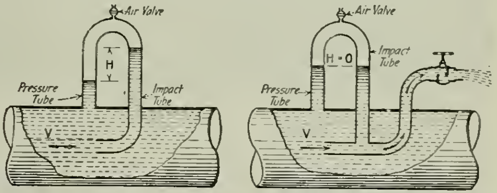
This pipe has a long thread cut on it, and since it is also used as a shaft, it is well to cut out short sections of the thread so that a wedge may be placed between the pipe and the top of the cone to prevent unscrewing or screwing up the pipe, thus changing the height. This pipe is the water discharge from the pan. At some points on the pipe about 1 ft. and 3 ft. below the pan, pipe flanges are keyed and faced to give bearings.

Above the pan an arm is arranged to carry a plow blade, which is made to fit in the pan and is to be set above its bottom, the distance depending upon the size of the concentrates. The pipe and pan are then made to revolve, using a rope, a belt or gear drive. The plow blade will remove the concentrates from the pan at an elevation greater than that of the water discharge or overflow. The water will naturally carry some fines, which can be taken to a screen or other dewaterer.

The pan will take all sizes of material from the bull-jig product to table concentrates. The wear and tear on both pan and blade is nominal.

Modified Pitot Tube

The pitot tube has long been used as a device for measuring the flow of liquids and gases, but only when used with the utmost care have the results proved uniform. Many experimenters have worked with modified forms in the endeavor to reduce the variation in results, but it is evident not only that the data obtained are variable, but that the same tube may have different coefficients, says *Engineering News-Record.*



Common Pitot Tube
FIG. I
Formula: $V = c\sqrt{2gH}$
H = Pitot Head
c = " Coefficient
g = Acceleration of Gravity

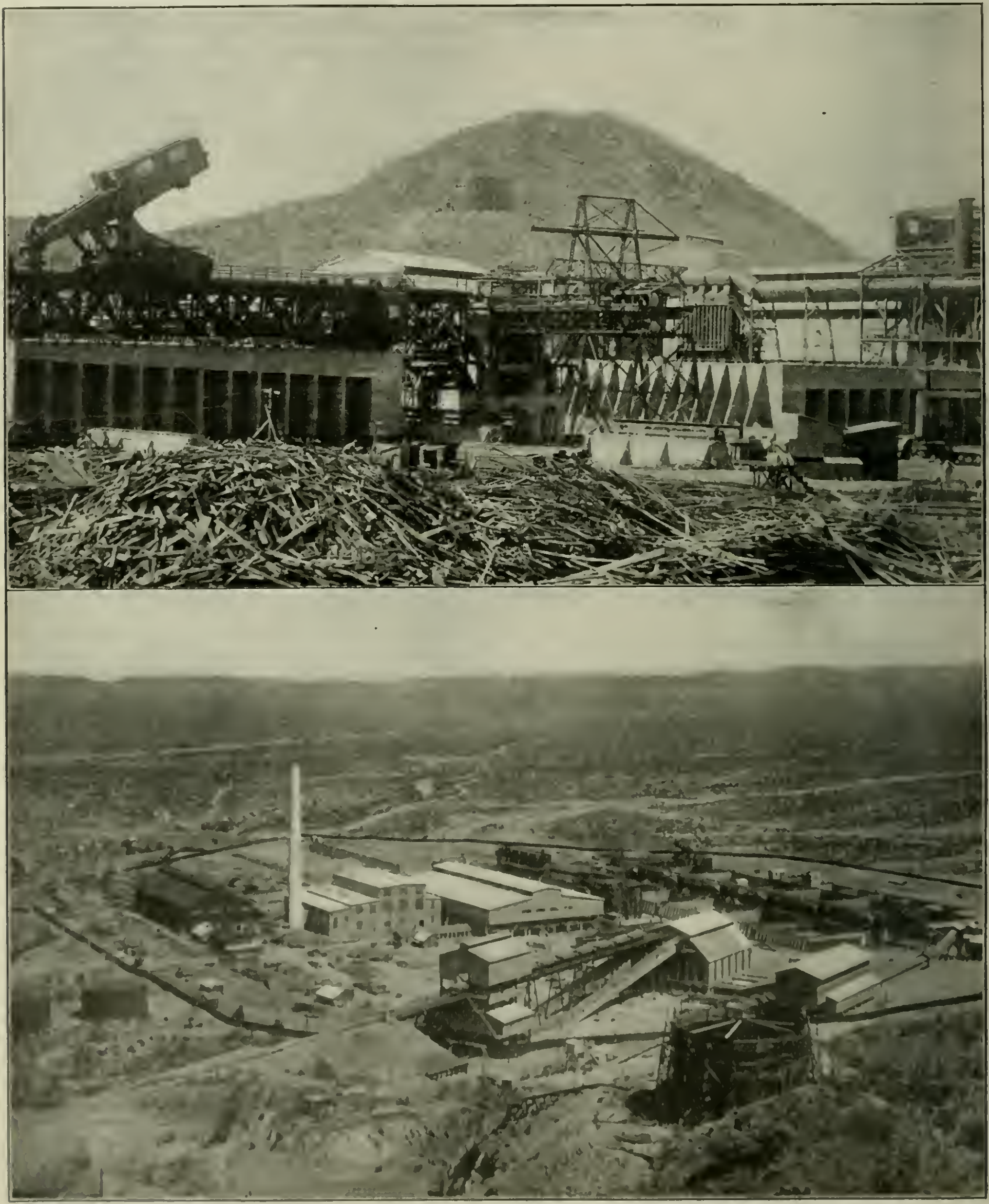
Hydraulic Shunt
(Modification of the Pitot Tube)
FIG. 2
Formula: $V = \frac{Q}{cA}$
Q = Flow from Tube
A = Area of Tip Opening
c = Tip Coefficient

ALMOST AS SIMPLE AS A PITOT TUBE

In order to correct this latter defect, Prof. H. A. Thomas has devised the "Hydraulic Shunt-Flow Tube," described in the March *Rose Technic*, p. 176. This is a tube so arranged that it may be introduced into the stream with the tip directed against the flow and yet maintain at the tip the same pressure that existed before the introduction of the tube. The water flows into this tube and may be shunted into a small container and weighed, leaving the velocity undisturbed.

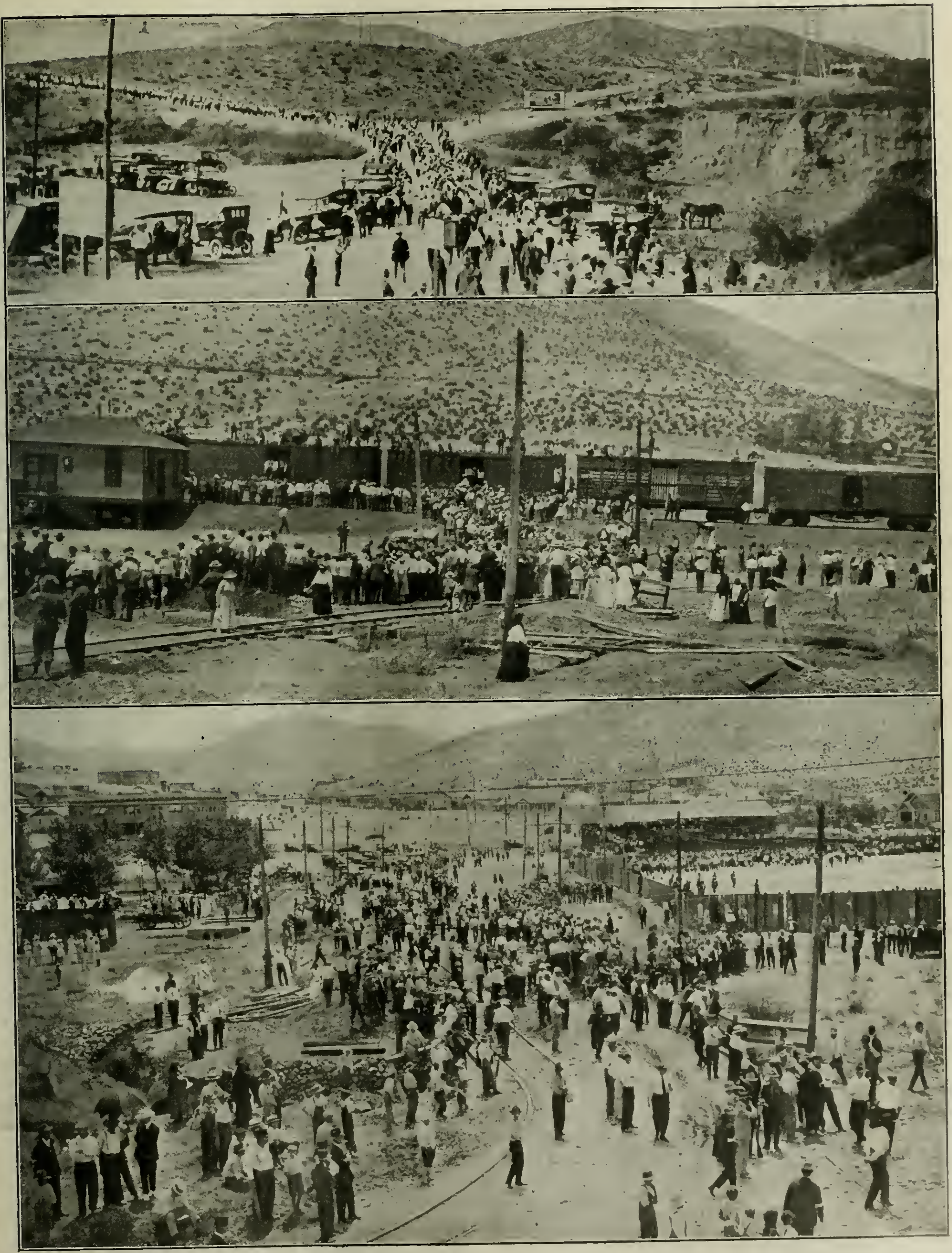
The velocity of flow at the tip of the tube will be equal to the quantity of water collected in the measuring tank, in a measured time, divided by the top area. It is possible to demonstrate mathematically that turbulent flow should not affect the coefficient of the tip. The tip coefficient should be unity under all conditions, but experiments show that it varies less than 1%.

Photographs from the Field



VIEWS OF THE NEW PLANT OF THE NEW CORNELIA COPPER CO. AT AJO, ARIZ.

The upper view is of a corner of the leaching plant shortly after completion, while the lower includes the tank house



VIEWS OF THE EXPULSION OF THE I. W. W. FROM BISBEE, ARIZ.

The upper view shows the exiles on their way from Bisbee to Warren, where they embarked. The central view is loading the men on cattle cars at Warren. In the lower view is shown Warren ball grounds, where the men were held pending deportation

Events and Economics of the War

It has been impressed upon us during the week that war is expensive. Secretary McAdoo has requested 5 billions more. $2,500,000,000 is wanted for coast defense. The year's war cost, it is said, will be over 11½ billions and may reach 14 billions with loans included.

Hurley and Capps succeed Denman and Goethals. The long rumored Central Purchasing Committee has at last been appointed. The Food Control bill is expected to pass shortly with Hoover as administrator.

Abroad the Allies have once more proclaimed that they will fight until their object is attained. The Russian retreat continues but the Rumanians gain. Kerensky is now dictator. Peace seems to interest the Germans more than it does the Allies.

Practices that Tie Up Cars

Relative to further increase in transportation efficiency, J. F. Porterfield, general superintendent of transportation of the Illinois Central Railroad, recently said:

"A saving equal to the present car shortage can be made by eliminating the delay incident to holding cars for reconsignment and surrender of bills of lading.

"After years of effort the railroads have finally agreed on filing tariffs covering uniform reconsigning rules and charges, and while these rules will not prohibit such reconsigning, they make a reconsigning charge of $5 where the movement of the car is interrupted and a nominal charge of $2 where the car is reconsigned without being delayed or diverted from the current of traffic. It is thought the $3 difference in the charge will greatly reduce the reconsigning in hold-yards and increase the placing of reconsigning instructions with the railroads sufficiently in advance of arrival of cars to effect the reconsignment without diverting cars from the current of traffic to hold-tracks. It is probable that the National Industrial Traffic League and the Commission on National Defense can prevail upon the Interstate Commerce Commision to permit these reconsigning tariffs, now under suspension, to go into effect at once.

"The practice of moving freight on 'Shippers Order Notify Billing,' always a source of serious loss in car efficiency, is causing additional car delay owing to the present banking system requiring the handling of bills of lading through several banks, resulting in a large number of cars being delayed awaiting surrender of bills of lading; although, of course, the most serious delay is caused by diverting cars from the current of traffic to hold-yards while the party named in the billing is receiving notice, obtaining and surrendering bill of lading. An order should be issued by the commission, having authority, to prohibit this practice during the present car shortage."

Speaking of sight draft shipments, W. F. Bode, vice president of Reid, Murdoch & Co., of Chicago, says:

"These are at the present time subject to surrender of bill of lading before delivery of car. It is suggested that a bond of indemnity to railroads be arranged for in advance, thereby insuring immediate delivery of car on arrival, saving from one to four days in the release of such car. Bond can be a six months' or an annual bond. This arrangement now prevails with a number of institutions."

Products Requiring Licenses for Export

An export license is required at present for any article on the following list of mineral, metal and chemical products:

Coal, coke, fuel-oils, lubricating oil, benzol, headlantern oil, toluol, naphtha, benzine, red oil, kerosene and gasoline, including bunkers.

Pig iron, steel billets, steel sheet bars, steel blooms, steel slabs, ship plates and structural shapes, iron plates, I-beams, mild-steel plates, rolled-steel plates, steel channels, steel angles, mild-steel plates (ordinary tank quality), steel beams, steel plates one-eighth of an inch thick or heavier (steel sheets one-eighth inch thick or heavier are classed as steel plates), steel tees and zees, structural steel shapes, boiler plates, tank plates, steel doors, steel-car frames, steel towers, scrap iron and scrap steel, ferromanganese.

Fertilizers, nitrate of soda, potassium salts, potash, cyanamide, phosphoric acid, phosphate rock, superphosphate, chlorate potash, ammonia and ammonia salts, acid phosphate, anhydrous ammonia.

Explosives, nitrate of potash, rosin, sulphur, saltpeter, turpentine.

Hoover's Six Requests

To bring about concerted action every organization member of the Chamber of Commerce of the United States is asked, in a war bulletin issued by the National Chamber committee coöperating with the Council of National Defense, to get behind Herbert Hoover's six big requests. These are to eat one wheatless meal a day; to eat beef, mutton or pork not more than once a day; to economize in the use of butter; to cut the daily allowance of sugar in tea or coffee and in other ways; to eat more vegetables, fruit and fish; and to urge in the home or the restaurants frequented the necessity of economy.

However good may be the individual intention, the bulletin declares, these requests are not going to be lived up to on any large scale unless men and women take concerted action. To assist in bringing this about about every organization member of the Chamber has been asked to make and to follow up among its members, lest they forget, the three requests made below of individual members.

Each individual member is requested: To undertake himself to live up to the six requests and to ask his friends and employees to do so; to ask clubs and associations of which he is a member to appoint committees to assist in making general the observance of the six requests; to put into effect other ways and means of making general in his community the observance of the six requests, advising the National Chamber Committee of anything he is able to do in this respect which might be of assistance in other communities.

"The important problem of food conservation will not be solved without the concerted and continued coöperation of business men," the bulletin concludes. "The National Chamber is bringing this fact to the attention of members at the request of Mr. Hoover, and relies on them for a prompt response. Men who stay at home must help win the war. Here is a chance for every man in the true spirit of American energy to put his individual shoulder to the wheel."

Workmen's Compensation Acts

This summary presents a brief survey of a report issued by the National Industrial Conference Board, which shows the general tendencies of workmen's compensation legislation in this country. The legislation varies widely in form, but its fundamental principle is universal. The basis of compensation is no longer a fault actually proved against the employer, but simply the fact that the injury was received by an employee while at work.

A narrow view still regards the new system as a modification of the former employer's liability system based upon negligence. The broader conception is that workmen's compensation definitely supplants the old liability of the employer and becomes a vital part of the labor contract. This view rests upon the assumption that the circumstances out of which work injuries arise are only to a limited extent within the control of employer or employee; and that accident originates, broadly speaking, in conditions of production rather than in conduct of persons. Under this view, compensation acts aim to meet a public necessity, not to redress a private wrong. Relief is afforded in terms of wage loss. The worker, in return for certainty of limited relief, loses his former rights of action; the employer forfeits his old rights of defense and becomes a limited insurer for work injuries occurring in the industry which he controls and operates.

Decisions of state courts on the constitutionality of workmen's compensation acts have often conflicted. Very recently, however, appeals to the Supreme Court of the United States from decisions of state courts have afforded a basis for a searching legal test of the constitutional questions involved, which have greatly clarified them. The general power of a state to enact compensation legislation in the public interest is no longer open to question. It is admitted that the industry should bear the burden of relief rather than the particular employer in whose plant an accident may happen.

More than 67% of the employees of this country are included under compensation laws of one sort or another. There is, however, no uniform basis for determining just what employees or classes of employees shall be included. In numerous industries, compensation acts do not apply to the small employer. The effect of this is, of course, to exclude a considerable proportion of the country's workers from the benefits of workmen's compensation.

In some states the acts are compulsory upon the employer; in others he has an election. In some the employer affected by compensation acts must either insure his liability or demonstrate his financial capacity for self-insurance. In certain states contribution to a state insurance fund is obligatory. In all cases the employer is primarily liable for the payment of compensation unless he either is required or elects to pay a fixed premium into a state insurance fund. His personal liability is not relieved by insurance with private underwriters.

In this country "occupational diseases" are not, as a rule, included under the term "accident" in compensation acts, but in the administration of these acts an increasing tendency by administrative boards and by courts to include many forms of disease contracted during employment is evident. Another source of conflict lies in the significance given to the term "accident." Many of these inconsistencies are due to the absence of adequate and standardized information in the reports of the various boards upon whom the practical administration of these acts devolves.

To secure greater uniformity an organized effort toward concert of action is essential. It is therefore suggested that the states should promptly undertake, under expert guidance, the establishment of a permanent, scientific, uniform system of compensation statistics, providing for separate publication of judicial decisions relating to the compensation principle. This would be a great step toward the establishment of definite insurable standards of liability and of equitable premium rates. It would exercise a powerful influence on legislative ideas of the relative hazard of occupations and permit the extension of the compensation principle to many workers now excluded.

It is further suggested that clear discrimination, in legal definition, between the terms "occupational disease," "accident," and "injury" would greatly tend to clarify liability and minimize the number of contested claims; that experience endorses direct settlement between employer and employee of all claims; that inasmuch as the compensation system is intended to be substitutional for and not supplemental to employer's liability, an exclusively compulsory compensation system is advocated, as tending to eliminate many technical questions relating to whether or not employer or employee made an election.

Light Motors for the Air

The United States is clearly passing through the formative stage of airplane development, says the Boston *News Bureau*. Nothing distinctly American has so far been done mechanically toward perfection of a military airplane. The United States has copied French and is preparing to copy English and possibly German models of military engines.

The story comes from Washington that an all-American airplane engine has been produced. It is asserted that this engine has been perfected with the sensational weight of a shade under two pounds per horsepower.

It is a fact that a group of engineers have been working on what they call an international or universal type of airplane engine. The thought in doing this was to develop a standard motor which could be then adopted as the American engine and built in a large number of factories throughout the country and in immense quantities.

But in making this universal motor the engineers and designers have simply taken parts of four or five of the leading fighting engines used on both sides, have cleverly combined them and produced a sort of hybrid, which is now in process of being worked out. In all fairness it must be admitted that this motor is far from tested out, and far from proved a perfected fighting engine.

The notion of the universal engine, however, is a thoroughly American idea. It may be that this engine really does weigh only two pounds per horsepower, based on the same standard of weight-testing that airplane companies regularly use. If this is actually the case, it is the lightest motor in the world and the airplane sensation of the war. It would give America immediate air supremacy, and if adaptable to automobile companies, might easily be turned out in thousands per month. But until some of these points are established airplane engineers and authorities will go slow in accepting the finality of the universal motor as proclaimed in the preliminary accounts from Washington.

Open Mind of the War Department

Ever since the United States entered the present war it has been the policy of the War Department to bring its executive personnel as much as possible into contact with the sort of people who come to Washington with original ideas. This receptive attitude has been very aptly nicknamed the "open-mind" policy, and although it gets the bureau heads and executive officers in for a great deal of extra work, anybody who carries with him the seed of a useful idea is welcomed and his plan given thoughtful consideration. In a word, the War Department wants to make use of the brains of the American people and is willing to comb out a great mass of fanciful schemes, knowing as they do that the thousand-and-first idea might contain the germ of radical improvement in our method of carrying out our end of the world conflict.

Every day men of importance and responsibility come in to offer suggestions. Also men, hitherto obscure, frequently submit ideas and inventions of importance. In fact, the War Department has already profited by its policy of the "open mind."

Delivering Household Supplies

Coöperative deliveries of supplies are urged in a bulletin written by Ida M. Tarbell, concerning the activities of the Commercial Economy Board. She says in part:

The board is now calling on women to coöperate in another saving which comes through reform in one of the everyday practices of life—the way we get our daily groceries, meat, vegetables. All we do is to ask for them—at any hour of the day—a dozen times a day—in any quantity—and presto! it is on the kitchen table.

The thing, which takes no forethought on our part, is pretty sure to be expensive. The Bureau of Commerce estimates that the gross delivery expense of retail grocers in the country is over $75,000,000 a year. What is this sum used for? For the hire of men to put up packages, to run wagons and trucks, to go to your house, often half a dozen times a day.

How is the delivery system to be put on a rational basis? There are towns in the country where it has been done by coöperative deliveries. Wherever well managed, the average saving has been around 50%. Of course this means reform in the method of ordering. One delivery a day is all that ought to be expected under present conditions.

The Women's Committee of the Council of National Defense urges women everywhere to aid. They can encourage their merchants to establish central deliveries. They can discipline themselves to thoughtful ordering. They can carry small packages and discontinue the practice of having goods sent home on approval. We shall see men freed from useless service.

To Avoid Rail Congestion

With the building of army cantonments requiring vast shipments of lumber and equipment, railroad men and the American Railway Association's special committee on national defense are doing much figuring to avoid serious congestion of railroad traffic after October 1.

The association's commission on car service estimates that from 100,000 to 120,000 cars of lumber will be required in the construction of cantonments. To protect the shipments of lumber at least 61,000 cars will be needed.

To move one field army of 80,000 men, according to the latest bulletin issued by the association, 6229 cars made up into 366 trains, with as many locomotives, will be required. These cars will be made up of 2115 passenger, 1055 box, 1899 stock and 775 flat cars.

This represents 0.7% of the locomotives owned by American railroads, 4.2% of their passenger cars and 0.2% of their freight equipment.

Daylight Economy

In view of the fact that the bill for saving daylight has already passed the Senate, it may be interesting to note one effect of light-saving legislation in England. In *Commerce Reports* is given the statement of the Leeds Corporation Electricity Committee for the year ended Mar. 31, 1917, which states that the number of units sold for all purposes showed an increase of 22.7%. For power purposes the sales of energy had increased rapidly, owing to war requirements, the number of units sold having advanced by 46.6%.

The police lighting regulations and daylight saving during the summer of 1916 caused the sales of energy to private lighting consumers to remain practically stationary, while the sales for street lighting had practically disappeared, being only $1713, as compared with $5781 in the previous year, and $17,179 in the last prewar year. It is pointed out that the war prices of materials and labor caused the working expenses to increase in greater ratio than the income.

Editorials

Tampering with the Machinery

THE controversy respecting prices seems to be abating somewhat. The Federal Trade Commission, upon orders of the Administration, is investigating the cost of producing steel, iron, copper, lead, zinc, coal, etc. Nobody in the possession of his senses and any expert knowledge expects anything useful to come of this. The undertaking is in magnitude analogous to the physical valuation of the railways. In many branches, the determination of the cost of producing copper, for example, the problem is insolvable, impossible. In the meanwhile the executive departments are continuing to consider the question on their own account. There are rays of hope and indications, if we read correctly between the lines, that Washington is obtaining a clearer perception of economic conditions.

Let us concede that the officials in the departments are animated by the sincerest motives to do the best that they can for the country. Let us concede, moreover, that in previous wars, even so recently as the Spanish War, there were scandals between the Government and business interests, in which the latter did not appear in the best light. Let us concede further, that the plan of the Advisory Council of National Defense in organizing subcommittees in the respective industries was not the best thing.

On the other hand, Washington should not have been so slow in awaking to the fact that the business interests of the country are just as patriotic as anybody else. In the talk about the poor being conscripted for their services, wherefore the rich must do their share by submitting to the conscription of their money, there has been a good deal of perversion of thought, even of nonsense. In the first place, the services of the rich are just as much subject to conscription as are those of the poor. In the second place, the rich have never demurred to the conscription of their wealth. On the contrary, they have subscribed with wonderful liberality to the Red Cross Fund, have assumed the bulk of the Liberty Loan and have faced the prospect of the enormous taxation with the utmost cheerfulness. All that business has asked of Washington is that its organization be not so tampered with that it will fail to run smoothly and will fail to produce the earnings out of which taxes are expected.

The organization of business is a delicate thing. There are relationships spreading over the entire world that are in perfect accord. Let some alteration be ignorantly and suddenly made in New York, there may ensue disasters in remote parts of the country. We have already had an example of this in the labor troubles that have spread through the West, which are directly attributable to the Government's threats to reduce prices for commodities, and have already had the effect of restricting the production of such necessary things as copper and lead at a time when the maximum production is needed.

All the talk about suspending the law of supply and demand has been foolish. That law is going to continue to operate, just as it always has. The determinative factor as to price is how much production is needed. The price will be what will induce the last part of that production to be made. In every industry there will be differences in the costs, and consequently in the profits of the producers. In the case of copper, for example, costs will range from 10 to 25c. The system of taxing excess profits is an automatic equalizer that takes care of such differences.

(The reader will note that we say nothing about 5 or 6c. costs for copper. We do not believe there is any such thing, the official reports of several companies to the contrary, notwithstanding. Such figures are but partial costs, useful for comparative purposes so long as other producers figure in approximately the same way, but they are not true costs. The reader will recollect that we have expressed these views for many years back.)

It does not matter particularly what negotiations are consummated between the Government and the producers. The Government may make an arbitrarily low price for itself, and the producers may consent to it. The result would be that the profits of the producers would be diminished, and therefore they would pay less taxes to the Government; or else the supply of the commodity having been diminished by the Government's subtraction, other users would have to pay more. In either case there would be no great difference to the Government nor to the producers.

It was not that which gave the shock to the markets and the industries, but it was the vague ukase that the prices of commodities to everybody must be reduced. This was like a threat to throw a crowbar into the machinery. If the economics of the great war has shown one thing more clearly than another, it has been the innate stubborness and selfishness of labor. The labor leaders said that prices for copper and iron, coal, etc., might be reduced. but they were not going to stand for any reduction of wages. There was, too, some reason in their talk, inasmuch as there was no prospect of the cost of living being reduced. On the contrary, Congress at this very time was inserting in the Food Bill a provision of $2 as the minimum price for wheat, although previous to the war dollar-wheat was the acme of agrarian hopes.

Washington is now beginning to see the inconsistency of shuddering over 25c. for copper and being enthusiastic about $2 for wheat. It begins to see, moreover, how tampering with the machinery is having bad results, such as the fomenting of labor troubles, which was one of the things that business men warned about in the early days of the price controversy. Washington is, perhaps, finally coming to see, also, that business men are patriots, not hogs, and anxious to serve their country. Probably it is being perceived, moreover, that this war should be fought with a spirit of domestic optimism, rather than pessimism. We look, therefore, for a change in the attitude of Washington and the passage into oblivion of the cost-of-production theory and many others.

The prices for commodities are going to be governed by the law of supply and demand, simply for the reason that nothing else will work. The Government will probably so organize itself that it will be able to buy intelligently and without disturbance of the markets. This last thing is really the goal toward which it is laboring, although it has so far failed to appreciate it.

Iron and Steel Conditions

THE strong and active condition which marked the iron and steel markets during the earlier months of the year has developed since June opened into considerable excitement, with rapid advances in prices. These have been especially marked in pig iron, the basic commodity. Bessemer pig, which sold in June, 1916, at $22 per ton in Pittsburgh, but rose to $36 in January last and $47 in May, has taken a further jump and is quoted this week at $55, a price far above any on record. Since July, basic pig has advanced from $19 a year ago to $35, to $43 and now to $51 per ton, and No. 2 foundry from $19.50 to $31 and now to $50. These, of course, are the figures for iron sold by the merchant financier, which furnish about 30% of the total. The steel companies which make their own pig iron get it at cost, but that cost has advanced materially, owing to the higher wages and the advanced cost of ore, fuel and supplies. On the basis of Lake freights and figures, ore is from 20 to 30% higher than a year ago; coke is rather more than double last year's price; while labor has gone up about 35 or 40%. The ton of pig iron must cost from one-third to one-half more than a year ago. Steel scrap, which is an important item in openhearth steel manufacture, has advanced in close parallel to pig iron.

Finished steel, which is dependent upon the prices of basic material and which at present absorbs nearly all of it, has of course advanced on parallel lines. Steel billets are quoted at over $100 per ton, while tank plates are $140@150, ship plates and angles $180@140, with other products in proportion. These are decidedly what would have been called "famine" prices a year or two ago, and are so high that a serious limitation of industrial demand would certainly have followed. Whether such a result is now threatened is not yet certain, owing to the unusual conditions which prevail. The uncertain condition which most affects the markets at present is the extent of export and government demands. Very large orders of both classes have been placed and more are expected, but the quantities are altogether uncertain. These orders will necessarily have preference, so that buyers of iron and steel for consumption and manufacture are faced by the conditions that not only will they have to pay high prices, but also there will be difficulty in placing orders at all, or in securing deliveries.

There is no immediate probability of any material increase of supplies in the immediate future. On June 1 there were in blast 340 coke and anthracite stacks out of the 404 on the list of the American Iron and Steel Association. Of the idle furnaces a few were permanently disabled and the rest were undergoing absolutely necessary repairs. The pig-iron production in May was approximately 3,455,000 tons. An increase to 3,500,000 tons monthly is probably the best that can be expected. Repaired furnaces blowing in must be nearly balanced by those which must be stopped, and of the new furnace capacity building hardly any will be ready until toward the close of the year. The charcoal-furnace capacity cannot be much enlarged; at any rate it furnishes but a trifling proportion of the total. We have spoken chiefly so far of pig iron because that is necessarily the basis of the business. Capacity for conversion into steel can be furnished as quickly as it is required. Rolling and forging machinery is again a slower matter, but will probably be ready when it can be used.

Zinc-Smelting Conditions

STATISTICS relating to the zinc industry were published in the *Journal* of July 7 disclose many interesting things. Among others is the great reduction in the average duty per retort. Whereas, in times preceding the war an output of 4.2 tons of spelter per retort per annum was reckoned, the yield in the latter part of 1916 was only about 3.6 tons, or six-sevenths of what it used to be.

To a certain extent this is attributable to the smelting of a lower grade of ore, it being reckoned that the average grade of ore smelted in 1916 was about 47%, compared with about 50% in 1914 and 1915. It was but natural that the enormous demand for ore, the smelters having required about 1,700,000 tons in 1916 against about 1,200,000 in 1915, should have led to the acceptance of lower grades. Ore production was not checked by contraction in the price for spelter, the latter having been chiefly at the expense of the smelters. In 1914 and 1915 there was a deficiency of smelting capacity, and consequently there was a premium upon the use of what existed, which expressed itself in the form of wide smelting margins. In 1916 the smelting capacity began to approach and even exceed what was required, and competition among the smelters trimmed down the smelting margin, which was, of course, to the advantage of the ore producer.

However, although the average grade of the ore smelted in 1916 was lower than in 1915, the chief factor in the reduced yield of spelter per retort was undoubtedly the lower extraction of the zinc from a given grade of ore, due to the rushed work and to the carelessness of labor in many respects.

BY THE WAY

HERBERT CLARK HOOVER

The cartoon of Mr. Hoover by Cesare that we present this week appeared in the New York *Evening Post* of July 21, 1917, by the courtesy of which publication we reproduce it.

"Because of the character of the ore, which is of volcanic origin and has never been affected by the action of frost as have ore deposits in more northerly latitudes," according to a publication that is promoting the sale of stock in this interesting mine, "the ore caves in easily and can be taken down with a minimum of labor. Even the expense of hauling the ore from the tunnels to the mill is eliminated, as by reason of the abundant water it is possible to convey the ore by a system of sluices, which make possible a still further economy, as in the course of transit the coarser particles of gold are automatically separated from the finer."

A newspaper of Grass Valley, Calif., has a report about a mule in the Empire mine, which is said to have kicked a man by mistake. The mule is known to every employee of the mine, 450 in all, and while there is no affection for her among 449 of them, they all have a wholesome respect for her in spite of her contrary disposition. It is a mine classic that she kicks the air pipe 2 ft. above her head for exercise. With Fred Wales, however, it is different. He has worked with Bessie for 14 years and has become attached to the animal. He excuses her vagaries as an indulgent mother condones the actions of a spoiled child. It is merely a matter of temperament, he says, and the other men do not understand her. Yesterday, however, his faith was shaken temporarily, but not for long. In the physician's office he took offense at a suggestion that the mule should be killed on account of her viciousness, and rushed to her defense. "It was perhaps my fault, it certainly was not hers. Bessie either did not know who it was when she kicked, or I had forgotten to give her the usual chew of tobacco. I am willing to take all the blame."

Price fixing is the most vicious blunder conceivable, says the New York *Sun;* not because of the injustice to producers and venders, but because of its inevitable effect in stopping production and checking the marketing of commodities. The fixing of minimum prices strangles trade and industry for psychological reasons. The minimum price becomes the maximum that any one will pay willingly and that the producer can count on getting. Fixed maximum prices are not only psychologic but economic barriers to production. In face of them no new capital will be embarked and no new effort put forth. The stimulus to industry and investment is the hope of profit. Lock the door on this opportunity, and capital and labor alike soon take to the subcellar and the roadside. An aim of the Government might well be the sane limitation of consumption, or at least the control of waste. In this direction, by far the most potent agency is the price current. Artificially low rates are an inevitable invitation to lavish and wasteful consumption, while high figures mean frugality and restraint, and the substitution of abundant foods for those of which there is a scarcity. We had the working of the law demonstrated most perfectly in the recent food agitation in this city. Man cannot beat the laws of the universe. When he fights them, they punish him relentlessly.

A correspondent in Arizona writes that, lest we might not see *Dunbar's Weekly*, which he characterizes as the "personal organ of Ex-Governor Hunt," he sends us a copy containing a few remarks that may be of interest to us. The remarks to which he refers are the following:

> The honest law-abiding people of Arizona had better be on their guard, as there is no right, law or business ethics these hounds respect. As an illustration of their tactics we cite this fact, the *Engineering and Mining Journal* of New York, the greatest paper of its kind in the world, recognized as the authority on the price of copper and other valuable metals, was adopted by the miners and the mining companies of Arizona as the guide that should regulate the prevailing prices of copper that was to be made the base of the sliding wage scale. The big publication could not be corrupted and became a source of annoyance to these companies, and six months ago, under cover, the Copper Queen purchased that great journal out and out and all for the purpose of using it as a decoy to rob the miners of Arizona, and yet we are told that this company is just in its dealings. What a condition of rottenness and pelf dear old Arizona is in today.

On another page the same journal asks:

> Why, we ask the fair-minded people of Arizona, was it necessary for the Copper Queen to purchase the *Engineering and Mining Journal* of New York at a price upward of one million dollars?

We are indeed interested in this news, which we might not have heard in the ordinary course of events. We have interviewed Phelps, Dodge & Co. on the subject and they said that they had not heard about it either.

July Mining Dividends

Disbursements to stockholders in July, by 55 United States mining and metallurgical companies making public reports amounted to $16,531,242. Of this amount, $5,026,450 represented special dividends in favor of the American Red Cross, paid by 13 companies. The regular payments, therefore, amounted to $11,504,792 distributed by 46 companies, as compared with $13,278,377, by 41 concerns in July, 1916. Canadian and Central American companies paid $1,055,807 as compared with $1,201,912 a year ago.

The only holding companyq which paid a dividend in July, 1917, was the St. Mary's Mineral Land Co., which disbursed $2 a share, or $320,000.

The record of United States mining and metallurgical companies for last month, showing a decrease, is a change from that of the earlier months of the year, during each of which amounts paid were in excess of the dividends of the corresponding period in 1916. Although there were a number of new dividend-payers on this month's list, several companies which paid in July, 1916, found it necessary to reduce their payments or discontinue, and the New Jersey Zinc Co., which paid an "extra" of $10 in July, 1916, distributed only $4 in July, 1917.

United States Mining and Metallurgical Companies	Situation	Per Share	Total
Ahmeek, c	Mich.	$4 00	$800,000
Allouez, c	Mich.	3 00	300,000
Am. Smelters, pfd., A	U. S.-Mex.	1 50	246,882
Am. Smelters, pfd., B	U. S.-Mex	1 25	375,000
*Am. Smelt. & Ref.	U. S.-Mex.	1 00	609,980
*Anaconda, c	Mont.	50	1,165,625
Ariz. Commercial, c	Ariz.	.50	132,500
*Ariz. Commercial, c	Ariz.	.10	26,500
Ariz. United, c	Ariz.	.01	25,000
Bingham Mines, l. a	Utah	.50	75,000
*Bingham Mines, l. a	Utah	.25	37,500
Bunker Hill & Sullivan, l. a	Ida.	.50	163,500
*Butte & Superior, z	Mont.	.40	116,079
Caledonia, l. a	Ida.	03	78,150
Camp Bird, pfd., g. s	Colo.	.18	110,501
Cerro Gordo, l. z	Calif.	07½	75,000
Champion, c	Mich.	6.40	640,000
*Chino, c	N. M.	40	347,992
Cresson, g. s	Colo.	10	122,000
Daly	Utah	.10	15,000
Dragon Cons	Utah	.01	18,750
Empire Copper	Ida	.05	50,000
Golden Cycle, g	Colo.	.03	45,000
Granite, g	Colo.	.01	16,500
Hecla, l. s	Ida.	.15	150,000
Homestake, g	S. D.	.65	163,254
Horn Silver, l. a	Utah	05	20,000
Inspiration, c	Ariz.	2 00	2,363,934
*Inspiration, c	Ariz.	25	295,492
*Internat. Nickel	U. S.-Can.	25	418,346
Iron Blossom, s., l. g	Utah	05	50,000
Iron Cap., c	Ariz.	1 00	102,510
Iron Cap., pfd., c	Ariz.	35	15,685
Isle Royale, c	Mich.	1 50	225,000
Judge Min. and Smelt., s., l. z	Utah	25	120,000
*Kennecott, c	Alaska	20	557,336
Loon Lake, c	Wash.	.01	14,404
*Magma, c	Ariz.	10	
*Nevada Cons., c	Nev.	.15	299,919
Nevada Hills, g. s	Nev.	.10	106,569
New Jersey Zinc	U. S.	4.00	1,400,000
North Butte, c	Mont.	50	215,000
Osceola, c	Mich.	6 00	576,900
Portland, g	Colo.	03	90,000
Prince Cons., l. s	Utah	05	50,000
*Ray Cons., c	Ariz.	20	315,436
Richmond, l. s	Ida.	02	16,800
Shattuck Arizona, c	Ariz.	1 25	437,500
Silver King Coalition, s., l. z	Utah	15	187,500
Tonopah Belmont, g. s	Nev.	12½	187,504
Tonopah Min., s	Nev.	15	150,000
United Copper	Wash.	01	10,000
United Eastern, g	Ariz	05	68,000
U. S. Smelting, com	U. S.-Mex.	1 25	438,894
U. S. Smelting, pfd	U. S.-Mex.	87½	425,555
United Verde, c	Ariz	1 50	450,000
*Utah Copper, c	Utah	50	812,245
Utah Copper	Nev.	01	6,000
Vindicator, g	Colo.	03	45,000
Wellington, s. g	Colo.	10	100,000
Yellow Pine, z. l	Nev	03	30,000

Canadian and Central American Companies	Situation	Per Share	Total
Cons. Min. & Sm. Co., c. z	B. C.	$0 62½	$260,445
La Rose, s	Ont.	05	74,931
McKinley-Darragh-Savage, s	Ont.	03	67,431
N. Y. & Hond. Rosario	C. A.	50	100,000
Nipissing, s	Ont.	25	300,000
Porcupine Crown, s	Ont.	03	60,000
Standard Silver Lead	B. C.	05	100,000
Temiskaming, s	Ont	03	75,000
Townsite Extension, s	Ont.	12	18,000

* Red Cross

Empire Copper Co. paid its regular quarterly dividend of 5c. a share, but instead of paying an extra of the same amount as was done in the preceding quarter, voted to invest $50,000 in Liberty Bonds, which will be distributed to the stockholders later.

Nevada Hills made two payments of 5c. each, which are understood to be in liquidation.

Initial payments were made in July, 1917, by Bingham Mines, Loon Lake and United Eastern.

The totals for the first seven months of the year are as follows: Mining and metallurgical companies, $121,348,231; holding companies, $3,867,789; Canadian, Central American, South American and Mexican companies, $11,230,666.

Strike Conditions in Arizona

My communication published in the *Journal* of July 21, 1917, suffered some pruning, I suppose owing to the exigencies of the "make-up." Yet, there was an excision of matter that I think ought to be of record. On page 137, column 1, clause beginning "Such occurrences" had direct reference to the attempts which had been made to burn our mines, which read as follows:

"On three occasions within the past few months attempts have been made to burn the mines in this district. On Sept. 23 of last year two mines, a mile apart, were set fire to and one of these fires being set in such a place and in such a manner that is was most difficult to fight, and had the efforts undertaken and continued during months at a heavy outlay not been successful, the largest producing mine in the district would have been forced to close down; while in the other case the mine affected, and which in that time was outputting 300 tons a day, had to be bulkheaded off and has not since operated The third attempt was less successful in doing material damage, owing to the early discovery of the fire, and prompt means of handling it.

"Such occurrences cannot be reasonably laid to the charge of any of the old employees in this district, but probably to some of the I.W.W. floaters whose activities have become so pronounced since the commencement of the European War." NORMAN CARMICHAEL,

Gen. Mgr., Arizona & New Mexico Railway Co.

Clifton, Ariz., July 25, 1917.

Wheat versus Steel

Here is Wall Street's great metaphysical problem, says the *Evening Post:* If in the words of Mr. Wilson, profits are never to be mentioned in the same sentence with patriotism, why does the Government consider a minimum price of $2 a bushel for wheat?

The reply may be that the crops must be stimulated at all costs and that fixing a minimum price is a necessary evil. But must not the output of steel be stimulated? Must not the output of ships be stimulated? Must not the output of copper be stimulated? If the word incentive is to be treated with contempt when mentioned in connection with steel manufacturers, why must it be treated with reverence when mentioned in connection with farmers? The truth is that what the Administration knows is this: though it could condemn the mention of profits and patriotism in immediate proximity to each other, though it could tell the farmer that with men giving their blood and their lives on the battlefield it would be a very sordid thing for him not to work at his hardest and increase his acreage to the greatest possible extent—though it could tell him all this, and though it would be right, yet it knows that if it depended on him to do it, and gave him no assurance of profit and no assurance against loss, wheat would not be grown in sufficient quantity; the progress of the war would be hindered and bedeviled—all because the Administration expected a higher code of morals and sacrifice from the farmers than it had any reasonable ground of expecting.

But this is how it treats the manufacturers. The Federal Trade Commission has made no investigation, and has not been ordered to make any investigation, of the cost of producing wheat. Yet Washington now considers guaranteeing a minimum price of $2, which means that the farmer is allowed to sell his wheat for more than that if he can get it in the market, but that if the market will not take all his wheat at more than $2, the Government will buy it at that price. Two dollars is more than twice the normal pre-war price. Now suppose that the steel manufacturers asked for exactly the same treatment as the farmers? Suppose they went to Washington and said: "We feel a little nervous about whether the market for steel is going to hold. The market price of steel before the war was $30. Couldn't you guarantee us that if by any chance the market broke, you would take all the steel from us that we couldn't sell at $60? Otherwise we will not have enough incentive." Washington would think only one thing: that the steel manufacturers had gone violently insane.

Manganese Production in Brazil

Exports of manganese ore from Brazil in 1914, says *Commerce Reports*, were 183,630 tons, valued at $1,380,453. In 1915, 288,671 tons were exported, to the value of $2,632,427. The consular export returns for 1916 show a very large increase over the figures for the preceding two years, reaching 503,120 tons, valued at $7,080,954. This exceptional development is due to the greatly increased demand for manganese in the United States, where 80% or more of the supply is now of Brazilian origin, because of the almost complete closure of other sources by the war.

Certain new Brazilian mines have been opened under the stress of the increased demand. These operations have been chiefly in the state of Minas Geraes; but the state of Bahia seems also likely to become a large producer of manganese ore.

A newly formed American company, which claims to have recently purchased four mines in the state of Bahia, is exporting manganese ore from the City of Bahia. The largest of these mines is in the municipality of Bom-Fim, northwest of the City of Bahia. It is reached by the Central Ry. of Brazil but has not been explored to any extent. Three other mines are near the town of Nazareth, southwest of Bahia. They have no railway outlets, and the ore now mined is taken by lighters to the Bay of Bahia and there loaded on ships. These properties are said to be smaller than the one at Bom-Fim.

Only two ships have been loaded at Bahia with ore from these mines, the amount shipped being 8300 tons. It is claimed that a large tonnage is in sight and that American engineers have reported very favorably upon the properties.

The local agents of the company estimate that with better railway facilities from 15,000 to 20,000 tons of manganese ore could be shipped monthly via Bahia. They claim, however, that the lack of sufficient railway facilities to carry the ore to tidewater is the big drawback. This is a general condition and applies to the state of Minas Geraes as well. In fact, it is the prevailing belief among technical men that the entire manganese problem of Brazil and, even further, the problem of disposing of its vast natural resources, is one of communications by highway in many interior districts and from the commercial centers of those districts by rail to tidewater.

Melting Point of Glucinum

In determining the melting point of glucinum and its heat of fusion, a review in the *Journal of the Society of Chemical Industry*, Mar. 31, 1917, of some German experiments, points out that glucinum prepared electrolytically from sodium glucinum fluoride, was pressed into pastilles and fused in a magnesia tube in hydrogen. The product contained 99.5% Gl, the principal impurity being the carbide. Heating and cooling curves gave the value 1278° ± 5° C. for the melting point.

An approximate determination of the heat of fusion by comparing the duration of the arrests when equal volumes of gold and glucinum were cooled under similar conditions, gave 277 calories per gram, while Crompton's rule, atomic weight × heat of fusion ÷ absolute temperature of fusion = 2, gave the value 341. Glucinum has the largest heat of fusion of any metal corresponding with its high melting point and low atomic weight.

Spalling of Magnesite Bricks

Spalling of magnesite brick, says J. W. Mellor, in an article in the "Transactions Ceramics Society," 1916-17, is attributed to shrinkage on heating caused by conversion of α- into β-magnesia, and to shrinkage caused by the closing of the pores in highly porous brick. Lightly calcined or α-magnesia has a specific gravity of 3.2 or 3.3, but the crystalline or fully shrunk β-magnesia has one of 3.65, that of the natural mineral, periclase, being 3.5 to 3.75.

The speed of conversion of α- into β-magnesia at 1300° C. is relatively slow, but is more rapid at high temperatures. To prevent spalling, the material must be maintained at a suitable temperature until a sufficient amount of conversion has occurred, and the porosity of the brick must be kept reasonably low. Bricks with a sufficiently high specific gravity do not spall, as the change in volume on further heating is too small to set up serious strains.

Personal

Francis Church Lincoln, director of the Mackay School of Mines at Reno, has been appointed State Assayer for Nevada.

G. E. Postma, a chemist in the service of the Bureau of Mines, has been transferred from Pittsburgh to the station at Tucson.

E. Gybbon Spilsbury sailed from New York on July 26 for Central America and expects to be absent until the end of August.

Charles M. Coats is now in the land department of the Kansas and Kentucky Oil Co. His address is Box 209, Chanute, Kansas.

Frank Oliver has severed his connection with the Mogul Mining Co., due to the closing down of the North Carolina property.

R. R. Hornor, of the Bureau of Mines staff, is engaged in an inspection of the metalliferous mines of northeastern Washington.

Howland Bancroft has returned to New York and is at the Engineers' Club. He will return to Denver about the middle of August.

John Hunt, underground superintendent at No. 1 mine of the Western Fuel Co. at Nanaimo, B. C., has been appointed general superintendent.

W. Sampson, superintendent of the Nickel Plate mine at Hedley, B. C., has resigned after 10 years' service and has gone to Salt Lake City.

B. W. Knowles has been appointed superintendent of the Nickel Plate mine, at Hedley, B. C., with L. S. Morrison and W. Trezona, assistants.

Lawrence Martin, of the University of Wisconsin, gave instruction in topography at the Officers Training Camp, Fort Sheridan, Ill., during June and July.

Eliot Blackwelder, of the University of Illinois, is in California as member of a commission appointed to investigate the petroleum resources of the state.

A. E. Wells, superintendent of the Salt Lake City station of the Bureau of Mines, has been spending a few days in Washington conferring with Bureau officials.

Frank L. Stack, superintendent of the Davison Sulphur & Phosphate Co., at Cumanayagua, Cuba, is returning to the United States to offer his services to the army.

Charles T. Williams, recently with the Cananea Consolidated Copper Co., at Chivatera, Sonora, is now with the Tonopah Belmont Development Co., Tonopah, Nevada.

Lapsley W. Hope, superintendent of the Yankee Girl mine at Ymir, B. C., has resigned to become superintendent of the Eureka-Holly Mining Co., at Eureka, Nevada.

Clifton Cooper, at one time with the Bon Air Coal & Iron Co., Nashville, Tenn., is secretary-treasurer of the new Suwanee Iron Co., with offices at Nashville, Tenn., which recently acquired the furnaces at Grand Rivers, Kentucky.

Fred W. Padgett, for the past four years research fellow in oil, gas and gasoline in the University of Pittsburgh, has been appointed associate professor of chemistry in the University of Oklahoma, where he will develop a research department in oil, gas and gasoline.

Charles Camsell is in charge of the field work of the Geological Survey of Canada in British Columbia this summer. He has his office at Vancouver and field headquarters at D'Arcy. He has parties at work in the Slocan, in East Kootenay and in the Omineca mining division.

Lionel S. Marks, professor of mechanical engineering at Harvard and Massachusetts Institute of Technology, has been assigned by the national advisory committee on aeronautics to take charge of investigations relating to airplane-engine design now being made at the Bureau of Standards.

W. H. Coghill, of the Bureau of Mines, will assist Thomas Varley, superintendent of the Seattle station, in the investigation of ore dressing, which is to be one of the principal lines of work at the Seattle station. Mr Coghill will continue his work on the molecular physics of flotation as applied to Oregon ores.

Mrs. W. Koenig warns the public, especially the mining public against a man representing himself to be the son of Dr George A Koenig, late Professor at the Michigan College of Mines. This man has asked assistance from graduates of the Michigan College of Mines on the score of their friendship for their former professor. He is not the son of Dr Koenig. The latter has one son only, Augustus Koenig, M. D., a practicing physician in Philadelphia.

Obituary

D. G. Scofield, ex-President of the Standard Oil Co. of California and more recently chairman of the board of directors, killed himself at his home in Oakland on July 30. Despondency, due to grief over the death of his wife five years ago, is believed to have been responsible. He was 74 years old. Mr. Scofield was one of the oil operators who laid the foundation for the Standard Oil Co. in Pennsylvania many years ago with John D. Rockefeller. A year ago he retired.

Clarence Hobart McDougall was killed in action in the battle of Arras in May. A graduate of McGill in 1905, he was employed as surveyor at the Snowshoe mine in the Boundary district, in British Columbia. Later he joined the staff of the Consolidated Mining and Smelting Co. of Canada, rising to be superintendent of the Sullivan and St. Eugene mines. He was a member of the Canadian Mining Institute. He was commissioned a lieutenant in the Canadian Engineers about a year ago.

William Bullock Clark died on July 27 at North Haven, Me., aged 57 years. He was born in Brattleboro, Vt., and entered Amherst in 1880, graduating in 1884. He pursued geological studies at the University of Munich, 1884-97 and studied at Berlin and London, making geological surveys of Prussia and Great Britain. He was instructor in Johns Hopkins University, 1887-89; associate, 1889-92; associate professor, 1892-94. He became professor of geology in 1894. In 1888, he was appointed assistant geologist, United States Geological Survey, working on Cretaceous and Tertiary formations of the Atlantic coastal plain. At this time he was requested to prepare the Correlation Bulletin on the Eocene, one of a series of similar reports presented to the International Geological Congress in Washington, in 1891. In 1889, he made study of Eocene deposits of the Far West and investigated the Eocene formation of the Atlantic border. He was geologist on the staff of the Survey, 1894-1907, after which he acted as coöperating geologist. In 1892 he organized the Maryland State Weather Service and became Director. In 1896, he organized the Maryland Geological Survey, since becoming State Geologist. In 1900, he was appointed commissioner for Maryland. In 1906, he was made a member of the Maryland State Board of Forestry and elected as its executive officer, which position he held until his death. Since 1901, he was president of the Children's Aid Society of Baltimore, a member of the executive committee of the State Tuberculosis Association and vice president of the Federated Charities of Baltimore. He was a member of many clubs: The Maryland, University, Baltimore Country, Johns Hopkins and city clubs of Baltimore and the Cosmos Club of Washington.

Societies

National Association of Purchasing Agents will hold its annual congress on Oct. 9, 10 and 11 next, in Pittsburgh, Pennsylvania.

American Institute of Metals will meet in Boston on Sept. 25-28. Separate sessions will be devoted to the discussion of crucibles and furnaces, the melting and casting of nonferrous metals, casting in connection with munitions making and the testing of nonferrous metals and metallography. The tentative list of papers includes 32 titles.

Industrial News

Homestead Valve Manufacturing Co., of Pittsburgh, Penn., has appointed the National Mill Supply Co., of Fort Wayne, Ind., as its sole representative for Fort Wayne and vicinity.

Sullivan Machinery Co. announces the removal of its San Francisco office from the Sheldon Building, No. 461 Market St., to the Hobart Building, No. 582 Market St. Ray P. McGrath is manager at San Francisco.

Cleveland-Cliffs Iron Co., has had plans prepared for a new hospital building at its mining headquarters, Ishpeming, Mich. The building, which will cost about $85,000, will be of brick, three stories high, 60 x 150 ft., and will be completely equipped.

Dodge Sales and Engineering Co. has discontinued its Salt Lake office probably for the duration of the war. Requests for information, bids or material should be taken up with the company's many Dodge, Oneida, or Keystone dealers or with the Mishawaka, Ind., office.

Asbestos Protected Metal Co., of Pittsburgh, has closed its Cincinnati office temporarily, due to the fact that E. G. Irwin, Cincinnati manager, has entered the Ohio National Guard. Communications should be addressed to the home office, First Nation Bank Building, Pittsburgh, Pennsylvania.

Ingersoll-Rand Co. announces the election of J. H. Jowett, formerly general sales manager, as vice president of the company. L. D. Albin, formerly assistant general sales manager, was appointed general sales manager. Mr. Jowett and Mr. Albin will continue to make their headquarters at the company's New York office, at 11 Broadway.

Wisconsin Electric Co., Racine, Wis., has on the market the Dumore Portable Grinder for making repairs on hammer and drill parts, for resharpening drill bits, and for regrinding cylinders, deep drawing dies, large gages, etc. It is equipped with a Universal motor, using direct or alternating current, is light and convenient, can be quickly set up in a lathe, milling machine or shaper, and attached to an ordinary lamp socket. Weight 17 pounds.

Western Electric Co. announces the opening of electrical-supply warehouses at the following points; New Haven, Conn., 135 Wood St., representative, Tyler L. Holmes; Baltimore, Md., 425 E. Oliver St., representative, S. Greenfield; Charlotte, N. C., 238 W. First St., representative, R. H. Bouligny. The Seattle office and warehouse has moved into new quarters at 84 Marion St. W. H. Quirk has been appointed manager of the Cincinnati warehouse. W. L. Sioussat will succeed Mr. Quirk as stores' manager in the Cleveland house.

New Patents

United States patent specifications listed below may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

Alkali Silicates—Process of Decomposing Silicates and Manufacturing Potassium Chloride. Harry Williams Charlton, Jones Point, N. Y., assignor to Kaolin Products Corporation, Va. (U. S. No. 1,234,626; July 24, 1917.)

Blast-Furnace. George L. Collord, Sharpsville, Penn., assignor to Blast Furnace Appliances Co., Cleveland, Ohio. (U. S. No. 1,234,630; July 24, 1917.)

Drafting—Blueprinting Machine. Ferdinand F. Metzger, Philadelphia, Penn. (U. S. No. 1,234,554; July 24, 1917.)

Excavating Machine. George Henry Dunlop, Auburn, Victoria, Australia. (U. S. No. 1,234,147; July 24, 1917.)

Iron-Ore Briquettes—Binding Material and the Method of Preparing. Walther Mathesius, Berlin, Germany. (U. S. No. 1,233,384; July 17, 1917.)

Lead—Process of Treating Lead Ores, by sulphidizing surface of minerals. Alfred L. Pelegrin, Tucson, Ariz. (U. S. No. 1,233,398; July 17, 1917.)

Mine-Protection System. Nils D. Levin, Columbus, Ohio. (U. S. No. 1,234,185; July 24, 1917.)

Mining System and Means. John S. Bartlett, Kalamazoo Township, Kalamazoo County, Mich. (U. S. No. 1,233,301; July 17, 1917.)

Ore Concentration. George Albert Chapman, Anaconda, Mont., assignor, by mesne assignments, to Minerals Separation North American Corporation. (U. S. No. 1,234,288, July 24, 1917.)

Pyrometer. Edwin F. Northrup, Princeton, N. J., asignor to Pyrolectric Instrument Co., Trenton, N. J. (U. S. No. 1,234,203; July 24, 1917.)

Rabble-Tooth. Harry H. Stout, New York, N. Y., assignor to General Chemical Co., New York, N. Y. (U. S. No. 1,234,408; July 24, 1917.)

Refractory Ores—Process of Treating Refractory Ores. Stafanus Johannes Vermaes, Delft, Netherlands, assignor to Mijnbouwmaatschappij Aequator, The Hague, Netherlands. (U. S. No. 1,234,426, July 24, 1917.)

Rock-Drill—George H. Gilman, Claremont, N. H., assignor, by mesne assignments, to Sullivan Machinery Co., Boston, Mass. (U. S. No. 1,231,097, July 17, 1917.)

Titanium Oxide—Method for Producing Composite Titanic-Oxid Products. Louis E. Barton, Niagara Falls, N. Y., assignor to the Titanium Alloy Manufacturing Co., New York, N. Y. (U. S. No. 1,234,260; July 24, 1917.)

Editorial Correspondence

BUTTE—July 26

Labor Situation has cleared with respect to the mechanical unions, but the week has passed without any definite conclusion having been reached as to the stand the striking miners' unions are going to take. There were endless meetings between the individual unions, between delegates of such unions with officers of the various mining companies, meetings on which votes were to be cast for or against accepting the proposals of the employing companies, but no general agreement was reached. On July 24 the 14 principal mining companies announced a schedule of wages which they proposed to pay and will probably continue to employ the men as they return without reference to union affiliations.

(By Telegraph—July 31)

Strike Situation Greatly Improved in Butte and with failure of metal trades to indorse the I. W. W. mine strikers, the latter are beginning to realize that they are beaten. The most vicious of their leaders, alleged to be under German pay, have left the district, and the strike is now in the hands of local leaders. A final attempt was made to have the electricians strike again in order to give encouragement to the striking miners, but only a few obeyed the order to walk out and when they saw that all did not quit, they returned to work. Ever since the strike has been on, the operating companies worked only on day shift, but recently night shifts have been added at half a dozen mines, and it is anticipated that in another week, practically all miners now in Butte will be back at work. However, several thousand of the best miners left the district, not desiring to become involved in the labor troubles, some going to other camps and many to harvest and hay fields. As there is a scarcity of labor everywhere, it will be months before normal crews can be secured for the mines.

I. W. W. Agitator Hanged in Butte early in morning of Aug. 1. According to dispatches, six masked men drove in an automobile to Frank Little's boarding house and took him from his room. His body was later found hanging from a railroad trestle. On the body was found a card bearing the old vigilante "3-7-77,' with additional inscription as follows:

Others Take Notice. First and Last
Warning
3-7-77. L D C S S W T

City, county and national officers have denounced the lynching and are taking steps to apprehend the perpetrators. Little was a member of the executive board of the I. W. W. and had only recently recovered from an automobile accident in Arizona where he had been engaged in I. W. W. strike work. His conduct was already under investigation by Federal officials, and the report of his reference to United States soldiers as "Uncle Sam's scabs in uniform" in a speech to a miners' mass meeting on July 18 had not increased his popularity in Butte.

DENVER—July 27

New Leadville Tunnel is projected. Leadville is a district in which the benefit of a large drainage and transportation tunnel has been demonstrated, the Yak Tunnel having proved wonderfully successful both productively and financially. Feeling that the large territory lying to the north of the main part of the developed district deserves similar recognition, persons have for years given more or less thought to the inauguration of a similar tunnel project, the portal to be well down along the eastern side of the Arkansas River Valley and the bore to be driven easterly or southeasterly. Last spring, the matter was taken up seriously by Arthur A. Barrett, who caused field surveys to be made and geological maps constructed to show the formations along several proposed routes. The result of this investigation was the conclusion that the project was altogether warrantable but that the tunnel could not be driven straight, it being found that the introduction of several curves or angles will enable the exploration to be maintained in ground that is recognized as favorable for orebodies. He proposes a particular route with a length of 7000 ft. which will bring the breast well into Breece Hill after traversing Canterbury Hill, Evans Gulch and a portion of Yankee Hill. According to his early plans, Prospect Mountain was to receive special attention but it is now evident that it is impracticable to accomplish the deep development of this great mountain and the proposed area on its south with a single tunnel. The site selected for the mouth is about 1½ miles north of the Denver & Rio Grande Ry. station in Leadville, immediately below the abandoned track of the Blue River branch to Breckenridge. The first 600 to 1000 ft. will be driven through wash.

SALT LAKE CITY—July 27

Increased Tonnages are being brought to market from the distant and less accessible camps. An evidence of this is the unusually large number of cars released by the Utah Ore Sampling Co. on July 23 when the number amounted to 32 cars. Twenty cars came from Utah; six from Nevada; three from California; two from Colorado; and one from Idaho.

Federal Copper Investigation as to the cost of production is now under way in this state. Copper mining, milling and smelting, and in particular the operations of the Utah Copper as the largest producer of the state, will be looked into. The men in charge of the work—W. A. Moore, H. A. Steinmetz and A. S. Christian—are in this city. They are being given free access to books etc. The present investigation is antedated by a similar study made some months before the entrance of the United States into the war under the direction of W. C. Ebaugh of this city for navy and army inventory. Labor conditions also will be gone into. In this connection it is interesting to note that while labor has been more difficult to obtain and less efficient than ever before in this section, there has been little serious trouble and all difficulties arising between employers and employees have been speedily adjusted. In the matter of costs, there are of course to be considered, as well as the high wages prevailing, the supply and quality of labor obtainable.

Shipping from the Cottonwoods—two camps, from which steep grades and heavy snowfall make the matter of transportation more or less of a problem—is now in full force. Shipments from Alta in Little Cottonwood have increased to about 700 tons weekly over the Salt Lake & Alta R.R. running from Wasatch to Midvale, with more ore coming down in trucks. The railroad is replacing its lighter equipment as rapidly as possible with 65-lb. rails to be able to carry a larger tonnage, and it is expected that this work will be completed by September. Properties shipping are the South Hecla, Michigan-Utah, Sells, Emma, etc. Improved haulage conditions in Big Cottonwood are marked by the recently declared dividend of $125,000 by the Cardiff, the largest shipper there. For many months this property has been seriously hampered by the haulage question—partly owing to bad roads, etc., and partly to the failure of a transportation company, which had contracted to haul the output of this mine. The Cardiff is now bringing down its own ores, using trucks. The daily output has been brought up to 125 tons. Since paying its first dividend in 1915, after developing a large orebody, the company will including the present payment, have paid $625,000 in dividends.

OATMAN, ARIZ.—July 26

Tom Reed Gold Mines Co. is undertaking to prospect and explore an interesting portion of their property, which consists of the faulted portion of the Aztec vein. This is really the easterly extension of the main Tom Reed vein system, which has been opened up for a distance of over 1500 ft. from the Aztec and Black Eagle shafts. Extending parallel to this vein and several hundred feet south of it, is another vein, which is held by eminent geologists who have made extensive and minute examinations of the Tom Reed property, to be the upper portion of the main vein. The vein opened up from the Aztec shaft does not outcrop at surface. The faulted vein can be traced on the surface for about 4000 ft. and already it has been opened up by cross cuts to a depth of between 400 and 500 ft. It is proposed to use diamond drills from the Aztec workings to complete the preliminary exploration and thus determine extent and contents of the orebodies, if such exist. At the top of the Aztec vein where the fault occurred, the vein is wider than where explored on the 400-ft. level from the Aztec shaft. A raise from the 400-ft. level reached top of the ore at 250 ft. So far as explored by shallow shafts and cuts, the upper portion of the vein appears to be in place and unbroken by the movement that wrenched it from its original position.

AJO, ARIZ.—July 26

Plans for Coöperative Store have been approved by the Board of Directors of the New Cornelia Copper Co. for the benefit of the corporation's employees, according to General Manager Greenway. Local Manager Curley has been turned over the use of a large and substantial store building now ready, and given a credit of $50,000 for initial stock of goods. He is to employ a capable store manager and start the business at as early a date as possible, charging prices comparable with those known in other Arizona mining camps. No employee will be forced to trade at the store. At the end of each year, after deduction of the actual operating cost, which shall include interest to the mining company for its advances, at 6%, the balance is to be divided among the employees of the mine and railroad in the proportion in which they have made purchases, no participation to be enjoyed in the profits by men of less than 4 months' employment. Dividends of men who have quit during the year will be divided among those who remain. The mining company will make no money whatever from the enterprise. In the event it proves unsatisfactory, the company reserves the right to withdraw at any time. Suggestion is made that the Board of Directors of the store company invite the election of a committee of seven from the employees, to advise monthly with the store manager. It is hoped that the plan will actually lower the cost of living, attach good and steady workmen to the camp and will avoid the charge, made in other camps, that the mining companies, in mercantile profits, are returning to themselves a material part of the wages paid.

HIBBING, MINN.—July 27

State Mine Shipments, according to reports given out by F. A. Wildes, State Mine Inspector, at Hibbing, for the week ended July 15, exceeded all previous records in output for this season. The total of 179,777 tons of ore was shipped to the head of the Lakes. The shipments were as follows: Shiras mine, Buhl, 12,006 tons; Leonidas mine, Eveleth, 28,985 tons; Mesabe Mountain mine, Virginia, 13,296 tons; Smith mine, Hibbing, 10,800 tons; Philbin mine, Hibbing, 4746 tons; Wanless, Buhl, 3680 tons; Woodbridge mine, Buhl, 14,190 tons; Frantz mine, Buhl, 3150 tons; Hanna mine, Mountain Iron, 9675 tons; Helmer nine, Kenney, 8178 tons; Deacon mine, Kenney, 4674 tons; Pool mine, Hibbing, 44,350 tons; Hill Annex mine, Marble, 15,075.

HOUGHTON—July 28

Two Militia Companies, part of the Michigan battalion of engineers, will go into camp at Houghton for two months' training, although their equipment is not expected for another week, and they probably will be called upon in the event of serious trouble with an I. W. W. outbreak. The mining companies are preparing to meet the labor issue and men who can be thoroughly trusted have been selected tentatively to help guard property and lives.

JOPLIN—July 28

First Aid Contest, held here July 4 has produced good results almost immediately. W. A. Lynott, who has work in charge, reports that 21 mining companies have ordered stretchers for their plants, while a total of 43 first-aid cabinets have been purchased.

Development of New Field is being attempted by Joplin operators, in what is known as the Elk Valley region, about 18 miles south of Springfield, Mo. There has been shallow mining in this region for a number of years, but in recent months it has been shown that there also are deeper runs. Gillis & Fink, who went there about a year ago and have been operating a small mill, have been doing so well that a modern concentrating plant has now been ordered. In part, the production is a high-grade carbonate of zinc.

Increase in Oklahoma Output is the most important feature of the recent operations in the Joplin district. Turn-in for last week amounted to over 8,000,000 lb. of blende and 1,700,000 lb. of lead concentrates. A few years ago there were numerous weeks when Joplin's total output did not exceed this amount. Besides, a number of companies in the Oklahoma field are holding ore, one mine alone having 2500 tons in its bins. This big increase in output is having a bad effect on market, particularly on the sheet-ground mines of the Webb City-Carterville section. A number of these have been closed down and more will have to close. While there are many rich producers in the Oklahoma field, it is also true that a number are little richer than mines of the older camp.

WASHINGTON—July 30

Arkansas Manganese Production was greater in a recent month than the entire output of the United States in a year before the war, so the domestic manganese situation is regarded as far from hopeless by W. C. Phelan, of the U. S. Bureau of Mines, who is making a personal visit to most of the manganese deposits of the country. While many manganese districts have failed to respond to prices which are from double to four times higher than they were when imports were unrestricted, this is not true of the Arkansas region which lies in Independence and Izard Counties of that state. These deposits have been known for many years and their development is entirely a result of the increase in price.

Oil-Land Leasing Bill is being delayed by hearings almost wholly devoted to proposed relief and remedial provisions. Max Ball, formerly chairman of the oil board of the Geological Survey, but now with the Roxana Petroleum Co., urges that additional hearings be granted. He claims that the general provisions of the bill were lost sight of in former hearings. These general provisions, he says, apply to an area so much greater than the relief provisions and are of so much greater importance to the public and to America's supremacy in the petroleum industry that those best qualified regarding the terms and conditions of future leases should be heard. Senator Henry L. Myers, the chairman of the committee on Public Lands, is opposed to additional hearings, but Senator Reed Smoot urged that Mr. Ball's request be granted.

Sources of the Rarer Metals have been investigated lately by Frank L. Hess, of the U. S. Geological Survey. He reports that there has been a marked increase in the general interest, and especially in the prospecting for, the rarer metals. As to the little-developed metals, such as antimony, he concluded that the United States can rely on domestic sources for one-half of its present needs of antimony. The largest portion of domestic antimony comes from the antimonial lead ores. The great bulk of imported antimony comes from China, but the United States has nearer sources in South America and Mexico, from which increasing imports are coming. In case of necessity, Mr. Hess believes that satisfactory substitutes for hardening lead, one of the chief uses of antimony, may be found in using calcium, barium, strontium, magnesium and copper. The United States could produce 3000 tons of nickel ore from domestic deposits, provided the necessity existed and the matter of costs were a secondary consideration. With regard to tungsten, Mr. Hess says: "High-water mark in the production of tungsten ores in this country may have been reached, but it is not impossible that under the incentive of prices reaching, say, $35 a unit, and the added zest of patriotism, the figures for 1916 might be exceeded."

Inventory of War Minerals is being made by the Committee on War Minerals, of which William Y. Westervelt, of New York, is chairman. The committee hopes to be able to ascertain whether necessary supplies of war minerals can be developed commercially by private capital, or whether the development should be fostered by the Government and if sufficient shipping for imports must be provided. One of the chief aims of the committee is to convert generalities into exact statement of fact. If it is advisable, for example, to use a part of the shipping for the pyrites trade, the committee hopes to point out the fact with a definiteness that may be the basis of intelligent action. Again, it is believed that manganese and pyrites sufficient for urgent needs can be developed domestically if necessity should arise, yet the committee wants more information before accepting that belief. It is therefore making a careful inventory of American resources of pyrite, sulphur, manganese, manganiferous iron ore, lead, nitrate, chromite, tin, nickel, platinum, flake graphite, sheet mica and high-grade refractory clay. Through coöperation of mining engineers and geologists in all parts of the country, the committee expects to amass in a few weeks the up-to-date economical information, which, linked with the data already in the hands of the American Institute of Mining Engineers, the Geological Survey and the Bureau of Mines, will enable it to reach definite conclusions that will permit the Government to outline a definite policy as to war minerals.

TORONTO—July 28

Manganese Deposits have been opened in the Cypress Hills in southeastern Alberta. Operations have been progressing for some time in charge of James F. Reilly, of Montreal,, who is stated to represent the Hersey and allied interests. It is reported that 800,000 tons have been indicated by the work done during the last few months. The ore is of good grade and is disposed of to the British War Office. Shipments of the ore are being made as rapidly as transportation facilities permit.

Steel Company of Canada, the headquarters of which is at Hamilton, Ont., is the only large Canadian steel-making company which does not control the sources of its raw material. At a meeting of the directors on July 12, an important change of policy was decided upon. The company in association with American interests proposes to acquire iron ore and coal properties located in the Eastern States, from which they can draw supplies, and to establish a large coke-producing plant in Hamilton of a capacity of about 800 tons per day.

Spectacular Gold Find has started a rush of prospectors into Rickard Township, about four miles south of the Abitibi River and 12 miles east of Iroquois Falls. It was made by two Swedes, who were cruising for pulp-wood timber. Three veins, ranging from 4 to 20 ft. in width, have been uncovered, the gold occurring in white quartz, which shows little other mineralization. The rock outcrop covering about one square mile has already been staked, and as the surrounding area comprises a number of veteran claims which are not open for mining locations there is little opportunity for prospectors.

The Mining News

ALASKA

ALASKA UNITED (Treadwell)—Ready Bullion mine produced in May, 24,316 tons ore yielding $44,113, or about $1.81 per ton, operating expense, $42,456; operating profit, $1956; construction expense, $4193; net loss, $2236, sundry income, $1340. The 700-ft. claim mine recovered from earth and around mill 11 tons concentrate yielding $4869, operating expenses, $2251; operating profit, $2614; construction expenses, $1187 net profit $1187; other income, $1340. No ore crushed at 700-claim.

ALASKA GASTINEAU (Juneau)—This mine and the mill at Thane, about mile south of Juneau, having difficulty getting labor to bring production up to anticipated tonnage. At present some ore being obtained from open pits back on mountain. Bartlett Thane, who developed property, is no longer actively connected with management. Is working extension of Alaska Juneau ore zone. Physical conditions seem to be more favorable to low costs at Juneau. Latter mine is protected on practically all sides from caves bringing in barren wall and surface rock.

ARIZONA

Cochise County

SHATTUCK ARIZONA (Bisbee)—Report for quarter ended June 30 showed metal production as follows: Copper, 3,921,297 lb.; lead 588,191 lb.; silver 52,887 oz.; gold, 183 oz. Gross operating cost per pound of copper 14.79c.; less operating credits 2.485c.; net cost 12.39c. Dry tons copper ore milled, 29,591; lead ore, 1412 tons. Production in April and May about normal, but June output was cut off June 27 when I. W. W. miners' union called strike. Low-grade manganese ores opened on 100, 200 and 300 levels.

Mohave County

I. W. W. PROBLEM in Chloride solved by mine operators and International Union of Mine, Mill and Smelter Workers reaching agreement as to wages and conditions, in return for which union agrees to support operators in efforts to eradicate turbulent element. All is peaceful in district, with every reason to believe condition will continue.

RATTLESNAKE (Chloride) — Stoping carload gold-silver-lead ore for shipment to Selby smeltery. F. E. Braly, superintendent.

KEYSTONE (Chloride)—Mill being remodeled by F. W. Sherman to treat dump ores. If results of experimental work are satisfactory, the mine will be reopened.

WEST STAR (Chloride)—Leased and bonded to E. J. Carter and associates of Chloride. G. R. Harkness, superintendent. Sinking operations begun July 10. Shaft down 60 feet.

UNION METALS CO. (Chloride)—Sinking shaft on Fredonia group sidelining the Golconda. At 40 ft. cut oreshoot carrying silver and copper. J. P. Ryan, general manager.

WESTERN ORE CONCENTRATION CO. (Chloride)—The Steffy custom mill now complete, ready to run when the 1800-ft. wooden pipe line is completed to provide reserve water supply. F. E. Steffy, general manager.

MINNESOTA CONNOR (Chloride)—P. S. Virgin, superintendent. Hauling 200 tons dump ore to Steffy mill for test run. Mine workings unwatered. Further development depends on result of mill run.

NEW TENNESSEE MINING CO. (Chloride.)— Opened up 4 to 5 ft. gold-lead ore at 235-ft. point in shaft. Top of shoot struck at 210-ft. point improving except few feet where vein pinched. Has widened again to 5 ft. G. J. Ridenour, superintendent.

UNION BASIN MINING (Chloride)—Operating Golconda mine. John Wanvig, Jr., superintendent, met with International Union officials, raised wages to Chloride scale. Union agreed to furnish miners in any numbers. I. W. W. element ordered out of camp. Evidently band sent into this region for purpose of tying up mines has been scattered and thoroughly defeated by harmonious efforts of operators and union miners.

UNITED EASTERN (Oatman) — First semi-annual report by Gen. Supt. J. A. Burgess shows total of 37,565 tons of ore treated; gross value, $793,197 or $21.12 per ton, extraction was 96% and net profits for period, $191,130. Developments on the 665-ft. level of the mine have opened orebody for 650 ft. On the 400-ft. level of the Sunnyside orebody 15 ft. wide has been opened for 340 ft. west from shaft. The Sunnyside lies south and west of the Telluride where an important orebody was opened 10 days ago. It is controlled by the same interests as United Eastern. This discovery is at a point three miles from the United Eastern shaft.

Pinal County

ARIZONA & BUTTE (Ray)—Station completed at 200 level and 90 ft. of crosscut driven.

McCALLUM (Ray)—Property north of Ray Lead Development Co. leased by James Pollard. Shipping ore to El Paso.

RAY LEAD (Ray)—Shipping four cars a week. Doing considerable development work. Shipments limited by transport facilities.

ARKANSAS

Baxter County

LOST JACK (Cotter)—Work started by Owan and Wood of Yellville, who will develop.

OHIO-REYNOLDS (Cotter) — The Ohio mine owned by Dr. Drennon at Rush, and Reynolds mine owned by R. R. Reynolds of Buffalo, have been consolidated. Both are situated in the Hall Mountain camp near this place.

Boone County

MARGUERITE (Everton)—Sold by Potts & Hoye, to Oklahoma men, who will build mill.

Marion County

NORTH STAR (Yellville)—New 50-ton mill ready.

BEN CARNEY (Rush) -Leased by Capt. George Chase, who has started tunnel.

WHITE EAGLE (Rush)—Operated by Yellow Rose Mining Co.; mining and milling with three eight-hour shifts.

MONTA VISTA (Buffalo)—Under lease to W. N. Anderson. Development work showing heavy deposits of jack and carbonate.

ARKANSAS-SOUTH CAROLINA (Rush) —This company installing development plant at Hawkey mine, on Clabber Creek. May build small mill this fall.

PRODUCTION from the northern Arkansas zinc and lead field for the month of June was: 5,475,000 lb. zinc and lead ore; 190,000 lead, balance zinc. Field produced for first six months this year, 24,362,000 lb.; 3,000,000 in mine bins. Increase of 33⅓ per cent. over same six months last year.

Newton County

LOST MOUNTAIN (Cavecreek)—This lead-zinc mine leased by W. O. Krueger, formerly with Old Confederate.

ELEVENTH HOUR (Ponca)—Producing carbonate of zinc. Sold by H. J. Vancil to Victor Primrose and associates who will continue operations.

CALIFORNIA

Calaveras County

CALAVERAS COPPER CO. (Copperopolis)—Damage by recent burning of transformer house repaired and mine in operation. Old dumps are also being treated Employ 125 men. S. M. Levy, manager.

SHEEPRANCH (Sheepranch) — W. B. Thompson, C. S. Jennison and H. Robinson Plate, of New York, have formed a syndicate to unwater and explore this old mine, with idea of equipping same with 200- to 250-ton milling plant if developments warrant. The Sheepranch mine was formerly operated by the Haggin-Hearst-Tevis interests and is reputed to have made a production of about $4,000,000. Since then, it has had a checkered career, having been in hands of several companies of limited financial means. Mine had 1350-ft. shaft with winze from 1300 level to the 1550-ft. point. Fissure vein, about 5 ft. wide, in Calaveras slate, is estimated to contain about $6.30 in gold. In former mining ore was sorted underground and as some of the quartz is dark, it is assumed that considerable loss arose from inability to distinguish this quartz from the black slate; there was also considerable loss from "high-grading." Oreshoots were about 1500 ft. in length. H. Robinson Plate, in charge of new work.

Del Norte County

CHROME MINING CLAIMS on French Hill, Crescent City, being developed by G. S. Barton, R. J. Rowen and M. E. Young, of Grants Pass. One working developed 5000 tons of ore Shipments will be made by auto-trucks to Crescent City, then by water to San Francisco. Ore runs 50% and over.

Mariposa County

QUARTZBURG MINING CO. (Mariposa) —Permitted to issue 60,000 shares common stock for mining claims in Quartzburg district and to sell 40,000 preferred shares for additional equipment.

COLORADO

Chaffee County

PARAMOUNT REDUCTION CO. (St. Elmo)—Mill being overhauled following test run on ore from Flora Belle mine. Capacity will be 75 tons daily.

Dolores County

RICO-ARGENTINE (Rico) — Block of ground leased to Marmatite Mining and Milling Co., which is working 20 men.

BERTHA S. (Rico) — Good-grade lead carbonate ore assaying well in silver opened in development work. Work temporarily suspended on account of water flow.

Gilpin County

FRANCIS (Central City)—Telluride of gold ore opened recently, similar to that produced by War Dance mine, of which Francis is probably extension.

POWERS (Central City) — Unwatered; lessees to resume work at once.

EUREKA (Central City) — Shaft down 700 ft. and will be sunk to 1000-ft. level. Remodeled mill making satisfactory recovery.

Lake County

MINES CLOSED as result of strike called July 21, but pumps are being kept going. Situation growing more serious and pumps may be pulled at certain mines.

TWIN LAKES DISTRICT slow in opening this year on account of late spring. Fidelity mine being reopened; shipped high-grade ore last autumn. Work on Miller and Lincoln Highway mines resumed. Latter being developed by Colorado Springs men. Lincoln Highway (automobile road) will be completed to Everett this autumn, and will help in opening Twin Lakes.

Mineral County

EQUITY CREEDE MINING CO. (Creede)—Being developed by Pueblo, Colo. men. Plant and machinery will be installed this summer.

Ouray County

U. S. SMELTING, REFINING AND MINING CO. is making canvass of possible production from Ouray and Red Mountain districts to determine advisability of reopening the smelting plant at Ouray.

BARSTOW (Ouray)—This Red Mountain mine being operated by lessees; mill to resume at once.

MOUNTAIN TOP (Ouray)—Underground mill now treating 25 tons daily. Expected to increase capacity by changes in equipment.

VERNON (Ironton)—Grading for new 60-ton mill under way. Good-grade copper-silver ore opened in development work in 4 parallel shoots. Mine work temporarily suspended until mill construction finished.

Pitkin County

NEWMAN TUNNEL (Aspen)—Local stock company formed and 10-year lease secured on old Newman mine, formerly heavy silver-lead producer. Tunnel will be driven to open and unwater property at depth.

San Juan County

BANDORA (Silverton)—In Ice Lake Basin sold recently to Eastern men.

ELK (Silverton)—Compressor and transformer being installed. Gold-silver-copper ore opened in 1200-ft. tunnel.

Summit County

JUNE GOLD OUTPUT of dredges in Breckenridge district was $175,000. No. 1 dredge of Tonopah Placers Co. operating near Colorado & Southern R.R. tracks, which cross valley just south of ground being dredged. As drilling in upper Blue River district, south of the ground now being dredged, proved gravel to be good grade, railroad right of way may be changed to let dredge past. Cleanups now made on dredges every 10 days, as they have been working in richer gravel lately.

PIONEER CONSOLIDATED (Breckenridge)—Mill running full capacity and making good extraction.

JUNE BUG (Breckenridge) — Lessees mining ore assaying 240 oz. silver in this Gibson Gulch property.

JESSIE (Breckenridge) — Additions to milling equipment will be made. Mine crew being increased. Sufficient ore developed to keep mill operating full capacity.

Teller County

SEMIMONTHLY PAY DAY will be established in Cripple Creek district in near future.

KOMAC (Cripple Creek)—New leasing company organized to work Victor mine; operations under way.

ECLIPSE LEASING (Cripple Creek)—Operating Jo Dandy mine under long-term lease; shipping good-grade ore. Shaft sunk from 500- to 800-ft. level, and development work on 600- and 700-ft. levels.

BEACON & RAVEN HILL GOLD MINING CO. (Cripple Creek)—Driving 250 ft. by contract from Roosevelt tunnel to cut extension of oreshoot worked to depth of 700 ft. in Elkton mine adjoining. This lateral will cut vein at considerably greater depth than worked formerly.

MICHIGAN

Copper

SOUTH LAKE (Houghton)—July shipments expected to average nearly 200 tons daily.

SENECA (Calumet)—Preparing for installation of second-hand 4000-ft. hoist recently purchased. Will also install second-hand compressor. Shaft sinking will begin in a few weeks.

Iron

STRIKE OF MINERS on Gogebic Range began July 30. Colby and Ironton mines of Corrigan-McKinney Co. among those affected. I. W. W. agitators arrested, and state constabulary is assisting in preserving order.

MINNESOTA

Cuyuna Range

DOCKS AT ST. PAUL for Cuyuna Range ore are being discussed. Ore may be transported down Mississippi River. Proposed use of bridge of St. Paul Bridge and Terminal Co. approved.

CONGDON-ADAMS (Riverton)—Drilling on 240 acres by Tod-Stambaugh Co. discontinued. Showed important manganese ore deposit

JOAN MINING (Duluth)—Sank shaft 60 ft. to rock in 14 days. Shipments will begin as soon as spur track is completed to property in NE¼, SE¼, Sec. 32-47-29. Mine electrically equipped. Owned and operated by M. L. Fay of Duluth.

Mesabi Range

DUNCAN (Chisholm)—This State lease, held by the Oliver company, made its first shipment recently. Not more than 5000 tons will be shipped from this property this season. Shipments also started from the Glen openpit; one steam shovel loading ore.

HULL-RUST (Hibbing)—Range loading records were broken at this Oliver operation recently when 200 forty-five-ton cars were loaded by one crew in a 10-hour shift. There are 18 shovels working at this pit and 16 locomotives hauling ore and overburden.

WARREN (Hibbing)—Leased from the Great Northern by Todd-Stambaugh interests. Shipped its first ore July 26. Mine is west of the Leetonia and was stripped by Winston Dear Co. with a 350-ton Marion dragline excavator, the first to be used on the Mesabi range. The cleanup work was done by an ordinary light-weight shovel.

MIDGET (Hibbing) — This new mine, west of Hibbing and owned by G. G. Hartley of Duluth, Carver Richards, range superintendent, shipped its first ore from its pit via the Duluth, Messabe & Northern to the docks last week. Expects to ship about 75,000 tons this season.

MARGARET (Buhl)—New Butler Bros.' property near the Wanless mine, is to be developed as an openpit by using one of the large 350-ton shovels which the Butlers were first to introduce on the range. Mine will not develop into large property; its total ore reserve less than 1,000,000 tons.

MISSOURI

Joplin District

ARISTA (Racine)—Opening promising silicate mine at depth of from 20 to 40 ft. Small mill completed.

BIG EIGHT (Galena, Kan.)—Plans to erect mill on new lease south of Baxter Springs, Kan., where 13 drill holes have been put down.

U. S. PAYMASTER (Joplin)—Planning second mill in Bell Center, Mo., camp. Ore giving 6% blende recovery. J. W. Martin, Newport, Ark., president.

LUCKY SEVEN (Afton, Okla.)—Preparing to build 300-ton mill, Baxter Springs, Kan. Shaft sinking now under way. J. C. Tucker, Afton, manager.

E. & N. (Duenweg)—With new 150-ton mill, making four to six car loads of blende concentrates monthly. A 16-ft. face being mined. W. P. Eberlein one of owners.

WHITE (Picher, Okla.)—Now handling 3500 tons of ore weekly; when fourth shaft is down, will increase to 4500 tons. Averaging 4% recovery. Adjoins Picher-Netta tract.

OLD CHIEF (Commerce, Okla.) — Fire destroyed mill, July 8. Worley & Co., owners, believe it of incendiary origin. Valued at $30,000 with $11,000 insurance. Not known if plant will be rebuilt.

LUCKY TIGER (Neck City)—Purchased 96-acre lease east of Picher, Okla., from J. W. Barnes, Baxter Springs, Kan., for reported consideration $40,000. Only slight development on tract, but surrounded by good mineralized land.

MONTANA

Deer Lodge County

CABLE MINING CORPORATION (Cable)—Purchased entire assets of Cable Consolidated. Fund of $125,000 for exploration to be obtained by assessment.

Lewis and Clark County

COFFEE (Helena)—Made shipment of rich silver-lead ore to smeltery.

TRUE FRIEND (Helena)—New hoist in place; sinking below 150-ft. station.

CRUSE CONSOLIDATED (Helena)—Drifting on ore at 150-ft. level. Crosscutting to foot wall from shaft at 150 level.

SCRATCH GRAVEL (Helena)—New 200-gal. pump in place. Rich gold ore coming from 300-ft. level. Winze to be sunk on oreshoot.

ST. LOUIS (Marysville) — Putting 80 tons ore through continuous cyanide plant per day. Ore from old stopes in Drumlummon mine. About 40 men employed.

Madison County

MANGANESE vein, carrying up to 20 oz. silver opened in Ruby Mountains by P. E. Harriman, of Virginia City. Butte men will develop.

MISSOURI (Virginia City)—Moving Easton-Pacific mill to this mine at head of Meadow Creek. About 20 men working. J. H. Panket superintendent.

CHOWNING MANGANESE (Ennis)—J. W. Chowning is employing about 15 men at this Cherry Creek mine. Ore will be hauled by motor truck to Norris.

REVENUE CONSOLIDATED GOLD MINES CO. (Norris)—Revenue group on Richmond Flats employing about 20 men in mine. Mill being remodeled. G. D. B. Turner, superintendent.

MADISONIAN (Norris)—G. D. B. Turner, superintendent of Revenue Consolidated, has acquired control of this property from Leiter Estate, of Chicago, and will unwater 400-ft. shaft, install hoist and electric power.

Silver Bow County

DAVIS-DALY (Butte) — Butte-Detroit mill being remodeled to handle manganese ore recently opened in Hibernia and New Republic mines.

NORTH BUTTE (Butte)—As result of recent fire, suit was brought by John Werta and Y. Johnson to recover $22,000 and $27,000 respectively for suffering and impairment of health due to the fire. Both men were rescued after having been imprisoned in the mine for 36 hr. without water or food. They charge the company with not providing proper means of escape.

NEVADA

Esmeralda County

GOLDFIELD CONSOLIDATED (Goldfield)—Net realization in May was $10,186 from 23,300 tons; costs per ton total ore, $5.704. Leasers produced 831 dry tons having gross value of $12,080, from which company received $4767 net. Company did 1186 ft. of development at cost of $6.51 per ft.

Nye County

TONOPAH ORE PRODUCTION for week ended July 21 was 9290 tons, valued at $167,220, comparing with 8902 tons for previous week. Producers were: Tonopah Belmont, 2723 tons; Tonopah Mining, 2000 tons; Tonopah Extension, 2380 tons; Jim Butler, 800 tons; West End, 1034 tons; Rescue, 192 tons; Montana, 106 tons; Cash Boy, 55 tons.

MANHATTAN MUSTANG (Manhattan)—Train Chase lease preparing 200 tons to be treated at War Eagle mill.

MANHATTAN MORNING GLORY (Manhattan)—No 3 shaft now 65 ft. deep in ore. Gasoline hoist and Jackhamer drill being installed. Main shaft 175 ft deep; bottom in limestone.

WHITE CAPS EXTENSION (Manhattan)—The Hendrie Bolthoff No. 1 hoist with 40-hp motor, formerly at the Booth shaft in Goldfield, will be installed at once. Chicago Pneumatic G C B compressor and five Jackhamer drills also to be used. Shaft 58 ft deep. Headframe now ready to be erected.

WHITE CAPS (Manhattan)—Station being cut at fifth level Will be 14 x 13 x 45 ft., with additional pocket for pump—a Platt 7 x 12-in. triplex, gear driven by 50-hp. motor; capacity, 210 gal. per min. under 700-ft head Dreadnought drills now being used in cutting station as ground has become harder Chutes being driven from third to second level for drawing ore from second-level stopes. Preliminary testing of mill now being made.

OREGON

Josephine County

OSGOOD (Waldo) — Carload of gravel shipped from this placer mine in Allen Gulch for test. J. T. Logan, manager.

PRESTON PEAK (Waldo)—This copper mine using new diamond drill recently purchased. Owned by Chicago stock company. Mr. Hoofer, manager.

TURK (Takilma)—Copper mine owned by Grants Pass Hardware Co., Grant Pass, Ore., being prospected under option by M. A. Delano.

QUEEN OF BRONZE (Takilma)—Final payment of $60,000 made on this copper mine, purchase price being $150,000. Formerly owned by Chas. F. Tutts of Colo. Spgs. Sold to six men: John Hampshire, John Towhy, R. B. Miller, M. S. Boss, T. F. Ryan and Roy H. Clarke. Corporation will be formed at once and property operated as stock company. Ore shipments in little more than year amounted to $1,283,000, according to smeltery returns. Low-grade ore is being sorted and put on dump for concentration later. About 700 tons of ore per month shipped for some time. There are 14 team outfits hauling ore to bunkers at Waters Creek. John Hampshire of Grant's Pass is general manager.

SOUTH DAKOTA

Lawrence County

TWO JOHNS (Trojan)—Supplying from 40 to 50 tons daily of good milling ore. Property under lease to Mogul Company.

GOLD DOLLAR (Trojan)—Leasers making regular shipments to Trojan mill. Ore hauled from mine to railroad by motor trucks.

CUSTER PEAK (Roubaix) — Contract let for sinking shaft additional 200 ft., making total depth of 500 ft. Concentrator being erected.

OFER-MOGUL TUNNEL (Trojan)—Has reached distance of 500 ft. Raises will be driven to upper workings and will afford more economical method of ore transportation.

WASP NO. 2 (Flatiron)—Coarse crushing 500-ton cyanide plant being wrecked. Quartzite ores found with lower depths require fine grinding. Building will be retained and if development warrants, new process will be installed. Development of gold and tungsten deposits will be continued.

Pennington County

GOLDEN SUMMITT (Hill City)—Shaft reached 275 ft. and several hundred feet of lateral work done. Expert main orebody will be cut soon. Larger hoist installed.

WHITE SWAN (Hill City)—Werlick and Hayes shipped 100 tons tungsten ore to American Tungsten plant and same being concentrated. Reported to have large body of 2½% material. So far ore taken from open cuts.

UTAH

Salt Lake County

HOWELL (Salt Lake)—Tunnel in 600 ft. showing mineralization. Being driven to set under ore opened in old workings. Near the Cardiff.

CARDIFF (Salt Lake) — Shipping 125 tons daily. Winze following ore downward from main-tunnel level has reached depth of 135 ft. (735 ft. from surface).

GARFIELD CHEMICAL AND MANUFACTURING CORPORATION (Garfield)—Producing 150 tons of sulphuric acid daily, the addition to plant having been completed. Original capacity, 100 tons.

COLUMBUS-REXALL (Salt Lake)—Recent strike—1350 ft. below surface and 500 ft. in from portal of tunnel—has in two weeks produced 60 tons of good-grade ore. Find is 300 ft. below Cardiff main tunnel level and is in "Cardiff" limestone, not far from quartzite contact.

UTAH COPPER (Bingham)—In spite of high costs, earnings first half of 1917 were good. First quarter, $7,246,319 or $4.46 per share and second estimated at $9,607,412, or $5.89 per share, making for first half of year rate of $10.35 per share or annual rate of $20.70, as compared with a little over $21 a share in 1916. June copper production was 19,909,097 lb., comparing with 17,877,432 lb in June, last year.

MONTANA-BINGHAM (Bingham) — Concentrates from first unit of new flotation mill at Fortuna workings, amounting to about $2000 daily Work on second unit being pushed Fortuna vein expected to be cut by Montana-Bingham tunnel in week or two Work in Bingham-Amalgamated—one-fifth interest owned by Montana-Bingham—being resumed on 300 level. Congor, connecting with Bingham-Amalgamated tunnel, making regular shipments.

Summit County

PARK CITY SHIPMENTS for week ended July 20 were 3,626,500 lb. There are nine shippers, among which the California-Comstock was represented, following reopening under new operating conditions.

DALY (Park City) — Increasing shipments. Shipped 160 tons week ended July 20.

PARK CITY KING (Park City)—Two streaks of ore in face of tunnel, which is in 160 feet. Company recently organized to develop large acreage crossed by three fissures.

Utah County

PACIFIC (American Fork) — Fissures Leasing Co. has about completed new mill building. Machinery yet to be installed. Car of high-grade ore being loaded

WASHINGTON

Stevens County

NORTHPORT SMELTING AND REFINING (Northport)—A 900-electrode Cottrell precipitation plant is being built at this works. Building will be 150x75 ft. and about 85 ft. high. Present loss said to be $500 daily.

CANADA

British Columbia

GRANBY CONSOLIDATED (Grand Forks)—Arranging to resume smelting at this copper works; closed several months on account of coke shortage.

CANADA COPPER (Greenwood)—Making arrangements to blow in its smeltery about Aug. 1. Closed owing to shortage of coke resulting from coal-miners' strike in Crow's Nest Pass district.

CANADA

Ontario

ORE SHIPMENTS from Cobalt over the Temiskaming & Northern Ontario Ry., as reported by Arthur A. Cole, mining engineer, for June were: Aladdin, 74 tons; Beaver, 37; Coniagas, 79; Dominion Reduction Co., 220; Hudson Bay, 33; Kerr Lake, 42; La Rose, 87; McKinley-Darragh, 172; National, 20; Nipissing, 663; O'Brien, 28; Penn Canadian, 52; Right-of-Way, 43; Temiskaming, 36; Trethewey, 22; total for Cobalt district, proper, 1614 tons; Miller-Lake-O'Brien (Gowganda) 52; total silver ore, 1666 tons; nickel ore, Alexo mine (Porquis Jctn.) 423 tons.

ADANAC (Cobalt) — High-grade ore found on this property which adjoins Temiskaming.

WHITE RESERVE (Maple Mountain)—A 2-in. vein carrying good ore encountered at 140-ft. level.

KIRKLAND LAKE (Kirkland Lake)—Will install mill of 150 tons capacity. Shaft now down 700 ft.

DOME (South Porcupine)—Mill tonnage up to 1500 tons per day, most of which comes from glory hole and is low grade.

BOSTON HOLLINGER (Boston Creek)—Sold to men interested in the Ross Rifle Co., of Quebec, who will install a plant at once.

PLENAURUM (Porcupine) — Diamond drilling begun to ascertain whether orebodies of the Jupiter continue on this territory at depth.

VIPOND-NORTH THOMPSON (Timmins)—The orebody cut some weeks since at 600-ft. level, 24 ft. wide, has been drifted on 50 ft., maintaining its width and gold content.

WHELPDALE VETERAN (Cobalt)—Trenching on this property, north of Gillies Lake, uncovered four new veins. Shaft being sunk and crosscutting will be done at 100-ft. level.

NIPISSING (Cobalt) — Shareholders' meeting to be held at Augusta, Me., on Aug 21 to consider proposition to eliminate the American company and continue only the Nipissing Mines Co., Ltd., of Ontario. Surmised that imposition of war taxes in both countries led to the proposal.

LAKE SHORE (Kirkland Lake)—Will sink another 100 ft. and again crosscut under lake to explore veins that have developed so well from 200-ft. level crosscut, where shoot is now over 150 ft. long.

MEXICO

CIE. DU BOLEO (Santa Rosalia, Baja Calif.)—Production for June amounted to 1,740,500 lb. copper. Grade of ore, 3.81%.

GREAT BRITAIN

COMMANDEERING OF IRON MINES of the counties of Cumberland and Lancaster, by the British minister of munitions, announced in cable dispatch of July 31 from United States Consul General Skinner, of London.

The Market Report

Metal Markets

SILVER AND STERLING EXCHANGE

July	Sterling Exchange	Silver New York, Cents	Silver London, Pence	July	Sterling, Exchange	Silver New York, Cents	Silver London, Pence
26	4.7556	78⅞	39¾	30	4 7556	78⅛	39⅝
27	4 7556	78⅛	39⅝	31	4.7556	78⅝	39½
28	4 7556	78⅛	39⅝	Aug. 1	4.7556	79	40¼

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

DAILY PRICES OF METALS IN NEW YORK

July	Copper Electrolytic	Tin Spot.	Lead N. Y.	Lead St. L.	Zinc St. !
26	24½ @25½	62¾	10½ @11	10¼ @10¾	8¼ @8½
27	25 @26	63	10½ @11	10¼ @10¾	8¼ @8½
28	25½ @26½	63	10½ @11	10.50 @10.90	8⅜ @8⅝
30	26 @27	63⅝	10½ @11	10.50 @10.90	8⅜ @8⅝
31	27 @28	63¾	10½ @11	10.50 @10.90	8⅜ @8⅝
Aug. 1	27 @28	63⅞	10½ @11	10.50 @10.90	8⅜ @8⅝

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

The quotations for electrolytic copper are for cakes; ingots and wirebars. Electrolytic copper is commonly sold on "regular terms" (r.t.), including freight to the buyer's works and is subject to a discount for cash. The difference between the price delivered and the New York cash equivalent is at present about 0.25c. on domestic business. The price of electrolytic cathodes is 0.05 to 0.10c. below that of electrolytic. Quotations for spelter are for ordinary Prime Western brands. We quote New York price at 17c. per 100 lb. above St. Louis.

Some current freight rates on metals per 100 lb. are: St. Louis-New York 17c.; St Louis-Chicago, 6.3c.; St. Louis-Pittsburgh, 13.1 cents.

LONDON

July	Copper Standard Spot	Copper Standard 3 Mos.	Copper Electrolytic	Tin Spot	Tin 3 Mos.	Lead Spot	Zinc Spot
26	125	124½	137	241½	238½	30½	54
27	125	124½	137	243¼	240	30½	54
28	...	...	.	...	.		
30	125	124½	137	246	242½	30½	54
31	125	124½	137	247	243	30½	54
Aug. 1	125	124½	137	247½	243½	30½	54

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2,240 lb. For convenience in comparison of London prices, in pounds sterling per 2,240 lb., with American prices in cents per pound the following approximate ratios are given, reckoning exchange at 4.80. £15 = 3.21c.; £20 = 4.29c.; £30 = 6.43c.; £40 = 8.57c.; £60 = 12.85c. Variations, £1 = 0.21⅜c.

NEW YORK—Aug. 1, 1917

All of the markets were stronger this week, this being most noticeably the cases with copper and lead. However, transactions were rather small and there continued to be considerable confusion respecting conditions.

Copper, Tin, Lead and Zinc

Copper—We indicated last week that the decline in copper had apparently bottomed. This proved to be the case, and sundry second-hand lots having been cleaned up, buyers who had to go to first hands found themselves obliged to pay higher prices. The market advanced sharply from day to day, more on improvement in sentiment than on transactions, the volume of which was small. It is beginning to be foreseen however, that the curtailment of production, owing to the labor troubles, is going to have a considerable bearing on the market, which during the recent period of dullness and uncertainty has been overlooked.

The big contract with the foreign governments that was negotiated last October has now practically been filled. Some refiners have shipped away all the copper owed by them. The others have completed their deliveries, but some of the copper still remains here, owing to inability of the buyers to get ship capacity to take it away.

The strike situation in Arizona is much improved. At Butte there is a slow but steady return of men to their work.

Not all copper consumers have been deluded by the theory that the government is going to abolish the law of supply and demand and provide copper for everybody at a reduced price. Thus, in the last number of "The Wire Message," published by the Habirshaw Electric Cable Co. and the Electric Cable Co., it is remarked as follows:

> One authority on copper is credited with making the following statement: "The price which the government decides to pay for copper will virtually decide the copper market price to consumers for the balance of the year." We believe statements of this kind produce a false impression, as it leads consumers to expect much lower prices, and, perhaps, to hold off supplying their needs only to find that they may later be forced into the market at higher prices than those prevailing today. We repeat a statement we have several times made, that we do not see how the price to the outside consumer can be determined by anything but the law of supply and demand. If it is true, that the production of copper has so materially increased that the present prices are not justified, they will come down no matter what the attitude of the government is. But if published statements are reliable, supply and demand so nearly balance, that it is difficult to see how there can in the near future be any material drop in price to the average purchaser.

Copper Sheets are quoted at 37@38c. per lb. for hot rolled, and 1c. higher for cold rolled. Wire is quoted nominally at 33c. per lb., f.o.b. mill.

Tin—This market was more active and the improved demand was reflected in a small advance in price. Banka tin was sold during the week at about 3½c. per lb. under the price for Straits.

Lead—There was a sudden reversal of form in this metal. On July 25, it looked as if the market was headed for 10c., but on the following day 11c., New York, was actually paid. This change in form is attributed to a fuller appreciation of what the labor troubles in Missouri mean with respect to production. August lead is already very scarce and is going to continue scarce.

Zinc—There was a firmer tone to this metal and certain sellers withdrew. This was more in sympathy with the strength in the other metals, than for any other reason, for it is well known that the unsold stocks of spelter are large. The bulk of the business during the week was done around 8⅜c. At the close, 8½c. was realized.

Zinc Sheets—Price of zinc sheets has not been changed. Market is still at $19 per 100 lb. f.o.b. Peru, Ill., less 8% discount.

Other Metals

Aluminum—The aluminum market is weaker. Quotations seem to be nominal and there is no interest in the market. Offers are reported as low as 49@51c. per lb. for No. 1 ingots at New York; futures slightly lower.

Antimony—The market was steadier and slightly firmer. We quote spot at 15@15¼c., and futures at 14½@15c., c.i.f., in bond.

Bismuth—Quoted at $3.50 per lb.

Cadmium—Quoted at $1.45@1.75 per lb.

Cobalt—Quoted at $1.70 per lb.

Magnesium—Ingot has declined 50c. per lb., and is now quoted at $2.

Molybdenum — Pure metal wire has dropped to $60 per lb., which is less than half the former price, the decline being due to improved methods of production.[1]

Nickel—Steady at 50@55c. per lb., with premium of 5c. per lb. for electrolytic.

Tungsten—Pure tungsten rod has declined to $80 per kg., for export only, the reduction in price being due to improved methods of production. Metal powder, 95%, is quoted at $2.80 per lb. Ferrotungsten has advanced to $2.95 in sympathy with the advance in the price for ore.[1]

[1] As quoted by Foote Mineral Co., Phila.

Quicksilver—The market is about the same as reported last week. The stocks in New York continue light, and quotations are made here at $115. San Francisco reports by telegraph $100@107½, market easy.

Gold, Silver and Platinum

Gold—Movement between United States and foreign countries during the year ended June 30, 1917, showed gain here of $685,254,801 and loss of $43,276,368. Gold imports were $977,176,026. From Alaska $15,409,529 in gold was imported.

Silver—The silver market has ruled dull and steady the past week, closing higher in London at 40¼ pence. The demand from India and China for shipment via San Francisco has stopped for the present.

Silver imports into the United States in the fiscal year ended June 30, 1917, were $35,003,653. From Alaska $683,824 in silver was imported.

Mexican dollars at New York, July 25, 61½c.; 26, 61½c.; 27, 60¾c.; 28, 60¾c.; 30, 60¾c.; 31, 61c.

Platinum—Steady at $105.

Palladium—Firm at $115, which price is bid to producers.

Zinc and Lead Ore Markets

Platteville, Wis., July 28—Blende, basis 60% Zn, $70 for premium ore down to $65 for medium grade. Lead ore, basis 80% Pb, $112@115. Shipments reported for the week are 3026 tons of zinc ore, 118 tons of lead ore, and 555 tons of sulphur ore. For the year to date the figures are: 80,990 tons of zinc ore, 3843 tons of lead ore, and 16,907 tons of sulphur ore. Shipped during the week to separating plants, 3356 tons of zinc ore. Several mines have been closed down due to low prices and unsatisfactory market conditions and prospect work has been curtailed.

Joplin, Mo., July 28—Blende, per ton, high $76.70; basis 60% Zn, premium ore, $75, medium to low, $70@65; calamine per ton, 40% Zn, $42@40; average selling price, all grades of zinc, $65.22 per ton.

Lead, high $127.40: basis 80% Pb, $120@110; average selling price, all grades of lead, $121.35 per ton.

Shipments the week: Blende, 8348 tons, calamine, 959 tons, lead, 1556 tons. Value, all ores the week, $795,780.

Many of the sheet ground mines are and have for weeks been engaged in trimming pillars and sides of drifts preparatory to closing down the mines on account of the high cost of explosives and supplies. Three more finished work this week and were closed down, one to be removed at once to another field.

Other Ores

Chrome Ore—Business was done at $1 per unit, f.o.b., California, for ore containing minimum of 46% chromic oxide.

Fluorspar—Low grade British spar, for reasonably prompt shipment, is offered at $22 per 2000 lb., f.o.b., New York, for 75% calcium fluorite, plus and minus 50c. per unit above or below 75%.[1]

Iron Ore—Prices, delivered lower Lake ports are for old-range bessemer, $5.95; old-range nonbessemer, $5.20; Mesabi bessemer, $5.70; and Mesabi nonbessemer, $5.05.

Manganese Ore—Metallurgical ore is quoted at $1.20 per unit for high grade.

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[1] As quoted by Foote Mineral Co., Phila.

Pyrites—Spanish lump quoted at 15c. per unit on basis of 10s. ocean freight, buyer to pay war risk, excess freight and any duty. Ocean freights are 42s. 6d. from Huelva to southern ports, contracts having been made at that figure lately.

Tungsten Ore—Unchanged at $25 per unit for wolframite and $26 for scheelite.

Iron Trade Review

NEW YORK—Aug. 1, 1917

Active buying of iron and steel products by the Government, says "Iron Age," in some cases with prices stipulated, but for the most part at prices to be fixed later, is in contrast with the continued abstention of private buyers from the market. There is little dissent from the view that present conditions are likely to last for some time and that if meantime some of the price peaks come off the steel trade will not suffer.

PITTSBURGH—July 31

Stagnation continues to be practically the only feature of the iron and steel markets, and instead of the condition causing concern or dissatisfaction, the whole trade, producers and consumers, appear to be quite contented. There is a feeling of relief that the readjustment which all realized must come eventually, with a continually rising market, is now not very far distant. The furnaces and mills are well sold up, while buyers with trifling exceptions are covered, for months to come, and there is nothing to do but carry out the business entered on books. The bulk of the high-priced business done in recent months was for comparatively early deliveries and most of the material will probably have been shipped before the readjustment is fully under way. The Steel Corporation, for instance, has sold during the past three months, when it sold at all, only at prices below those currently quoted as the market, and so with the majority of the large interests, the fancy prices having been obtained by the smaller producers. The Steel Corporation's unfilled obligations decreased 500,000 tons during June and predictions of the July decrease run as high as 750,000 tons.

Production has been greatly curtailed by the extremely hot weather of the past few days by an average of 10 to 20%, the curtailment being particularly heavy because there are no extra men to take the places of those who lay off.

Pig Iron—A sale of 1000 tons of basic iron for prompt shipment was made yesterday at $52, valley, establishing the market at that level, a decline of $1 from last week's quotation and of $2 from the top price quoted on the movement, so that in pig-iron readjustment is already under way. The market in general is stagnant, inquiries being few, and limited to prompt deliveries. We quote: Bessemer, $55; basic, $52; foundry and malleable, $53@55, f.o.b. valley furnaces, 95c. higher delivered Pittsburgh.

Steel—Mills quote same prices as formerly, $95@100 for billets and $105@110 for sheet bars, but the few consumers who have been inquiring refuse to pay the price and say they will wait. They do not even make bids. Nominally the market is quotable at the old level but practically there is no market.

Ferroalloys

Ferromanganese—The market has proved fairly firm, when actual purchases are undertaken, and does not reflect conditions suggested by recent hearing reports. Prompt carloads bring $400 and less than carloads have sold up to $450. Deliveries over the remainder of the year are quotable at $375@400 and first half deliveries at $350@375.

Ferrosilicon—The 50% material is quoted at $225@250. Bessemer ferrosilicon, 12%, quoted at $100.

Spiegeleisen—Quoted at $80@85.

Iron Ore

Iron Ore—Lake shipments have been heavy in July though not entirely up to expectations as many boats lost a few hours' time awaiting unloading. Season prices are based on $5.05 for Mesabi non-bessemer, at Lake Erie dock.

Coke

Connellsville—After declining for three weeks following Independence Day, which witnessed the usual bulge in prices, the market has stiffened in the past few days, prompt furnace coke being quotable at $11@12. The stiffening is attributed to car shortage. The railroads had improved the supply but the operators were unable to load all the cars.

STOCK QUOTATIONS

N. Y. EXCH.†	July 31
Alaska Gold M	5
Alaska Juneau	3
Am.Sm.& Ref.,com.	102
Am. Sm. & Ref., pf.	113
Am. Sm. Sec., pf., A	98
Am. Sm. Sec., pf. B	91
Am. Zinc	25
Am. Zinc, pf	60
Anaconda	77
Batopilas Min	1
Bethlehem Steel.	132
Bethlehem Steel, pf.	115
Butte & Superior.	36
Cerro de Pasco.	34
Chile Cop	20
Chino	55
Colo.Fuel & Iron.	50
Crucible Steel	81
Dome Mines.	10
Federal M. & S	25
Federal M. & S., pf	53
Great Nor., ore ctf.	33
Greene Cananea.	43
Gulf States Steel	118
Homestake	101
Inspiration Con	56
International Nickel	38
Kennecott.	43
Lackawanna Steel	92
Miami Copper	41
Nat'l Lead, com.	56
National Lead, pf	109
Nev. Consol	22
Ontario Min	5
Quicksilver.	1
Quicksilver, pf	1
Ray Con	28
RepublicI.&S.,com.	90
Republic I. & S., pf	103
Sloss-Sheffield.	54
Tennessee C. & C.	17
U. S. Steel, com.	123
U. S. Steel, pf	119
Utah Copper.	104
Va. Iron C. & C	68

N. Y. CURB†	July 31
Big Ledge.	2
Butte & N. Y.	1
Butte C. & Z.	8
Caledonia	70
Calumet & Jerome.	1
Can Cop. Corpn	2
Carlisle	4
Cashboy	06
Con Ariz. Sm.	2
Con. Coppermines	7
Con Nev.-Utah	63
Emma Con	1
Ferber.	* 60
First Nat. Cop.	2
Goldfield Con.	59
Goldfield Merger.	05
Greenmonster.	1
Hecla Min	8
Howe Sound	5
Jerome Verde.	1
Kerr Lake	4
Magma	52
Majestic	42
McKinley-Dar-Sa.	.53
Mohican	[illegible]
Mother Lode	.36
N. Y. & Hond	12
Nipissing Mines.	7
Ohio Cop	1
Ray Hercules	3
Richmond	.65
Rochester Mines	.48
St Joseph Lead.	19
Standard S. L.	[illegible]
Stewart	[illegible]
Success	.20
Tonopah	6
Tonopah Ex.	2
Tribullion	[illegible]
Troy Arizona	21
United Cop	75
United Verde Ext	36
United Zinc	4
Utica Mines	27
White Knob, pf.	1
White Oaks	12
Yukon Gold	1

SAN FRAN.*	July 30
Alta	.03
Andes	11
Best & Belcher.	02
Bullion	.01
Caledonia	.08
Challenge Con	01
Confidence	05
Con Virginia	23
Gould & Curry	‡ 02
Hale & Norcross	03
Jacket-Cr Pt	08
Mexican	10
Occidental	1 65
Ophir	1 09
Overman	01
Savage	07
Seg Belcher	‡ 01
Sierra Nevada	10
Union Con	17
Utah Con	01
Belmont	4 00
Jim Butler	75
MacNamara	13
Midway	09
Mont.-Tonopah	19
North Star	10
Rescue Eula	18
West End Con	80
Atlanta	09
Booth	07
Comb. Frac	03
D'field Daisy	03
Florence	13
Jumbo Extension	24
Kewanas	13
Nevada Hills	70
Nevada Packard	32
Round Mountain	76
Silver Pick	10
White Caps	1 17
Big Jim	69
United Eastern	4 75

BOSTON EXCH.*	July 31
Adventure	2
Ahmeek	99
Algomah	.60
Allouez	62
Ariz. Com., ctfs	12
Arnold.	.25
Bonanza	20
Butte-Balaklava	.55
Calumet & Ariz	79
Calumet & Hecla.	535
Centennial	17
Copper Range	59
Daly West	1
Davis-Daly	5
East Butte	11
Franklin.	6
Granby	76
Hancock	14
Hedley	16
Helvetia	25
Indiana	2
Isle Royale	29
Keweenaw.	2
Lake.	11
La Salle	3
Mason Valley	8
Mass	13
Mayflower.	2
Michigan	2
Mohawk	80
New Arcadian	3
New Idria.	14
North Butte.	18
North Lake.	1
Ojibway.	1
Old Dominion	56
Osceola	84
Quincy	83
St. Mary's M. L.	77
Santa Fe	1
Seneca Mines	10
Shannon	7
Shattuck-Ariz.	23
So. Lake.	3
So. Utah	.15
Superior	8
Superior & Bost.	4
Trinity	7
Tuolumne	1
U. S. Smelting	57
U. S. Smelt'g, pf	49
Utah Apex	2
Utah Con	15
Utah Metal.	4
Victoria.	3
Winona	3
Wolverine	45
Wyandot.	‡ .45

BOSTON CURB*	July 31
Alaska Mines Corp	62
Bingham Mines	12
Boston Ely	71
Boston & Mont	78
Butte & Lon'n Dev	15
Calaveras	3
Calumet-Corbin.	01
Chief Con.	2
Cortez	20
Crown Reserve.	28
Crystal Cop.	1
Eagle & Blue Bell	2
Houghton Copper	95
Intermountain	1
Iron Cap, Com	15
Iron Cap Cop., pf.	15
Mexican Metals	27
Mines of America	1
Mojave Tungsten	.53
Nat. Zinc & Lead.	50
Nevada-Douglas.	1
New Baltic	1
New Cornelia.	17
Oneco.	.50
Pacific Mines	‡ 30
Rex Cons	.24

SALT LAKE*	July 31
Bannack	55
Big Four	18
Black Jack	.06
Cardiff	5 50
Colorado Mining	.17
Daly-Judge.	8.00
Empire Copper.	1 30
Gold Chain	18
Grand Central	‡ 60
Grand Gulch	19
Iron Blossom	90
Lower Mammoth	03
May Day	06
Moscow	15
Prince Con	1 05
Silver-King Coal'n	2 95
Silver King Con.	3 75
Sioux Con	10
So. Hecla	1 35
Uncle Sam	02
Wilbert	25
Yankee	07

TORONTO*	July 31
Bailey	‡ 03
Beaver Con	32
Buffalo Mines	1 00
Chambers Ferland	14
Coniagas	3 40
Hargraves	11
La Rose	45
Peterson Lake	10
Right of Way	05
Temiskaming	30
Wettlaufer-Lor	05
Dome Exten	16
Dome Lake	18
Foley O'Brien	60
Hollinger	4 10
McIntyre	1 51
Newray	63
Porcu. Crown	45
Schumacher	42
Teck-Hughes	48
Vipond	31
WestDome	19

STOCK QUOTATIONS—Continued

COLO. SPRINGS	July 31
Cresson Con.	6.00
Doctor Jack Pot.	.04
Elkton Con.	.05
El Paso.	.28
Gold Sovereign.	05
Golden Cycle.	2 11
Granite	.50
Isabella	10
Mary McKinney.	.15
Portland.	1 41
United Gold M	20
Vindicator	.70

LONDON	July 12		
Alaska Mexican	£0	10s	0d
Alaska Tre'dwell	1	0	0
Burma Corp.	4	3	9
Cam & Motor.	0	7	9
Camp Bird.	0	6	6
El Oro.	0	10	0
Esperanza.	0	9	6
Mexican Mines	4	7	0
Nechi, pfd	0	12	6
Oroville	0	16	3
Santa Gert'dis.	0	10	6
Tomboy.	0	18	6

* Bid prices. † Closing prices. ‡ Last Quotations.

MONTHLY AVERAGE PRICES OF METALS

Silver	New York			London		
	1915	1916	1917	1915	1916	1917
January	48.855	56.775	75.630	22.731	26.960	36.682
February	48.477	56.755	77.585	22.753	26.975	37.742
March	50.241	57.935	73.861	23.708	27.597	36.410
April	50.250	64.415	73.875	23.709	30.662	36.963
May	49.915	74.269	74.745	23.570	35.477	37.940
June	49.034	65.024	76.971	23.267	31.060	39.065
July	47.519	62.940	79.010	22.597	30.000	40.110
August	47.163	66.083	...	22.780	31.498	...
September	48.680	68.515		23.591	32.584	
October	49.385	67.855		23.925	32.361	
November	51.714	71.604		25.094	34.192	
December	54.971	75.765		26.373	36.410	
Year	49.684	65.661		23.675	31.315	

New York quotations cents per ounce troy, fine silver London, pence per ounce, sterling silver, 0.925 fine

Copper	New York		London			
	Electrolytic		Standard		Electrolytic	
	1916	1917	1916	1917	1916	1917
Jan	24.008	28.673	88.083	131.921	116.167	142.895
Feb.	26.440	31.750	102.667	137.895	133.167	148.100
Mar.	26.310	31.481	107.714	136.750	136.000	151.000
April	27.895	27.935	124.319	133.842	137.389	147.158
May	28.625	28.788	135.457	130.000	152.522	142.000
June	26.601	29.962	112.432	130.000	137.455	142.000
July	23.865	26.620	95.119	128.409	125.500	140.409
Aug	26.120	.....	110.283	.	126.304	
Sept	26.855	.	113.905	.	134.071	
Oct	27.193		122.750	.	142.523	
Nov	30.625		134.659		155.432	
Dec	31.890		145.316		162.842	
Year	27.202	..	116.059	.	138.281	

Tin	New York		London	
	1916	1917	1916	1917
January	41.825	44.175	175.548	185.813
February	42.717	51.420	181.107	198.974
March	50.741	54.388	193.609	207.443
April	51.230	55.910	199.736	220.171
May	49.125	63.173	196.511	245.114
June	42.231	62.053	179.466	242.083
July	38.510	62.570	168.357	242.181
August	38.565		169.870	
September	38.830		171.345	
October	41.241		179.307	
November	44.109		186.932	
December	42.635		183.368	
Av. year	43.480		182.096	

Lead	New York		St. Louis		London	
	1916	1917	1916	1917	1916	1917
January	5.921	7.626	5.820	7.530	31.167	30.500
February	6.246	8.636	6.164	8.505	31.988	30.500
March	7.136	9.199	7.375	9.120	34.440	30.500
April	7.630	9.288	7.655	9.158	34.368	30.500
May	7.463	10.207	7.332	10.202	32.967	30.500
June	6.936	11.171	6.749	11.123	31.011	30.500
July	6.352	10.710	6.185	10.644	28.137	30.500
August	6.244		6.088		29.734	
September	6.810		6.699		30.786	
October	7.000		6.898		30.716	
November	7.042		6.945		30.500	
December	7.513		7.405		30.500	
Year	6.853		6.777		31.359	

Spelter	New York		St. Louis		London	
	1916	1917	1916	1917	1916	1917
Jan	16.915	9.019	16.745	9.449	89.810	48.379
Feb	18.420	10.045	18.260	9.875	97.762	47.000
Mar	16.846	10.300	16.676	10.130	95.048	47.000
April	16.695	9.459	16.525	9.289	99.056	54.632
May	14.276	9.362	14.106	9.197	94.217	54.000
June	11.752	9.371	11.582	9.201	68.591	54.000
July	8.925	8.643	8.755	8.473	50.750	54.000
Aug	8.730		8.560		51.587	
Sept	8.990		8.820		52.095	
Oct	9.829		9.659		54.159	
Nov	11.592		11.422		56.023	
Dec	10.665		10.495		65.842	
Year	12.804		12.634		72.071	

New York and St. Louis quotations, cents per pound, London, pounds sterling per long ton. ‡ Not reported

Pig Iron, Pitts.	Bessemer‡		Basic‡		No. 2 Foundry	
	1916	1917	1916	1917	1916	1917
January	$21.60	$35.95	$18.78	$30.95	$19.70	$30.95
February	21.16	36.37	18.93	30.95	19.51	30.95
March	21.81	37.37	19.20	33.49	19.45	35.91
April	21.65	42.23	18.95	38.90	19.45	40.06
May	21.78	46.91	19.11	42.84	19.58	43.60
June	21.95	54.22	18.95	50.05	19.34	50.14
July	21.95		18.95		19.70	
August	21.95		18.95		19.22	
September	22.88		19.58		19.53	
October	24.61		21.26		21.61	
November	30.07		28.18		26.55	
December	35.16		30.95		30.79	
Year	$23.88		$20.98		$21.15	....

‡ As reported by W. P. Snyder & Co.

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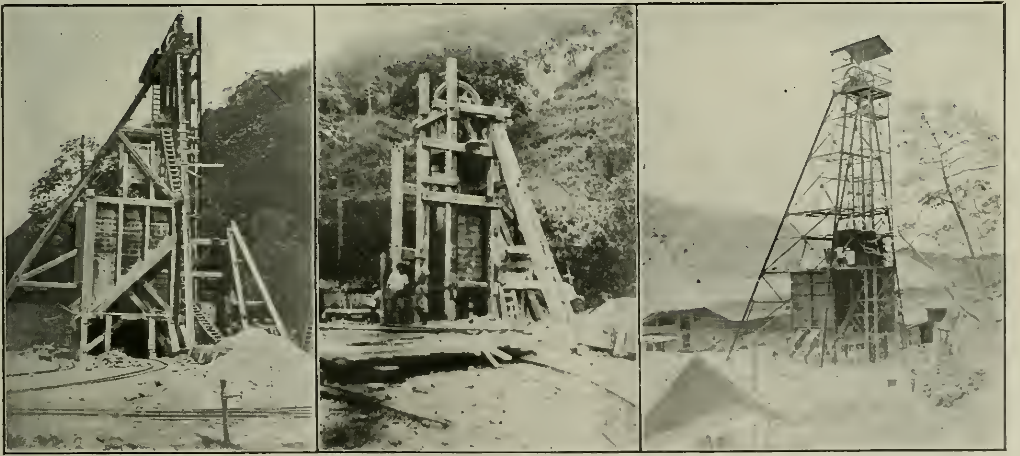
A Steel Headframe in Ecuador

BY W. A. WOLF AND T. L. CHAPMAN*

The South American Development Co. has erected a 90-ft. headframe at its Zaruma mines in Ecuador, South America. The mines are three days by muleback from river transportation during the dry season, when the trails are in comparatively fair condition; during the six months of rain but little freight is carried, the trails being almost impassable. All material is transferred to river boats at Puerto Bolivar, the nearest port, about 100 miles south of Guayaquil. Small river steamers make the trip up the river in from six to twelve hours.

THE headframe is of the "A" type, with two sheaves for hoisting in counterbalance, the distance from the collar of the shaft to the sheaves and to the peak of the roof being 80 ft. 6 in. and 92 ft. respectively. The distance from the center of the two-compartment shaft to the center of the hoisting drum is 92 ft. 6 in.



Old Headframe Temporary Headframe New Headframe

HEADFRAMES AT ZARUMA MINES, ECUADOR, S. A.

The steel framework, supplied by the Lackawanna Bridge Co., was designed for a working load of approximately 16,000 lb. and consists of the 80-cu.ft. skip with its load of four tons, the cage and 1000 ft. of 1-in. rope. The resultant of the stresses in the hoisting rope falls two feet within the center plane of the back braces.

A general view of the structure is shown in the accompanying drawing with the horizontal cross-bracing part of the ore bin and minor details omitted. The steel is medium steel supplied under "Manufacturers' Standard" specifications. The members were painted with two coats of Detroit graphite at the shop and one coat of red graphite after erection. The steel is not subjected to warm moist mine air, as the shaft is downcast.

The main front columns and back braces, excepting the lower sections, are of two built-up 6 x 6 x ⅜-in. angles. In the lower panel they are made-up sections of two 6 x 6 x ⅜-in. angles and two 4 x 3 x ¼-in. angles with ¼ x 2-in. lacing bars.

The sheaves, carried on plate diaphragms, with their center line parallel to the center line of the back bracing, are 7 ft. in diameter and carry a 1-in. plow-steel hoisting rope. Each sheave is sectionalized, consisting of 14 parts—6 spokes, 6 rim segments and 2 hub sections. The total weight of each sheave, including the 6-in. shafting to which it is keyed, is 2209 lb. The sheave platform is wood-covered and has a wooden handrailing. An iron ladder attached along the center line of the diagonal back bracing runs from the ground to the sheave platform. The guides, in front of the plane of the main columns, are of hardwood indigenous to the country and are the same as are used in the shaft.

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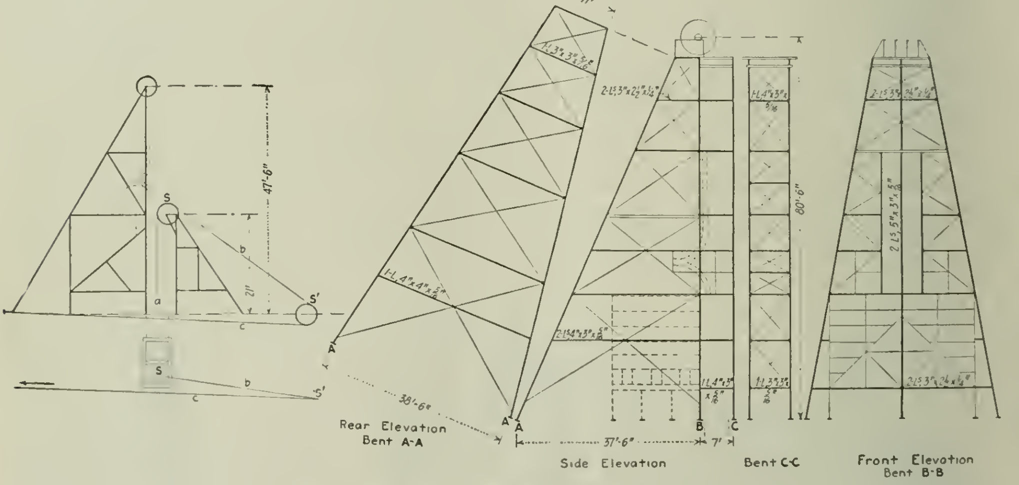
*Guayaquil, Ecuador, S. A.

The self-dumping, four-ton, Kimberley-type skip, of the usual design, is of ¼-in. plate with additional wearing plates and is suspended beneath the cage. The cage is inclosed and fitted with gates and safety dogs. The cage and skip combined weigh 5750 lb. A Wellman-Seaver-Morgan safety detaching hook is also provided. The cage, skip and sheaves were built by the Allis-Chalmers Company.

The hopper-type ore bin, wood-lined and faced with ¼-in. steel wearing plates, has a capacity of 200 tons. It is divided into two compartments by a hinged door. At present one side is for ore and the other for waste.

Muleback is the only means of transportation. This and the condition of the trails prohibit shipping material in heavy pieces or in long lengths.



HEADFRAME AT ZARUMA MINES, ECUADOR, S. A.

The structural steel, total weight of 108,688 lb., was shipped in 2337 pieces, packed into 410 bundles, the heaviest piece weighing 210 lb. The longest piece was nine feet in length. Rivets, bolts, corrugated iron, etc., made an additional 150 packages. The costs of the headframe, including cages, skips and sheaves, from manufacturers to destination at the mines, are shown in the table.

COST OF THE HEADFRAME

F. O. B. New York	$6,607 87
Ocean freight	1,143 42
Port charges at Puerto Bolivar	793 89
River steamer and transfer	134 04
Muleback transport	1,755 62
Total ..	$10,434 84

All ore for the mill and waste rock from the mine are hoisted through the one shaft. The old headframe was torn out and replaced by the steel structure without interruption to hoisting or interfering greatly with the regular mine work. This was accomplished by the use of a small temporary headframe built on the opposite side of the shaft.

The old frame was a wooden structure of the "A" type, 47 ft. 6 in. in height, the front legs, back and side braces being of timber built up by nailing and bolting 2-in. plank together. The combined capacity of the ore and waste bins was about 80 tons. Rock was hoisted in a 20-cu.ft. self-dumping skip with a ¾-in. steel hoisting rope passing over a sheave 48 in. in diameter.

The work preliminary to the erection of the steel was effected by concreting the upper part of the shaft, erecting the temporary headframe, razing the old headframe and concreting foundations for the new headframe.

It was decided to concrete the shaft to a depth of 25 ft. below the surface, the ground around the collar being loose. From a depth of 25 to 50 ft. the ground was firm, the space between the lagging of the shaft sets and the ground being filled with loose rock. This section was relagged with 2-in. hardwood lagging and a cement grout, one of cement to ten of sand, forced in by gravity to bind this loose rock. After the completion of the grouting, the ground around the shaft was excavated to a depth of 25 ft., or to the top of the grouting, a heavy truss first having been placed to support the front legs and the front posts of the old headframe and its ore bin, as on excavating the ground was taken from under these members. The ground being loose, spiling was necessary. The shaft sets were well braced.

The base of the concrete walls around the shaft was made 4 ft. wide and sloped in to 8 in. except at the front corners and the back center, the concrete at these points being made 2 ft. thick as they are foundation points for three of the members of the steel structure. Board forms secured to the shaft timbers were used only on the inside of the walls, a rock wall being built for the back form as the concreting advanced. A 1:3:6 mixture was used. The walls were reinforced with No. 7

COST OF CONCRETE GROUTING

	Supplies	Labor
Cement ..	$785 18	
Hardware	68 28	
Timber	229 16	
Excavations		96 00
Lagging		123 14
Forms		192 10
Mixing and pouring		382 56
Machine shop		14 98
Carpenter shop		25 95
Total	$1,082 62	$834 82
Total, supplies and labor		$1,917 44

triangular mesh and ¼-in. twisted bars. Filling of the excavation back of the rock wall with broken rock and dirt, dampened and tightly tamped, was also carried along with the concrete. Grouting the shaft and concrete for the collar required 257 sacks of cement. Costs of relagging, grouting and concreting were as given in the accompanying table. Cost of obtaining sand and rock is included in the table.

The Temporary Headframe

The temporary frame, 21 ft. in height and placed on the opposite side of the shaft, was made sufficiently high for the skip to dump directly into a car, a short lip between the dumping plates being all that was necessary. The front legs, side and back bracing were built-up 7 x 10-in. timber made of 2 x 7-in. plank nailed and bolted together.

The hoisting rope was carried almost horizontally on rollers from the drum to an auxiliary sheave placed on the opposite side and 24 ft. beyond the center of the shaft and to one side of a line through the center of the drum and the center of the hoisting compartment, so that the cable carried horizontally would clear the shaft collar. Positions of the headframes and the auxiliary sheave are shown in the illustration, the head sheave being in the plane of the rope aSb, the auxiliary sheave in the plane of the rope $bS'c$.

In changing from the old to the temporary frame the only hoisting time lost, about one hour, was in lowering the head sheave from the old to the temporary frame and placing the cable in its new position. The total cost of the temporary structure was $619.96, of which $197.79 was for supplies, mainly timber, and $422.16 for labor.

Removing the Old Headframe

The razing of the old frame was without incident. Several days were required as it was taken down in sections. The shaft opening was carefully housed to prevent objects from falling into the shaft. Excavating, building of forms and the mixing and pouring of concrete for the foundations of the steelwork followed the removal of the débris of the old frame.

Excavations for the foundations were made to a depth of about 3 ft. 6 in. The forms were brought up about 1 ft. 6 in. above the surface of the ground, the shaft collar having been raised that amount. The total area of the base of the foundations approximates 400 sq.ft. exclusive of the shaft collar. The foundations contain about 1200 cu.ft. of concrete, which required 192 sacks of cement, using a 1:3:6 mixture, the volume being augmented by the addition of large rock to the base of the foundations.

COST OF THE FOUNDATIONS

	Supplies	Labor
Excavations	$0 89	$98.08
Cement	586 60	
Forms	92 11	65 43
Mixing and pouring		163 38
Foreman		85 80
Total	$679 60	$412 69
Total supplies and labor		$1,092.29

Erection of the steel followed the completion of the foundations, as many sections as could be readily handled having previously been assembled and riveted on the ground. Sections 15 to 25 ft. long, weighing up to 1000 lb., were built up and riveted on the ground. For swinging the steel to position a 50-ft. gin pole was used, the pole being raised and lashed to the steel in place as the work progressed. All hoisting of steel was done by hand with block and tackle. During erection the parts were bolted, riveting being done above ground only after the frame was completely assembled. Over 12,000 rivets were used on the frame; about 1600 were shop-driven, and about 5000 were driven on the ground previous to erection, the remainder being driven after all the steel was in position. All riveting was done with pneumatic hammers.

The steel was placed and bolted in position in 37 working days. Two months were spent in replacing the bolts with rivets, lining the ore bin, building chutes and placing the sheaves. The temporary headframe, which had been in use for 4½ months, was removed; three shaft sets at the collar were taken out and replaced by two; the last of the steel, which could not be placed until after the removal of the temporary frame, was riveted into place, and the hoisting rope and skip were changed. Hoisting was interrupted by this work for only 17 hours. The first skip load of rock was hoisted, using the new structure, on Oct. 6, 1916.

The cost of assembling and erecting of the steel frame was as shown in the tables.

COST OF ERECTING THE HEADFRAME

	Supplies	Labor
Assembling	$261 51	$738 27
Erecting	973 65	2,742 16
Painting	118 07	38 40
Wiring	13 50	16.32
Lining ore bins	703 44	201 15
Supervision		657 79
Total	$2,070 17	$4,394 09
Total, labor and supplies		$6,464 26

In the last table all costs are included from the commencement of the preliminary work in the shaft to the completion of the structure.

TOTAL COST OF THE HEADFRAME

	Supplies	Labor
Shaft collar	$1,082 63	$834 83
Temporary headframe	197 79	422 16
Foundations	679 61	412 68
Assembling and erection	2,070.17	4,394 08
Total	$4,030 20	$6,063 75
Total, labor and supplies		$10,093 95

All work except the assembling and erection of the steel, which was under the supervision of John Paul, master mechanic, was directed and supervised by the mine staff.

Canadian Research

The activity of the Canadian Research Council is described by its chairman, Prof. A. B. McCallum, in an interview appearing in a recent issue of the *Canadian Engineer*. The chief problem before the council is that of making lignites economically usable. In some countries this is done by carbonizing and briquetting with tar or pitch. But lignites vary so greatly in composition that a treatment that is useful with one may be worthless with another.

The council is also considering the practicability of using the tar sands of Alberta as road material. Other subjects of research are reforestation and the production of phosphates and potash. The German supply of the latter being cut off, feldspar is being looked to as a possible source, though no means of utilizing it have as yet been discovered.

The fixation of atmospheric nitrogen for the manufacture of nitric acid and ammonia is being studied at the request of the Imperial Munitions Board.

Observations on Sinking Pumps

By J. F. Kellock Brown*

From a varied experience in the use of sinking pumps the author points out some of the shortcomings in their design. The subject is treated entirely from the viewpoint of the user of sinking pumps. It might be impossible to design a pump to overcome all the objections mentioned, but several pertinent suggestions and remedies are given.

THE following notes are the outcome of considerable practical experience with many sinking pumps operated under a variety of conditions. They are written from the viewpoint of the man who has had to handle this class of plant on the ground, and for that reason they will in all probability not be gratifying to the pump maker. There may be all sorts of mechanical disadvantages in connection with some of the ideas brought forward, but I have hardly ever handled a sinking pump without wishing that I had a pump designer standing in the pouring wet shaft beside me.

There are undoubtedly many sinking pumps that are excellent machines mechanically; that is, under ideal conditions, they do their work with satisfaction and some perfection, but put to the test under adverse conditions, which usually appear in shaft-sinking work, where water is troublesome and the going bad, there nearly always appears about the pump some point that is capable of improvement. In other words, it would seem that designers have paid sufficient attention to the proper design of the pump itself, but not enough to the general conditions under which it has to work.

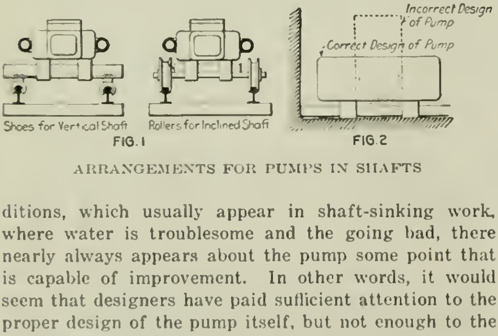


FIG. 1 FIG. 2

ARRANGEMENTS FOR PUMPS IN SHAFTS

First, consider the handling of the pump in vertical shaft-sinking, in which heavy water is encountered, and which may not or not require heavy timber. Getting a small sinking pump down a shaft of this type is an operation that absorbs the energies of the entire force. The pump has to be hauled over the ground on skids, lifted by main force upon the platform at the shaft collar and the hoisting rope attached. If the hoist is too small for the work, trouble begins with the failure to lift the pump. Perhaps the hoistman thinks he will take a running jump at it, so he gets a good head of steam, uses a little slack, and does enough to jerk one end of the pump off the platform. This more than likely causes it to swing round suddenly and erratically; everybody gets out of the way to avoid smashed feet, and the pump swings with a jerk and a jar on the rope, into the shaft, while congratulations are rife if no further damage is done, which would be a miracle. Should the pump, however, prove too heavy for the hoist, the work is at a standstill until someone takes a 40-mile journey out to the nearest station and waits there a week for a single block of sufficient size to take the hoisting rope without damaging it through bending round too small a radius. Makers of course contend that the provision of such a block for an emergency of this nature has nothing to do with the design of the pump. To this contention I agree, but I might add that it would aid their sales if they would confer with their customers and find out the conditions under which the pump is to be used, the size of the hoist, and if too small, recommend and provide such a block ready made to assist in the work, thus ensuring good results.

Difficulties in Getting the Pump Down the Shaft

Having raised the pump either by sheer lift or by dividing the load between the headframe and the hoist, it is swung clear in the shaft, swaying about from side to side. All parties make a grab at it to steady it, and one man is saved from falling down the shaft by the slack of his pants. Down it goes slowly, while a few of the more venturesome follow it cautiously down the ladderway. If the shaft is sunk at a slight inclination, one corner of the pump sooner or later catches on the walls, and the pump rolls over and smashes part of the ladderway, if it does nothing else. The damage having been repaired, pinch bars are brought down to roll the pump over again. Some engineer who passed his examinations in brilliant style, in order to get what he thinks is a good leverage, inserts the end of his bar between the pump casing, or waist piece, and the piston rod. Not quite satisfied with the power he is exerting, he sits down on the ladderway and shoves with his feet against the end of the bar. United energy turns the pump, and the aforesaid engineer sustains an unexpected descent and is only rescued by quick work on the part of someone else. In the resultant effort the pump rolls completely over the other way, and the outstanding pinch bar takes another workman below the knee, laming him for a week. On perhaps the third attempt in the confined space, the pump rights itself and an examination in the half-light available discloses the fact that the piston rod looks somewhat the worse for usage, and the pump has to go to the surface for overhauling, which cannot be done in the shaft. And so the work goes on with a great waste of time and expenditure of effort, partly through ignorant labor and lack of proper directive knowledge, but mainly because there is no simple, easy system of getting sinking pumps up and down a shaft. These pumps have to be taken up and sent down many times because there is something wrong with them, and although the labor force improves with practice, the operation of hoisting and lowering is always troublesome and often dangerous.

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*137 McGill St., Montreal, Que., Canada

Some makers think they provide against the cause of these difficulties by supplying skids beneath the pump. They are made of wood, however, and the effort expended in trying to overcome the friction of wet wood-slides against wet wooden barring or close timbering that is not exactly flush is greater than any advantage that is gained. There is also little benefit, except that it protects the under side of the pump where there are rock walls whose projections would otherwise catch first one side and then the other, causing the pump to tilt easily and roll over. In a vertical shaft these troubles are not so great, but the dangers from swinging and twisting are increased.

Runways Should be Provided

To overcome these difficulties, is it not possible for pump makers to provide a simple runway of small rails, built in short sections capable of being extended and driven into position by a wedge? On this would run a rectangular carriage bolted to the pump, the gage being wider than the pump. Before taking down the pump, this runway would be spiked to the timbers and a length left below, projecting into the water. On being raised, the carriage and the pump attached to it would be placed on this runway, and it could then be slowly and steadily slid into position. As the carriage would be broader than the pump, there would be no tendency to overturn. In this manner a sinking pump could be raised and lowered with a maximum of ease and without a great waste of time. In the vertical, or nearly vertical, shaft the small wheels of the carriage could be replaced by guide shoes, as shown in Fig. 1. The slight sacrifice made in space, which need not be more than a few inches, is more than offset by the greater ease in handling. There is no disputing the fact that a sinking pump has to be raised and lowered in shaft work from a variety of causes—in firing shots, for breakdowns, changing suction hose, changing pipes, timbering—and in a confined space with a constant stream of water pouring down, the slowness of the work is exasperating. Pump makers have eliminated a great many of the troubles of faulty design of the past, and if they would now turn their attention to the provision of some easy means of raising and lowering, many mining men would be thankful.

Perhaps the next point that calls for consideration is the shape and balance of the pump. By shape, is meant the relation of the width of the base and the depth through the pump. To get easy handling, the base should be greater than the depth at any section of the pump, as shown in Fig. 2. If this is not the case, the pump is easily tilted and rolled over. There are a few sinking pumps on the market that are irregular in this respect, some part or other jutting out beyond the line of the center of gravity, causing the pump to be more susceptible to twisting and rolling over to that side. A pump with a broad base means stability and is not so dangerous to handle.

All Openings Should be on One Side of the Pump

This brings us to other points in the design of sinking pumps. Every door, and every set of bolts on the pump, holding the door of the water chest and of the steam and valve chest, should be on the side of the pump toward the center of the shaft. A pump so built that the water door faces one way and the steam chest another way, at right angles to it, is storing up trouble for itself as soon as conditions require the pump to go into a corner of the shaft. A pump of this awkward design must be shifted from its position every time something has to be examined inside or the valves cleaned. Moreover, it is easier to have a man who has to stand on awkward footing, work at bolt heads in front of him rather than stretch around corners after them.

The next point concerns the pipe connections for inlets and outlets. These commonly are placed at right angles to the length of the pump. This arrangement not only causes an abrupt right angle bend, but also gives rise to troubles from another source. In order to minimize time lost in the shaft and to do as much work as possible on the surface where conditions are more favorable, short lengths of pipe or nipples of the proper size are inserted in the exhaust, steam, and discharge outlets, before the pump goes down. But in lowering the pump these nipples are often broken off within the thread of the casing, which causes much trouble in taking the broken parts out. The alternative of putting together these nipples, elbows, and unions (all from awkward position in the shaft) is a slow and troublesome task. Unless the men are familiar with the work, it necessitates much running up and down to get the proper sizes, loss of others in the sump below, perhaps accompanied by some wrenches that can ill be spared. There is surely no mechanical objections to designing a pump in such a manner that the pipes enter and leave parallel with the length of the pump. This would not only make the pump easier to handle in itself, but it would also facilitate the attachment of the pipe lengths. Again, is there not such a thing as a good reliable tight swivel joint that could be profitably used on all these pipe lines and placed on the pump on the top of the short entrance piece? As already stated, the pump and the piping cannot always be maintained in a parallel line, and it is always difficult to make the pipes come near to their proper positions on the pump. A joint that would permit play at this point would tend to make the handling of the sinking pump quicker. Unless one has stood in a shaft in which the water is rising steadily and fast, he cannot appreciate how anything that would aid speedy work is to be so desired.

Put Folding Steps on the Bottom of the Pump

A sinking pump is usually placed in a corner out of the way of the ladder and bucket run. This may require a staging over to the pump on which a man can stand while working. Usually when a breakdown does occur, it is found that this has yet to be done, and all the time the staging is being built the water is rising and driving the men away from their work. Is it not possible to have two folding steps attached to the foot of the pump. On which a timberman or pumpman could stand, as shown in Fig. 3. If in addition he had a strap passed round his waist and hooked to some part of the pump or to some special hook provided on the pump, he would be in the most natural position to work at the most troublesome part of the pump (the water chest), would have both his hand free and would be independent of a staging that would have to be put in every time the pump was lowered.

The rods by which a sinking pump is suspended should be adjustable, so that the pump may hang vertically or be made to lean either in or out at the foot as required, as shown in Fig. 4. There are many occasions when a pump that hangs away from the shaft wall at the bottom is much easier to get into position than one that is apt to dig its nose into every spike and rock projection on the way down. There should be little difficulty about this.

USE COMMON BOLTS AND NUTS INSTEAD OF STUD-BOLTS

Then there arises the question of stud-bolts versus common bolts and nuts, and despite difficulties of design and the additional weight that has to be added to get this, the common bolts are preferable. Everyone knows the condition of the pump which has its water-chest cover or steam-chest cover held in position by two stud bolts while the rest have worked loose or been broken off short. A pumpman working with such a machine faces disaster every day, because there is no way of remedying the trouble except by sending the whole pump, or half of it, to the nearest machine shop, often many miles away. If common bolts had been used, it would have been easy to stock a few sizes and replace them when broken or lost down the shaft. The use of stud and common bolts are shown on the right of Fig. 3. These same reasons make it advisable to have the nuts, single or double, holding the plunger to the continuation of the connecting-rod and the piston to the piston rod, replaced by keys. Nuts strip under hard usage, get lost and cannot be replaced or made on the ground, while at a pinch a key can be made that will temporarily answer the purpose.

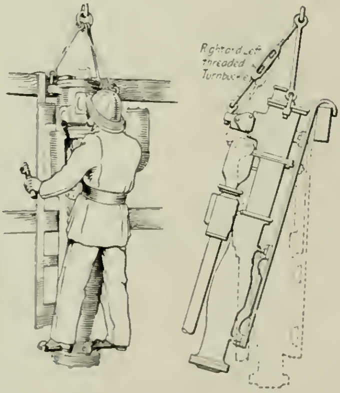

FIG. 3. SINKING-PUMP INSTALLATION

A plunger should not be threaded to the piston-rod continuation, but it should pass through the plunger. This has to be a water-tight connection or some day the plunger will be found split from a "freeze." The piston, piston rod and plunger must pull through the pump when the top cover is removed, and if designers would set their wits to devising means whereby some hold could be got on this piston and the rod, at the top, so that it could be hoisted from the pump if need be, they would be doing a favor to pumpmen. Such an arrangement would be a great deal better than the present practice of having a man driving the ram end with a billet of wood and a sledge hammer.

Pumps that are all arms and legs, levers and projecting arms are not suited for shaft work. These things get smashed, bent and broken too easily, but at the same time some arrangement of a bypass from discharge column to suction column is certainly handy. On the discharge column a valve immediately above the pump—a clack valve which will hold up the column of water—is useful, but it would be more useful still if some of the water in the discharge column could be utilized for flushing the water chamber and its valves under proper regulation.

HAVE OPENINGS LARGE ENOUGH TO GET HANDS IN

One sometimes wonders why it is that pump makers make the entrance to the water chest and the steam chest, or the steam-valve chest, so small that a man's hand can't get properly inside. This is especially true of the valve chamber in the water chest, which is apparently designed to admit a small, ladylike hand and not that of an average burly miner, who is lucky if he can get two fingers through with which to extract a piece of rock or other foreign matter that is interfering with the proper working of the pump.

The question of screwed-in valve seats compared with pressed-in and keyed seats is perhaps more for the designer to settle than the pump user, but the viewpoint of the man who has to run the pump should not be ignored. In general, seats that are pressed in are more easily removed, replaced, and in case of great necessity temporarily repaired by crude appliances on the site of the actual work, than is the screwed seat. Owing to rusting and other water effects, a threaded seat has most frequently to be cut out with hammer and chisel, an operation which under careless hands may destroy the corresponding thread in the casing and result in the whole pump being sent to the shop, to get rebored and rethreaded and finally ending up with valve seats of assorted sizes.

No doubt pump makers will despise these suggestions as being crude and at variance with good mechanical design and as being the cry of a crank on sinking pumps. But before they are finally dismissed one way or the other, let it be said that they are the results of some bitterly gained experience, of much standing in rubber boots on the water chest of the pumps, in oilskins and hat, with a hot steam exhaust enveloping the pump, and operating under conditions where to make any headway on the water, the change from an upper lift to a lower one had to be made at lightning speed.

Spanish Mineral Exports

Exports of metals and minerals from Spain for the quarter ended Mar. 31 are reported by the "Revista Minera" as below, in metric tons:

	Metals		Ores	
	1916	1917	1916	1917
Iron	21,569	29,005	1,117,111	1,152,302
Copper	4,316	3,997	14,717	3,172
Copper precipitate	3,026	2,825		
Lead	42,927	35,448	956	56
Zinc	1,122	202	28,532	5,661
Manganese			216	1,945
Quicksilver	417			
Pyrites			837,012	486,312

Iron exports include pig and manufactured iron and steel. Exports of salt were 86,917 tons in 1916 and 75,198 tons in 1917. Imports of coal were 479,729 tons, an increase of 26,790 tons; of coke, 24,826 tons, a decrease of 14,021 tons.

Metallurgy of Ferrochromium[*]

Ferrochromium in steel manufacture increases the tensile strength of the steel when added in small amounts. Chromium-bearing steels are harder than ordinary steels. Chrome steels are used in armor plate and in making armor-piercing projectiles. The manufacture and use of the alloy is described.

FERROCHROMIUM, like ferrosilicon, was one of the pioneer alloys made in the electric furnace at the time when this appliance was first used for the manufacture of ferro-products. As in the metallurgy of other ferroalloys, the technique of ferrochromium manufacture gradually has been improved. As an electric-furnace product, ferrochromium is second to ferrosilicon from the standpoint of tonnage.

Prior to the introduction of the high-temperature electric-melting furnace, the manufacture of ferrochromium was performed almost entirely in the blast-furnace stack, although a smaller amount was made in the crucible. Crucible manufacture gives high-tenor alloys, but several concomitant disadvantages are present. Only small charges can be fired at a time; the crucible cost is high, as special and expensive pots are required; and the alloys, though rich in chromium, are also comparatively high in impurities. The product is, therefore, not always satisfactory. For commercial purposes the electric furnace affords satisfactory appliance in which alloys high in chromium tenor and low in impurities can be smelted. The large quantities demanded in steel metallurgy for chromium steel production are now made by the electric furnace in the United States, Germany and elsewhere. Various double carbides of chromium and iron have been isolated by different investigators; these double carbides consist of Cr_3C_2 and Fe_3C in varying proportions. The carbide, $Fe_3C.3Cr_3C_2$ was isolated by Carnot and Goutal from a ferrochromium alloy analyzing 59% chromium and 9% carbon, according to Leon Guillet. The same workers showed the presence of the double carbide $3Fe_3C.Cr_3C_2$ in a chromium-bearing steel containing 2% chromium and from 0.5 to 2% carbon. Moissan produced the chromium carbide Cr_3C_2 in his electric-furnace experiments. According to F. Robin, Williams made $3Fe_2C.2Cr_3C_2$ in the electric furnace.

THE MODERN FERROCHROMIUM

The modern ferrochromium is a high-percentage alloy, containing 60% chromium or more, and the physical properties are directly a function of the amount of carbon present. Thus, as regards color, ferrochromium containing 0.5% carbon is bright gray in color, not unlike lead in appearance, while that with 2.5% carbon resembles aluminum, and an alloy containing 5.5% carbon resembles gray iron in color. Ferrochromiums containing less than 5.5% carbon are magnetic, the magnetism varying with the carbon content; while alloys containing 7.5 and 9% carbon are nonmagnetic, according to Keeney.

It is not an uncommon occurrence to hear of cases of disintegration in shipments of ferrochromiums, as with ferrosilicons, but to date no evidence of accidents, either fatal or otherwise, in connection with the evolution of gases from ferrochromiums have been reported. As far as I know, ferrosilicon is the only ferroalloy that exhibits the phenomenon of giving off noxious and poisonous gases. It has been claimed that the presence of an excess of aluminum in ferrochromium will give rise to a tendency to a spontaneous disintegration accompanied by the evolution of phosphine, PH_3. In June, 1910, Copeman, in England, reported that samples of a consignment of ferrochromium from France had disintegrated, evolving an "acetylene-smelling" gas. The samples disintegrated upon exposure to air and moisture, and apparently gave off large quantities of phosphine. However, this shipment had an unusually large percentage of silicon present, and this fact was supposed to be the cause of the crumbling of the material and the concomitant gas evolution. Prior to 1899, or at the time when the electric furnace came into use, ferrochromium was made either in the blast furnace or in crucible pots. Up to the present time it has been made in crucibles, blast furnaces, electric furnaces and by the Goldschmidt thermit process. The latter process can give a carbon-free product of high purity, showing 98 to 99% chromium on analysis. Neumann, Moissan, Keeney and others experimented in the production of ferrochromium by the electric-furnace process, and the results of the latter have been set forth in several writings in current technology.

TABLE I. ANALYSES OF FERROCHROMIUMS

Kind of Alloy	Elements in % Cr	Fe	C	Si	Al	Mn	Ca	S	P
Blast furnace..	30.00 to 40.00	....	6.00 to 12.00		...	....	....	.....	
Blast furnace..	41.39	....	7.12	0.21		1.84		.....	0.052
Crucible....	19.80		3.80			0.33			
Electric furnace	54.50	22.00	9.50	2.25	0.80	0.15	0.25	0.04	0.03
Electric furnace	60.90	31.60	6.10	1.10					
Electric furnace	63.50	35.00	0.60	0.20	0.10	0.10	0.35	0.03	0.02
Electric furnace	63.50	21.50	7.50	5.80	0.80	0.15	0.25	0.04	0.03
Electric furnace	64.00	28.50	5.50	0.40	0.50	0.15	0.25	0.04	0.03
Electric furnace	64.00	31.00	3.50	0.30	0.40	0.15	0.30	0.04	0.02
Electric furnace	64.50	22.00	9.50	2.25	0.80	0.15	0.25	0.04	0.03
Electric furnace	68.24		1.00	1.85	0.50	...	...		
Electric furnace	70.96	23.23	5.21	0.50	.	....	....	0.078	0.008
Electric furnace	96.00 to 98.00	2.00 to 3.00	0.75 to 1.25	0.05 to 0.75	..	....	...	.	

ELECTRIC FURNACE USUALLY USED

Only a small amount of ferrochromium is made in the blast furnace at the present writing for the reason that the electric furnace is more efficient, where the power cost is low; and further, the electric furnace turns out a better product. When ferrochromium is made in the blast furnace, it requires a heavy fuel consumption for its successful manufacture. About three tons of fuel per ton of the 40% alloy are used. The blast furnace product is normally rather high in combined carbon and may contain sulphur. According to Keeney, theoretically, it should be possible to secure a ferrochromium containing 65% chromium from a chromiferous ore containing 60% Cr_2O_3 and 20% FeO, but usually the result is an alloy analyzing about 30 to 40% chromium and 6 to 12% carbon. The modern method of making ferrochromium then, as already stated, is in the electric furnace, although a lesser quantity is produced by the thermit method.

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[*] An article by Robert J. Anderson in "Iron Trade Review," July 12, 1917, reprinted by courtesy of the publishers.

Generally speaking, the iron-chromium alloy produced in the electric furnace analyzes about 60 to 65% chromium and from 5 to 9% carbon. This product may receive a subsequent refining and decarburization on treatment, which gives a low-carbon alloy. Analyses of ferrochromiums are given in Table I. As may be noted, the impurities in the electric furnace alloys are normally quite low; the carbon may vary from 0.60 to 9.50%, dependent on the amount of this element desired in the alloy.

WHERE CHROMITE IS FOUND

The raw materials used in chromitic smelting are chromiferous iron ore, or chromite, and anthracite coal, coke or charcoal as a reducing agent. Chromiferous iron ores from Canada, Cuba, Turkey, New Caledonia, New South Wales and California have been used in smelting. The only commercially important ore of chromium is chromite, $FeCr_2O_4$. The ore is widely distributed in the United States, being found particularly in California, in Monterey and Santa Clara Counties; in Maryland, near Baltimore in the Bare Hills; and in Massachusetts, North Carolina, Pennsylvania and Wyoming. Almost the entire production in the United States since 1880 has come from California. The ore is mined also at Brusa, in Asia Minor, about 60 miles from Constantinople; in New Caledonia and in the Urals. Canada has turned out increased tonnages in late years; ore is found at Bolton and Ham, Quebec. Chromite occurs in basic igneous rocks like gabbros and peridotites, particularly those containing olivine; these rocks readily decompose to serpentine, so that much chromite is taken from serpentic rocks. Typical analysis of chromiferous iron ores used for smelting are given in Table II.

TABLE II. ANALYSES OF CHROMIFEROUS ORES

	Percentage Composition									
Kind of Ore	Cr_2O_3	FeO	Al_2O_3	MgO	CaO	Si_2	MnO	P_2O_5	S	H_2O
Cuba	50 0	18 57	12 44	13 38	2 16	3 82		0 45	0 69	
California	52 68	15 30	11 40	16 23		3 40	0 15			0 94
Turkey	51 7	14 2	14 1	14 3	1 7	3 5				0 3
Turkey	52 8	10 24	10 48	13 96	2 37	0 2	0 2	0 05		1 05
New Caledonia	55 7	13 2	16 2	9 8	0 25	6 95			0 06	

The composition of the ore varies considerably according to the sources, but an average analysis for that used for electric-furnace smelting is: 50% Cr_2O_3; 25% FeO; 10% Al_2O_3; with CaO, MgO, SiO_2, etc., variable within rather wide limits.

Electric furnaces for the production of ferrochromium are similar to either the Siemen's crucible furnace or to the Heroult furnace. The method of producing ferrochromium for the market is essentially as follows: Finely ground chromiferous iron ore is mixed with anthracite coal and shoveled into the furnace around the electrodes, charging being continued at periodic intervals so that the top of the mix remains unfused. The reduction takes place and the alloy is tapped from the furnace into iron receivers, which are dumped when the poured metal freezes. The product is broken and packed in kegs or boxes for shipment. Alloys containing as low as 5% carbon can be economically produced in one reduction, but for higher-grade ferrochromiums a subsequent refining is demanded.

In general, the first product contains from 60 to 65% chromium and from 5 to 9% carbon. To give the low-carbon alloy, this first product is then remelted and decarburized. In refining, the alloy is treated with a mixture of chromiferous ore, fluorspar and lime, the amount used being a function of the impurities to be removed. The alloy is covered with this mixture and heated. It is thus possible to reduce the carbon to as low as 0.25%, but the usual percentage is about 0.5.

Gustave Gin describes the decarburization of ferrochromium as follows:

"When fused carburized ferrochromium is superheated in the presence of an oxidizing slag and the entire mass allowed to cool, it is regularly found that as it cools down the surface of the previous tranquil bath becomes the seat of ebullition, at first slight, but increasing in intensity up to the moment immediately preceding solidification. It is likely that this ebullition is caused by the disengagement of the oxide of carbon due to deoxidation of the dissolved oxide by the carbon present in the alloy. It is naturally very difficult to account for these circumstances and the exact causes of the phenomenon, because in any of the observed cases neither the variations of heat of formation of the metallic carbide nor the oxide present are known nor are the variations of the specific heats of the components and the products within the temperature ranges considered known exactly. We feel, however, that this is an example of the principle advanced by Le Chatelier that an increase of temperature favors endothermic reactions and a lowering of temperature exothermic reactions."

Rossi, the well-known titanium investigator, has made ferrochromium in the electric furnace containing 68.24% chromium, 1.85% silicon, 1% carbon and 0.5% aluminum from an ore containing .50% Cr_2O_3. Neumann employed a ferrosilicon containing 91.65% silicon and 1.03% carbon, as a reducing agent for th production of ferrochromium. His product analyze 38.05% chromium, 2.53% silicon and 0.87% carbon Moissan made ferrochromium in the electric furnac by the reduction of chromite with carbon, obtainin an alloy analyzing 60.9% chromium, 31.6% iron, 6.1% carbon, and 1.1% silicon

TABLE III ANALYSES OF CHROMIUM-BEARING STEELS

	Elements %								
Use	C	Si	Mn	P	S	Cr	W	Mo	
Tool steel	1 16	2 89	0 21	0 047	0 038	2 74			
Tool steel	0 66	0 08	0 08	0 018	0 016	3 43	16 81		0 1
Tool steel	0 64	0 05	0 01	0 015	0 012	3 73	14 06		0 1
Tool steel	0 82	0 18	0 26	0 003	0 016	3 71	14 63	0 017	0 2
Tool steel	0 59	0 22	0 06	0 028	0 023	2 86	18 81		.
Axles: side, main and connecting rods	0 25 0 30		0 40 0 30			1 00			0 1 0 1
Axles, bolts, hammer rods	0 20		0 30 0 40			0 50			0 1
Car axles, holding bolts, etc	0 20		0 40			0 80			0 1
Wheels, gun barrels, crank pins	0 45 0 55		0 80 1 00			1 25			0 1
Casehardening steel for parts	0 12 0 15		0 20			0 30			0 1
Armor plate	0 25					1 50			N 3 2

CHEMISTRY OF THE ALLOY

Keeney has demonstrated that a chromium steel ca be made in the electric furnace directly from hematit and chromite; the control of the carbon in the produc by means of the carbon charged is difficult if chromiu s present. He also showed that ferrochromium can be readily made directly from chromite in the electric furnace; that the percentage of carbon in the ferrochromium cannot be held low by regulating the amount of carbon charged unless there be high chromium loss in the slag; that the percentage of carbon in the ferrochromium must be regulated by decarburization with an oxide slag of iron or chromite after tapping the slag from the first reduction; that the silicon and phosphorus cannot be held low in the product under the strong reducing action required, and that the sulphur can be caused to readily enter the slag.

In the crucible, chromiferous ore is reduced with carbon, using a flux consisting of lime, borax, fluoride or water glass. The thermit process is one of direct reduction, being dependent for its success upon the strong affinity of oxygen and aluminum, as is well known. The aluminum robs the chromite of its oxygen with the result that chromium is reduced.

A soft ferrochromium has been put out by the Sociéte la Néo-Métallurgie with as low as 0.25% carbon, and the Goldschmidt Thermit Co. makes carbon-free ferrochromium. The Sociéte has produced a ferrochromonickel containing 16 to 38% iron, 5 to 60% nickel and 24 to 27%; chromium has been made which contained 50% chromium, 8 to 10% silicon, 38% iron and 2% carbon.

Chromium in Alloy Steels

The use of chromium in alloy steels has markedly increased, and its employment promises to further increase on account of the special properties it confers upon the metal. It is desirable as an alloying constituent, also because it may be introduced with relative ease in the manufacture of alloy steels. In a word, the effect of chromium on steel may be briefly stated as follows: It does not act as a scavenger, removing oxides and occluded substances as do titanium, manganese and silicon, nor does it confer soundness on the steel in the manner of silicon and aluminum. Added in small amounts, it increasese the tensile strength of the steel to some extent, without markedly decreasing its ductility; but when added in too large amounts, it causes brittleness. Both of the foregoing effects are dependent upon the amount of carbon present.

Chromium, when added to steel, raises the normal critical range, thus causing the changes to take place at elevated temperatures and also more slowly. Hence chromium-bearing steels are harder than ordinary steels because quenching more effectively prevents the transformation of the austenite. When added to iron, chromium does not materially harden the metal, and chromium-bearing iron or very low-carbon chromium steel will not harden even when submitted to drastic water quenching. The chromium steels contain from 1 to 4% or more of chromium, and the carbon may range from 0.50 to 2%; such steels are normally employed in the hardened condition. Chromium is commonly associated with nickel or vanadium for special purposes. Table III gives some analyses of various chromium-bearing steels.

Chromium steels are well adapted for use in the manufacture of armor plate and for armor-piercing projectiles, as well as for automobile parts, and in other cases where great hardness and high tensile strength are desired. Chromium steels are employed for making steel tires and springs for railway purposes, file steel, plows, burglar-proof safes, automobile forgings, armor plate and armor-piercing projectiles, tool steels, axles, connecting, side and main rods; transmission parts, crankpins, gears, bolts, wheels, gun barrels, casehardening steels, and for some other uses. In combination with nickel, chromium forms the now well-known chrome-nickel steel of the trade. Recently it has been employed with tungsten for magnet purposes.

Manganese in Arkansas

Washington Correspondence

Much attention is being focused on the maganese development in progress in west-central Arkansas. Owing to the important part that this region may play in the ability of the United States to care for its own needs of this important mineral, there is unusual interest in the following description of the occurrence and character of these ores, by Hugh D. Miser:

The manganese ores occur as nodules, pockets and short irregular veins from a fraction of an inch to 4 ft. thick. Thicknesses of 4 ft., however, are rare, and those of a foot are not common. The orebodies are scattered through the hard novaculite and can doubtless be found on every mountain where the Arkansas novaculite is exposed. The ores occupy bedding planes or joint cracks or form a cement in a novaculite breccia, in which the rock fragments range from a fraction of an inch to over a foot in diameter. The iron and manganese ores may be intimately mixed in the same pocket or vein, they may occur separately in different parts of the same vein, or they may occur in separate masses. Most of the ore is confined to two stratigraphic horizons in the Arkansas novaculite.

The ores consist of oxides, four of which, psilomelane, pyrolusite, manganite and wad, have been identified; if others are present, they probably occur in minute quantities. Although these minerals may be found separately, as a rule two or more are intimately mixed in the same deposit, and in some places they are associated with iron ores and manganiferous iron ores. Psilomelane, pyrolusite and manganite form the larger part of the manganese ore in this region. A material consisting of rock fragments and clay cemented together by soft manganese oxide is present at a number of places; locally it is known as "bog ore."

Waste In Ore-Cleaning Operations

By A. L. H. Street*

Reviewing a suit in which the operator of a custom mill sued to recover compensation for cleaning ore-bearing dirt and rock and in which the defendants counterclaimed damages for asserted waste of ore in the operation, the Springfield, Mo., Court of Appeals holds that defendants were not entitled to show in evidence that other dirt taken from the same pile and from the same mine to another mill yielded 2% more mineral than plaintiff recovered; there being no proof of a substantial similarity in the conditions covering the amount of ore recovered at the other mill. (Osborne vs. Eyster, 192 Southwestern Reporter, 143.)

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Cost of Crosscutting on the Mother Lode[*]

An investigation was recently made in Amador County, California, for the purpose of ascertaining and comparing results obtained in crosscutting, in the belief that such information would be of value to the operators in the district.

MOST of the crosscuts in the Mother Lode mines are in the slates and what are commonly termed greenstones (chiefly diabase and amphibole schist). No two crosscuts were driven under the same operating conditions. The chief factor of difference, and the factor upon which the most dependence must be placed, was the hardness of the rock. This was determined only by observation in the crosscuts. Even with the most complete knowledge of the nature and hardness of the rock, there would still remain the fact that it would break more or less easily, depending on the direction of the drive with regard to stratification or cleavage. There were many other points of difference in conditions under which the work was done. On this account care must be used in drawing conclusions from the data given.

All the information was secured by personal visits to the mines. As much of the data as possible is tabulated the remainder is in the form of comments on the various operations. It has been thought desirable to refer to each crosscutting operation only by number.

TABLE OF DATA RELATING TO THE DRIVING OF TEN CROSSCUTS IN VARIOUS CALIFORNIA MINES

Op. No.	Hardness of Rock 1–5	Distance Driven, Ft.	Size of Cross-Cut, Ft.	Ventilation	Average Length of Tram, Ft.	Grade of Track, %	Type of Drill Used	Kind of Bit	Air Pressure at Drill, Lb. per Sq. In.	Depth of Holes, Ft.
1	5	94	6 x8 7 x9	Fair	Various	1.5	Piston	Cross	85–90	5½–6
2	5	346	7 x9	Fair	Various	1.5	Water Hammer	Carr	85–90	5½–6
3	4	100	5x6½	Good	1,000	.	Hammer Stoper	Carr	90	5
4	4	500	6 x9½	Fair	275	0.2	Water Hammer	Carr	90–95	5
5	4	427	5½x7	Poor	1,318	5.0	Hammer	Cross	70–90	5½
6	5	172	7 x9	Poor	140	0.66	Piston	Cross	75	5½
7	4	357	7 x9	Poor	180	0.5	Piston	Cross	80	5½–7
8	3–4	450	5 x6 7 x9	Poor	2,190	0.84	Piston	Cross	80	6
9	4–5	150	6 x7½	Fair	85		Water Hammer	Cross	90	5 –6
10	3	432	5 x7	Poor	210	1.5	Piston	Cross	85	5

Op. No.	No. of Holes per Round	Shifts to Drill Round	Advance per Drill Shift, Ft.	Shifts Worked Per 24 Hours	Day's Pay Contract	Kind of Fuse Used	Strength of Cap	Kind of Powder Used	Lb. Powder per Round	Cost per Ft. Labor and Explosives
1	15–16	3	1.5–2	2	DP	Comet	6x	30% Ammo-Gel.	62	$6.12
2	15–16	1–1½	4	2	DP	Comet	6x		62	3.82
3	16	1	4.25	1	DP	Delay Expl	..	35% Gel Dyn	50	3.62
4	16	1	4.5	2	DP				50	3.42
5	11–13	1½	2.60	1	DP	Eclipse Special	6x	40% Gel Dyn	30	4.38
6	15	2	2	3	DP	Pacific	6x	40% Ammo-Gel	50	5.87
7	12	1	5	2	C	Pacific	6x		62	1.94
8	11	1½	3.66	3	DP[1]	Aneroid	6x	40% Nit Gly	30	4.07
9	12	5.8–6.8	5	3	DP	Pacific	6x	35% Ammo-Gel	38	3.07
10	8–10	5.8	4.5	1	C	Pacific	6x	40% Ammo-Gel	30	3.36

[1] Bonus paid. Machinemen received $3 per day, chuck tenders and muckers $2.50 per day. For every 5 ft. over 50 ft. per week, all men received 25 cents per day additional.

All the crosscuts are in the hard greenstone of Amador County except operations No. 8 (hanging-wall slate), No. 9 (andesite and schist) and No. 10 (slate). Five degrees of hardness were selected, No. 5 being the hardest. Fortunately, most of the rock encountered was uniformly hard.

For fear of creating an erroneous impression regarding the use of some particular drill, it was decided not to mention the make, but simply to divide the drills into two classes, piston drills using solid steel, and hammer drills using water through hollow steel. In practically all the operations one-ton, steel, end-dump cars were used and shoveling was done either from a steel sheet or from planks. Hand-tramming was used in all the operations except No. 3, in which mules were used. The track gage in all cases was 18 in., and 16-lb. rails were used except in operations Nos. 6 and 10, where 12-lb. rails were used. No timber was used, except in operations Nos. 5, 6 and 7, which required a few sets each.

Costs shown in the table were figured only on labor and explosives, the following charges being made for labor: Drillmen, $3; chuck tenders and muckers, $2.50. More complete costs appear in the additional notes on the various operations. No overhead charges are included except where expressly stated.

ADDITIONAL NOTES ON THE VARIOUS OPERATIONS

Operation No. 1. This work was done in 1915, the cost of the 94 ft. being:

	Cost	% of Total Cost
Drilling (labor)	$295.25	41.2
Mucking and tramming	192.50	26.8
Supplies	48.50	6.8
Powder (at 11c. per lb.)	181.45	25.2
Total ...	$717.70 or $7.63 per ft.	

Operation No. 2. Of the 346 ft., 239 were driven in 1916 and 107 ft. in 1917. The 1916 costs were:

	Cost	% of Total Cost
Drilling (labor)	$785.25	31.4
Mucking and tramming	583.25	23.3
Powder	946.45	37.9
Track, ties and incidentals	186.43	7.4
Total ...	$2,501.38 or $10.46 per ft.	

COSTS FOR 107 FT. MADE DURING 1917

	Cost	% of Total Cost
Drilling (labor)	$292.00	27.6
Mucking and tramming	327.00	30.9
Supplies	84.20	8.0
Powder (at 17c. per lb.)	354.20	33.5
Total ...	$1,057.40 or $9.88 per ft.	

In operation No. 3, firing was done electrically from a 110-volt line, with switch, using delay exploders. In operation No. 4 practically the same cycle of operations as No. 3 except that two shifts were worked.

Since this work was done the 1¼-in. round, hollow steel with cross-bit, one set of which sufficed to drill only one hole, has been discarded in favor of 1-in. hexagon, hollow steel, with Carr bit. Drilling speed has increased 25% or more, and the new steel drills from five to eight holes without resharpening. The drill has been equipped with a striking block, or anvil block.

COST OF DRIVING 426.5 FT

	Cost	% of Total Cost	Cost per Ft
Timbering[1]	$51.88	1.8	$0.12
Drilling	1,084.16	36.9	2.54
Mucking and tramming	521.73	17.8	1.22
Explosives	670.48	22.8	1.59
Candles	18.60	0.6	0.04
Hoisting	591.10	20.1	1.38
Total	$2,937.95	100.0	$6.89

[1] Not timbered throughout

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[*] Abstract of Bulletin No. 5, California Metal Producers' Association, by Edwin Higgins, 625 Market St., San Francisco.

Most of the work in operation No. 5 was done with one drillman on the first shift and one mucker on the second shift. During the period, July, 1916 to February, 1917, 426.5 ft. was driven at the cost shown in the table.

In all, 163.5 drill-shifts were worked, which gives an average advance of 2.6 ft. per drill shift.

The cost for the 172 ft. in operation No. 6 was $1255 ($7.30 per ft.), which does not include air, hoisting, drill sharpening or superintendence. The work was done in July, 1916. In operation No. 7 drillers and muckers made from $4 to $4.50 per ft. on contract. Ventilation was by compressed air with water spray used after shooting. Two shifts were worked.

DETAILED COST PER FOOT OF CONTRACT WORK

	Cost per Ft.
Drillers (2)	$2.78
Trammers and shovelers	2.22
Timbermen	.30
Powder	2.42
Fuse	.19
Caps	.06
Candles	.10
Timber	.36
Power	.58
	$9.01

In operation No. 8 the cost per ft. of 1015 ft. of drifting under all conditions; all timbered and from soft to very heavy ground were,

	Cost per Ft.
Drillers	$3.90
Engineers	.12
Trammers and shovelers	3.81
Timbermen	1.20
Powder	1.19
Fuse	.13
Caps	.05
Candles	.20
Timber	1.90
Power	.60
	$13.10

OPERATION NO. 9. DETAILED COST FOR 150 FT. OF CROSSCUT

	Cost per Ft.
Explosives	$142.00
Steel	20.00
Timber	37.30
Pipe	22.50
Air	20.00
Labor	993.60
Total	$1,235.40 or $8.24 per ft.

COST OVER A DISTANCE OF 100 FT.

700 lb. powder at 17c	$119.00
220 caps at $1.30 per 100	2.86
1,320 ft. fuse at $5.20 per 1,000 ft	6.86
160 lb. steel at $0.093 per lb	14.90
100 ft. 2-in. pipe at 16c. per ft	16.00
Contract 100 ft. at $4.50 per ft	450.00
Air	20.00
Total	$629.62 or $6.30 per ft.

Track, superintendence, surveying and power bring the total cost up to $10.34 per foot.

The best progress in operation No. 10 was 53 ft. over a 10-day period, or at the rate of 160 ft. per 30 days. The average rate was about 120 ft. per month. Actual drilling time for a round was 5 hours, setting up and tearing down taking up 2 hours.

Track, superintendence, surveying, assaying, apportionment of power, hoisting, etc., bring the cost up about $3.60 per ft., making the total cost $9.90 per foot.

All drilling and shooting was done on day shift. Mucking and laying planks and track was done on night shift; 378.5 man-shifts were worked, or 153 shifts day and night.

Comments on the Various Operations

Operations 1 and 2 afford a fair comparison of the solid-steel piston drill, as compared with the water-hammer drill. The 94 ft. of operation No. 1 were driven with a piston drill, three shifts being required to put in a round of holes. At this point (see operation No. 2) a change was made to the water-hammer drill, after which a round of holes was drilled in from 1 to 1½ shifts.

Attention is directed to the greater percentage of total cost chargeable to drilling in operation No. 1, as compared with No. 2. The increased cost of explosives and supplies in operation No. 2 is due largely to the increase in the cost of these materials in 1916 and 1917.

Operation No. 3 is one of two out of the ten in which delay exploders were used. A minimum of misfires occurred, and results were reported better than blasting with cap and fuse. This crosscut was run with a hammer stoper and good progress was made. The section of the drift was small compared with the other operations. It was reported that the fact that drilling was done on one shift and mucking on the next made for economy but not speed. Keeping of drill parts in duplicate was an important factor in lessening delays.

No. 4 was an efficient operation. A very important bit of information was brought out at this mine; namely, the change from 1¼-in. hollow, round steel with cross-bit, to 1-in. hollow, hexagonal steel with Carr bit, which greatly increased the drilling speed and the number of holes that could be drilled with one set of steel.

The striking feature of No. 6 is the slow progress made with the solid-steel piston drill. No. 7 is a case in which good progress was made with the piston drill. However, the ground was not of the hardest at all times and the fact that the work was done on contract had some effect on the speed. No. 8 is a striking illustration of what can be done in crosscutting by day's pay plus a bonus. An average of 77 ft. was made every week. No. 9 showed the lowest cost in labor and explosives.

The cost of operation No. 1 was abnormally high for the reason that there was no other work being done in the mine and all charges were directed toward this one crosscut. The progress was excellent, but on account of the fact that the ground was not as hard as any of the other operations, it is hardly fair to use this operation in comparison with the others.

As indicated previously, it is believed that operations 1 and 2 afford the best comparison between the solid-steel piston and the water-hammer drills. However, one such operation cannot be taken as conclusive. While comparisons from the table are by no means accurate on account of varying conditions, it is of interest to note the following:

Omitting operation No. 10, the average number of shifts required to drill one round of holes was 1.81 for solid-steel piston drills and 1.14 for the water-hammer drills. The average advance per drill-shift was 3.10 ft. for the piston drills and 4.07 for the water-hammer drills. The average cost per foot in labor and explosives was $5 for the piston drills and $3.66 for the water-hammer drills.

Making a further distinction, the average cost per ft. in labor and explosives shows $3.62 for the water-hammer drills using the Carr bit; $3.72 for the water-hammer drills using the cross-bit; $5 for solid-steel piston drills with cross-bit.

Quicksilver production in Italy in 1916 amounted to 1,093,851.5 kg., according to "Rassegna Mineraria." In 1915 the production was 985,514 kg.

Corrections for Sag in Long Steel Tapes

By W. H. Rayner
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The corrections to be applied to steel-tape measurements have been discussed by many investigators whose results have been presented in various ways.[1] However, there are so many variable conditions and requirements governing such measurements that a different treatment of the theory is occasionally warranted by the demands of practice. Obviously, some corrections might be applied in base measurements which would be neglected in other work; and again, mining surveys with long tapes on steep slopes impose different considerations from those that would apply to measurements taken under different conditions. The corrections for sag, in most cases, are the most troublesome to make, especially in the case of the longer tapes; and since for most classes of surveys these corrections are not required to be determined to more than two or three significant figures, it is thought that a graphical solution would probably be more useful than tables. The corrections for temperature and stretch are in simple and direct relation to the distances measured and are not considered in this discussion.

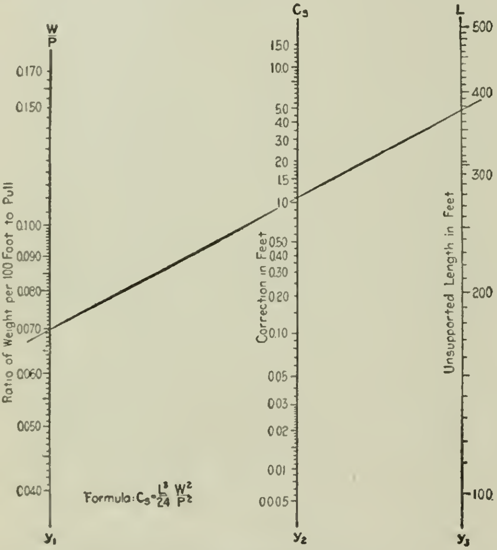

FIG. 1. CHART FOR DETERMINING CORRECTION FOR SAG IN STEEL TAPES

In Fig. 1 are given the corrections for sag under various conditions of weight, pull and length, for tapes from 100 to 500 ft. in length. In this diagram use has been made of the nomograph to deal with the four variables involved. For any given tape the weight is a constant, hence the relation between weight and pull may be expressed as a ratio which becomes one variable $\frac{W}{P}$ in the nomograph. The units for the different quantities are shown on their corresponding ordinate lines in the diagram.

The use of the nomograph is very simple, and one example will be given to illustrate it. A 500-ft. tape weighs 7 lb., or 1.4 lb. per 100 ft. A distance is measured with a pull of 20 lb. where the unsupported length is 375 ft. What is the correction for sag in this case? Solution: The ratio of weight per 100 ft. to pull $\left(\frac{W}{P}\right)$ equals $\frac{1.4}{20}$ or seventy hundredths. The unsupported length L is 375 ft. Place a straight-edge across the nomograph to intersect these two quantities on their corresponding ordinate axes, and the middle ordinate is intersected at a point which reads 1.08 as the correction due to sag alone.

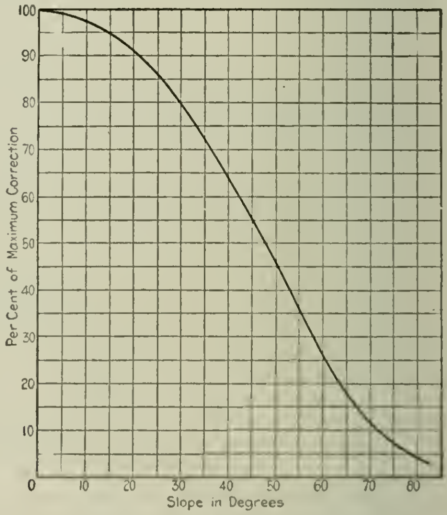

FIG. 2. CHART FOR DETERMINING CORRECTION FOR SAG IN STEEL TAPES ON SLOPE

The effect of slope on sag corrections is shown in Fig. 2. This curve has been prepared from data given by E. V. Huntington and shows the percentage of maximum correction for the various slopes. For example, suppose that the above measurement had been made on a 20° slope. From the curve it is seen that the correction for sag on a 20° slope is 91% of the maximum, and accordingly the final correction due to sag is 91% of 1.08 ft. or 0.98 ft.

It is possible that some engineers in the field would like to make use of such a diagram to a larger scale; hence, the following directions are given, which may be followed without any knowledge of the theory of nomographic construction.[2] First, construct three vertical lines (ordinate axes), which we may consider as being numbered y_1, y_2 and y_3 from left to right. The intervals y_1 to y_2 and y_1 to y_3 must be in the exact ratio of 3.6 to 6. Second, plot to any scale and beginning at any point on y_1 the logarithms of the numbers 40 to 170, and to the same scale beginning at any point on y_3 plot the logarithms of numbers from 100 to 500. This means that the linear distance from 100 to 170 on y_1 must be exactly the same as the distance from 100 to 170 on y_3. Third, solve the given equation, $C_s = \frac{L^3}{24}\,\frac{W^2}{P^2}$ for a number of selected conditions to give values of the correction which will be evenly distributed over the ordinate y_2. Fourth, subdivide this ordinate to any further degree desired and number the scale accordingly.

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[1] "Mathematical Theory of Metallic Tapes"; Report U. S. Geological Survey, 1892, Appendix No. 8, p. 480. "A Graphical Method for the Correction of Steel Tapes"; Walter Scott Weeks in University of California Publication in Engineering, Vol. I, No. 9; price 10c. E. V. Huntington, of Harvard University, in L. S. Marks' "Mechanical Engineers' Handbook." See also various textbooks.

[2] For a complete description of this theory and method, see "The Construction of Nomographs," by H. E. Babbitt, Proc. Ill. Soc. of Engrs. and Surveyors, 1916, p. 161.

Some Suggestions on Economy

By H. T. Durant*

Economy for obvious reasons is practiced to a far greater extent now than ever before, or at least for some time. Even when peace eventually comes, the effect of the present world situation will still be evident. All the readers of the *Journal* are primarily interested in some branch of engineering, and many have probably had at times to do some hard thinking in the direction of economy of time or materials. It is always easier to take the line of least resistance, especially when not handling one's own money, and for that reason economy often starts late in the day or, perhaps, when there is no other alternative.

In every department of every large undertaking it is possible to lay down certain regulations, instructions, standing orders—call them what you will—which for all practical purposes do not change from day to day or from month to month. A separate set of such orders would be made out for each department, which orders would be issued to the department concerned, typewritten or printed. They are not then misunderstood or forgotten like verbal ones; it is the duty of all employees concerned to know these orders.

This procedure causes great saving of time and supervision, does away with much useless talking and reiteration. It is, therefore, only emergencies and special conditions which cannot always be provided for in standing orders, but must be dealt with by foremen or management when they arise.

A very fruitful source of waste is in ordinary business-letter writing. A long letter is usually bad. Letters should be to the point, clear and complete and without ambiguity. Letters that are written in purposely indefinite terms are an insult to the intelligence of the recipient, and leave him with no illusions as to the characteristics of the orginator of the letter. Badly written letters cause much subsequent correspondence.

The case is very much the same with contracts, estimates, specifications, etc. In all these there is ultimate economy if the original work on paper has been done honestly; otherwise, legal assistance may be required later on, and it is uncertain when and how that may end. Where work is measured in hours instead of output, as often must be the case, it is more than ever vital that due consideration be given to the welfare of the workers, whatever rank they may occupy. It is a matter of common knowledge that, in some places, it is no uncommon thing for workers coming on at, say, 6 a.m. on a cold winter morning to do 1½ or 2 hours work (often heavy manual work) before taking any food. Probably only those who have actually tried it know the exact value of this kind of work. It is often preceded by a journey or walk, it does not represent the worker's average effort and it is not good for the worker's health. Care and skill are exercised on the design, layout, maintenance and insurance of a power plant, and apparently the same applies to the human machine.

Obviously, overtime cannot be economical and should be avoided as much as possible. Quick decision and some knowledge of human nature are essentials in obtaining confidence of subordinates—more so than skill at trade or occupation.

To come to the more concrete side of economy or waste, there is a very common one appreciated by every mining engineer; that is to say, waste dumps of various kinds. Waste rock or waste material, such as residues from cyanide works, concentrating mills, etc., should as far as possible be dumped at a high level, and in a convenient position for rehandling, and each class of material should be dumped separately.

I know of at least one case in which nearly a million tons of metalliferous residues, the product of many years, has during the whole period of its collection been dumped with boiler ashes and various other barren materials. As a result, the mixture is at present of no value. Had the residue in question been properly and separately dumped, it would now, by modern methods, have become a very considerable asset. Some of us could cite instances of gold and silver tailings being run into rivers or being allowed to spread themselves naturally in shallow layers over large areas.

Low-priced machines that have a high maintenance and running cost are a source of waste; it may be a long time before the machine can be scrapped and replaced by a machine which can be run and maintained reasonably. Especially in out-of-the-way places, it is economy to fall into line with one's nearest neighbors, if any, as regards class, etc., of machinery installed; this may permit the giving and receiving of a certain amount of friendly assistance, and incidentally it prevents the carrying of heavy stocks of spare parts, renewals, etc.

No mill of any kind can be laid out and brought satisfactorily to a ready-to-run condition except with the coöperation of or under the supervision of someone who has actually worked in such mills. Unless the mill is sited, designed and erected under such supervision, it will require more or less extensive adjustment after it starts running, and even then its running costs may always be too high. With pipes and fittings, it is often good practice to carry out the work in as few different sizes as possible, even if by this means the pipe services are in some cases larger than demanded, for in this way a smaller and less varied stock of pipes, valves, fittings, etc., is carried.

The same procedure, to some extent, applies to pulleys, belting and shafting, and by a little ingenuity and planning it is possible to use belting in few widths, not in too many different thicknesses (plies), and to have shafting and therefore all its details in a reduced number of sizes.

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Artificial Covellite

By J. M. Frankel
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About two years ago a specimen piece of chalcocite was broken in handling, and to keep the two pieces together an ordinary rubber band was put around them. During an examination of this specimen some weeks later, the rubber band was moved to one side, exposing a black streak, much resembling lampblack. On the supposition that rubber and chalcocite under ordinary conditions were inert compounds, this apparent reaction seemed curious. That the streak was not accidental was proved by repeating the experiment, when a similar result was obtained after a few days' exposure of the chalcocite to the influence of the rubber.

The attention of Dr. Graton was called to this phenomenon. Dr. Graton had the experiment repeated, rubber, flour of sulphur, and a crystal face of sulphur being used, all of which gave the black powder on the surface of the chalcocite.

An approximate analysis of the black powder showed it to be a copper compound with a composition corresponding to the formula CuS. The experiment was repeated with various forms of rubber, such as red-rubber packing, conveyor-belt rubber and eraser rubber. All gave the same result, the strongest action coming from the sheet packing.

Chalcocite and Rubber Packing

It was observed upon examining a piece of chalcocite that had been subjected to the action of some red-rubber packing for more than a year that the black powder usually formed, had changed in spots to a powder of the characteristic blue color of covellite. This blue powder, after several months' exposure to the influence of the rubber, had the appearance of an incrustation of minute crystals. Specimens of this incrustation were shown to Professor Butler, of the University of Arizona, who stated that they were undoubtedly covellite.

A small piece of native copper from Michigan has been tried and the same result obtained, except that instead of being black, the powder produced is blue, similar to the blue spots formed on the chalcocite.

Thus far the results of the experiment may be summarized as follows:

1. Chalcocite in contact with rubber for a few days, under ordinary conditions of pressure, temperature and light, becomes coated with a black powder. After about a year and a half of exposure to the action of the rubber, this powder turns blue in spots, and a few months later these blue spots assume a crystalline appearance.

2. The composition of the powder and the color of the crystals are those of covellite.

3. The rubber appears to be but little more affected than it is by ordinary long exposure to the air.

4. The action is not confined to the actual points of contact between the rubber and the chalcocite, but is distributed all over the surface of the chalcocite facing the rubber, and on the adjacent sides. It varies in intensity proportional to the distance. The inference is, of course, that the action is due to some volatile compound of sulphur contained in the rubber.

5. Native copper in contact with rubber, under the same conditions as the chalcocite, also becomes coated with a blue powder. An investigation has not been made to see whether this powder is also covellite, or whether chalcocite is not actually formed first and the covellite from it, instead from the copper direct.

The results of this experiment would indicate that chalcocite in the presence of a volatile sulphur compound becomes converted into covellite: $Cu_2S + S = 2CuS$.

In the series of changes incident to the process of secondary enrichment of copper ores, it has always been assumed that covellite is a transition product formed between chalcopyrite and chalcocite. The results of this experiment would point to covellite being in some instances a secondary product after chalcocite, and not always a transition product.

Australian Mineral and Metal Exports

The following figures of exports are taken from the official reports of G. H. Knibbs, Commonwealth Statistician of Australia, for the years ended June 30, 1915, and June 30, 1916:

Substaoce	Unit	1914–15	1915–16
Alunite	Cwt.	52,400	12,800
Ammonium sulphate	Cwt.	113,801	129,651
Aotimony ore	Cwt.	50,316	74,631
Bismuth ore	Cwt.	1,295	2,602
Coal	Tons	1,371,745	929,998
Coke	Tons	14,329	25,253
Copper—ingot and matte	Cwt.	669,189	737,841
Copper ore	Cwt.	141,578	89,035
Copper concentrates	Cwt.	785	347
Copper sulphate	Cwt.	86	44
Gold—bar, dust, ingot, sheet and in matte	Oz	198,809	254,355
Gold—ore, quartz and concentrates	Cwt.	15,654	6,232
Iron, pig	Cwt.	37,450	53,494
Iron, ore	Cwt.	78,041	156,800
Lead, pig and matte	Cwt.	2,164,871	2,458,134
Manganese ore	Cwt.	5	10,315
Metal scrap (except iron and steel)	Cwt.	25,260	24,424
Molybdenite	Cwt.	2,080	2,569
Phosphate, rock	Cwt.	22,340	75,839
Platinum ore	Cwt.	87	91
Platinum, bars, blocks, etc	Oz.	70	79
Plumbago, black lead, etc	Cwt.	373	394
Quicksilver	Lb.	600	647
Scheelite and wolframite	Cwt.	10,315	19,720
Silver, bar, ingot, sheet and matte	Oz.	6,851,405	6,591,518
Silver and silver-lead ore	Cwt.	104,596	3,415
Silver and silver-lead concentrates	Cwt.	448,527	192,150
Tin, ingots	Cwt	29,891	68,690
Tin ore	Cwt	40,215	44,066
Tin concentrates	Cwt.	2,630	4,050
Zinc bars, blocks and rods	Cwt.	53,561	46,000
Zinc concentrates	Cwt.	2,409,815	3,688,599
Zinc ore	Cwt.		505

The metal content of ores and concentrates exported, estimated from assay were as follows:

		1914-15	1915-16
Gold ore, quartz and concentrates:			
Gold	Oz	12,153	5,812
Silver	Oz	18,720	14,836
Bismuth	Cwt.	26	30
Silver and silver-lead ore and concentrates:			
Silver	Oz	681,467	259,094
Lead	Cwt	374,798	111,172
Zinc	Cwt	22,350	15,801
Gold	Oz	345	
Copper ore and concentrates			
Gold	Oz	43	9
Silver	Oz	1,398	5,960
Copper	Cwt	22,482	16,176
Tin ore and concentrates.			
Tin	Cwt.	29,310	52,815
Zinc ore and concentrates			
Silver	Oz	1,609,545	1,692,980
Lead	Cwt.	186,536	206,294
Zinc	Cwt.	1,070,066	1,632,180

In addition to the total quantities, the reports give details of the amounts going to various countries, and also the states from which the metal was exported. They also include figures of imports by countries of origin and importing states.

Areas of Segments of Circles

By W. B. Marquard

Professor of Mining, Lafayette College, Easton, Penn.

There is frequent need for an easy formula for finding the area of a segment of a circle, since this area is needed in calculating the contents of horizontal cylinders for various depths of the liquid in the cylinder. The content of such a cylinder equals the area of the segment times the length of the cylinder.

No satisfactory formula has been developed for finding the area of circular segments in terms of the radius and altitude of the segment. All exact formulas involve the central angle subtended by the chord of the arc, and it is a difficult matter for a practicing engineer to make use of such formulas when the altitude of the segment alone is given.

AREAS OF CIRCULAR SEGMENTS

Formula used, $\text{Area} = R^2 \text{ arc vers } \frac{h}{R} - (R - h)\sqrt{2Rh - h^2}$

Depth	Area / R²	Log Area / R²	Depth	Area / R²	Log Area / R²
1/60 R.	0.00408	$\bar{3}$ 61066	31/60 R.	0.64320	$\bar{1}$.80835
2/60 R.	0.01145	$\bar{2}$.05881	32/60 R.	0.67252	$\bar{1}$.82770
3/60 R.	0.02091	$\bar{2}$ 32035	33/60 R.	0.70216	$\bar{1}$ 84644
4/60 R.	0.03211	$\bar{2}$.50664	34/60 R.	0.73209	$\bar{1}$ 86456
5/60 R.	0.04478	$\bar{2}$.65108	35/60 R.	0 76224	$\bar{1}$.88209
6/60 R.	0.05872	$\bar{2}$ 76879	36/60 R.	0.79267	$\bar{1}$ 89909
7/60 R.	0 07381	$\bar{2}$ 86812	37/60 R.	0.62334	$\bar{1}$.91558
8/60 R.	0.08993	$\bar{2}$ 95391	38/60 R.	0 85424	$\bar{1}$.93158
9/60 R.	0 10705	$\bar{1}$.02959	39/60 R.	0.88535	$\bar{1}$.94712
10/60 R.	0.12502	$\bar{1}$ 09698	40/60 R.	0 91670	$\bar{1}$.96223
11/60 R.	0.14376	$\bar{1}$ 15764	41/60 R.	0.94821	$\bar{1}$.97690
12/60 R.	0.16350	$\bar{1}$.21352	42/60 R.	0 97991	$\bar{1}$.99119
13/60 R.	0.18387	$\bar{1}$.26451	43/60 R.	1 01180	0 00509
14/60 R.	0.20492	$\bar{1}$.31158	44/60 R.	1 04385	0 01864
15/60 R.	0.22666	$\bar{1}$.35538	45/60 R.	1.07610	0.03185
16/60 R.	0.24900	$\bar{1}$.39620	46/60 R.	1.10839	0 04469
17/60 R.	0.27190	$\bar{1}$.43441	47/60 R.	1.14087	0 05724
18/60 R.	0.29548	$\bar{1}$.47053	48/60 R.	1.17347	0.06947
19/60 R.	0.31957	$\bar{1}$.50457	49/60 R.	1.20619	0 08106
20/60 R.	0 34416	$\bar{1}$.53676	50/60 R.	1.23901	0.09311
21/60 R.	0.36945	$\bar{1}$.56756	51/60 R.	1.27193	0.10476
22/60 R.	0.39483	$\bar{1}$.59641	52/60 R.	1.30492	0.11559
23/60 R.	0.42083	$\bar{1}$.62411	53/60 R.	1.33904	0.12659
24/60 R.	0.44730	$\bar{1}$.65060	54/60 R.	1.37113	0.13708
25/60 R.	0.47418	$\bar{1}$ 67594	55/60 R.	1 40433	0.14747
26/60 R.	0.50143	$\bar{1}$.70021	56/60 R.	1.43756	0 15763
27/60 R.	0 52910	$\bar{1}$.72354	57/60 R.	1.47083	0 16756
28/60 R.	0.55711	$\bar{1}$.74594	58/60 R.	1.50415	0.17729
29/60 R.	0.58549	$\bar{1}$ 76752	59/60 R.	1.53746	0.18681
30/60 R.	0.61419	$\bar{1}$ 78830	60/60 R.	1 57080	0.19612

Note—Areas for various depths of segments are found by multiplying numbers in the second column by the square of the radius. To facilitate the work of computation in making a table to show contents of tank for various depths the logarithms of the areas are given in the third column. The logarithms of the contents in cubic feet for the various depths are found by adding the sum of the logarithms of the length of the tank and twice the logarithm of the radius to the tabulated logarithm in the third column. The logarithm of the contents in gallons is found by adding the logarithm of length and twice the logarithm of radius and log 7.4805 to the tabulated logarithm in the third column (Log 7.4805 = 0.87393). When the depth is greater than the radius the area of the major segment must be found, which equals the area of the circle (3.14159 R²), less the tabulated area of the small segment.

A number of approximate formulas have been developed for finding the area of segments. The simplest one gives area as $\frac{2}{3}AL$, where A is the altitude and L is the length of the chord of the segment. This formula assumes that the arc of the circle corresponds to the arc of a parabola and gives quite close results when the altitude of the segment is less than one-fifth of the radius; it cannot be used when the altitude is over one-quarter of the radius. Other formulas for finding approximate areas of segments do not readily permit the use of logarithmic computation and, furthermore, are far from accurate.

The accompanying table has been constructed to give accurate areas of segments for various altitudes that range from one-sixtieth part of the radius up to the radius.

The area of the major segment is found by subtracting the area of the tabulated small segment from the area of the circle (3.14159 R^2). Areas for various altitudes are found by multiplying numbers in the second column of the table by the square of the radius. Each division of the first column represents an altitude of one-sixtieth part of the radius. Hence areas are shown for every inch of 5-ft. circle, or for every 0.4 in. of a 2-ft. circle, etc.

A table showing the contents of horizontal cylinders for various depths of the liquid can be easily made by using the following table of segment areas. The use of logarithms is urgently advised in making a table showing the contents of tanks. The following illustrations show a method of obtaining the contents in cubic feet and also in gallons:

Radius = 5 ft. Length = 12 ft. Log R²L = 2.47712

Depth	Log. Volume, Cu.Ft.	Volume, Cu.Ft.
5/60 R = 5 inches	$\bar{2}$ 65108 + 2 47712 = 1.12820	13.43
25/60 R = 25 inches	$\bar{1}$ 67594 + 2 47712 = 2 15306	142.25
60/60 R = 60 inches	0 19612 + 2.47712 = 2.67324	471.24

If it is desired to find the contents in gallons, add the log (7.4805 R^2L) to the tabulated logarithm in the third column of the table:

Radius = 3 ft. Length = 10 ft. Log. (7.4805 R²L) = 2.82827

Depth	Log. Volume, Gal	Volume, Gal.
5/60 R = 3 0 inches	$\bar{2}$ 65108 + 2 82817 = 1.47925	30.15
25/60 R = 15 0 inches	$\bar{1}$ 67594 + 2 82817 = 2.50411	319 24
60/60 R = 36.0 inches	0.19612 + 2 82817 = 3.12429	1,057.5

A Decimal Coinage for Great Britain

The full report of the British Institute of Bankers on the adoption of a decimal coinage and the metric system of weights and measures has been made public. The committee that prepared the report believes that the adoption of the metric system will be of great advantage, especially in the extension of foreign trade. As a prelude to the adoption of that system, it believes that a decimal system of coinage should de adopted and therefore recommends such a system.

For many reasons, among which is its general acceptance as a standard in foreign as well as domestic trading the pound sterling must be retained as the unit, and the system recommended by the committee is based upon the pound sterling. A standard unit of so high a value as the pound involves the division into 1000 instead of 100 parts. The present pound contains 240 pence, or 960 farthings, so that the smallest division—one-thousandth—would be very nearly the value of a farthing. This division the committee would call a "mil." The coinage proposed is as follows: Gold, pound or sovereign, and half-sovereign. Silver, double florin, 200 mils; florin, 100 mils; half-florin, 50 mils; quarter florin, 25 mils. The half-florin would correspond very nearly to the present shilling. Nickel, 10-mil piece, copper, four-mil, two-mil and one-mil pieces. A four-mil instead of a five-mil piece is recommended because its value would be almost exactly the same as that of the present penny, which is a general standard in small transactions. The difference in value would be only 4%, which would not be noticeable in these small coins.

Flotation Process at Real del Monte and Santa Gertrudis[*]

The Real del Monte, Pachuca, Hidalgo, Mexico, has rected a 50-ton Minerals Separation plant at its yanide plant near Omitlan. A mixture of oils is used, he proportion of each, per ton of ore treated being: Barrett No. 1 coal-tar oil, 1.319 lb.; Barrett No. 609 reosote, 1.319 lb.; No. 80 pine oil, 0.200 lb. Costs of perations are given as $1.57 (U. S. currency) per on, the following results having been obtained:

FLOTATION RESULTS AT REAL DEL MONTE

Extraction by difference—63.9% Ag 60% Au.
Tonnage—Dry Pulp 1.038 tons per hour.
Dilution—4 91 Water to 1 Ore.
Conditions of solutions—Traces of CaO.

Oils employed:		
arrett No. 1 coal tar	1 319 lb. per ton	
arrett No. 609 creosote	1 319 lb. per ton	
ine tar No. 80	0 200 lb. per ton	
Total oil	2 838 lb. per ton	
	Grams Ag	Grams Au
Contenta:		
leads	382	1 25
ails	134	0 50
Extraction	248	0 75
Assay of Froth from Compartments	Ag	Au
-2-3	5 909	22 00
	3 961	14 25
-6	1 779	6 00
-8	1 274	4 00
10	1 964	6 00
1-12	2 595	1 25

At Santa Gertrudis K. & K. and Callow machines ave been installed with average recoveries of 72%, lthough as high as 78% has been obtained.

There are being constructed in the company shops, dditional K & K machines for an ultimate capacity of 60 tons per day.

Petroleum Supply Decreasing

The nation is warned in a statement issued by A. C. edford, president of the Standard Oil Co., that the upply of oil products is decreasing alarmingly. He ays:

In view of the abnormal conditions confronting the ation, it is peculiarly important that the country hould understand the serious situation now prevailing the petroleum industry.

This country is producing crude oil at the rate of bout 300,000,000 bbl. a year, but it is using it at the ate of 335,000,000 bbl. a year. The amount of crude il in storage, all grades, May 1, 1917, was 165,688,797 bl. The country is absorbing the entire current production and drawing very rapidly upon its reserve supplies.

The rapid development of the automobile is largely esponsible for present conditions. In 1910 there were 00,000 automobiles in use in the United States; in 916 the number was 2,350,000. Today there are more han 4,000,000 cars, demanding over 40,000,000 bbl. of asoline a year. Other uses of gasoline and oil are exanding upon an enormous scale.

The demand for oil products is greater than the suply of crude oil. Because of the demand, the price of rude oil has risen, thus stimulating more and more producers to drill new wells. Though this drilling has been going on with great aggressiveness—because the cost of drilling is much greater than in the past and the total successes fewer than ever—the returns from such efforts are not as satisfactory as they were a year ago. In the first three months of this year 4701 wells were completed, yielding an initial production per day of 344,876 bbl. In 1915, 1711 new wells yielded 349,010 barrels.

In other words, though there have been almost three times as many new wells drilled in 1917 as in 1915, the initial production is considerably less than in 1915. The drilling of wells is still going on, but thus far there has been no increase in production over last year or the year before.

The meaning of the foregoing is this: If our Government is to have the petroleum it will need to prosecute the war successfully and supply all necessities directly growing out of the war, two steps will have to be taken, namely:

1. The public will have to economize in the use of gasoline. Sufficient gasoline should be available to provide for all normal uses of automobiles. But pleasure riding should be curtailed. People should look upon their automobiles as necessities to be used only when needed. Not a gallon of gasoline should be used in the present emergency except for some useful end.

2. Every oil producer in the country should be encouraged as a patriotic effort to secure the utmost possible output of crude oil. The present expense of drilling new wells is very great and increasing, and the results are often discouraging. But there is oil to be had if producers in the oil business will redouble their efforts to get it out of the ground.

The petroleum industry has gone into this situation wholeheartedly and with an eye single to assisting the Government in its stupendous problem, and I am convinced that the Government, on its part, will meet the situation in a liberal and broad-minded spirit and that a just price will be paid, sufficient for the maintenance and development of industry.

In reliance, therefore, on the good faith of the Government, there should be no relaxation on the part of producers in their efforts to turn out oil, and every private individual and industry should consider it a patriotic duty to observe all possible economy in the consumption of gasoline.

Acquisition of Water Rights

By A. L. H. Street

Attorney at law, 829 Security Building, Minneapolis, Minn.

Under the laws of California, where a mining company has diverted water from a stream for a period of five years, such continued use, adverse to the rights which owners of downstream lands might have asserted, a prescriptive right to continue the diversion arises, according to a late decision of the California Supreme Court in the case of E. Clemens Horst Co. vs. Tarr Mining Co., 163 Pacific Reporter, 492. But, on the same authority, it is the law that the lower landowners may restrain a subsequently increased diversion of the water where the right of the mining company to divert the increased quantity has not been acquired by similar prescriptive use.

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[*] Abstract. "Informe sobre el tratamiento de los minerales por otacion en las Compañias Mineras Pachuca y Real del Monte y anta Gertrudis," by Simeon Ramirez, Inspector of Mines, in Boletin Minero," Mexico, May 1, 1917.

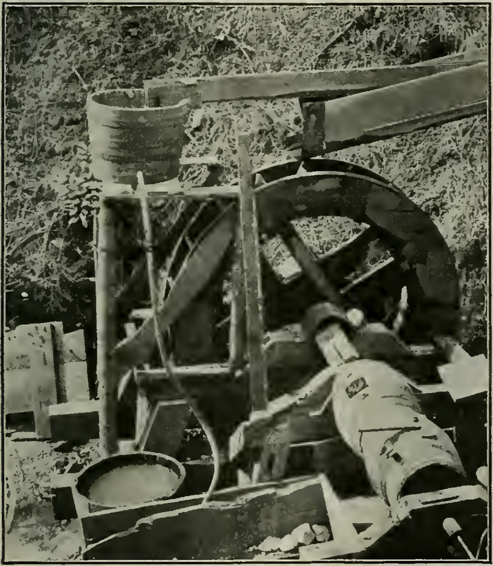
Ingenious Mill Run by Water Power

By J. W. Swaren*

An ingenious water-power driven mill and amalgamator has been constructed for working the soft ore of a prospect near Georgetown, Calif.

The overshot wa'erwheel, made entirely of wood, is approximately 16 ft. in diameter. The shaft consists of a 12 x 12-in. timber turned to fit wooden bearings. The spokes of the waterwheel are 4 x 4 in., bolted to the shaft. The wheel buckets are built of 1 x 12-in. planks.

On the end shown in the illustration, two 20-gal. wooden casks are used for amalgamation. On the opposite end, by means of wooden gear and pinion, a grinding mill of the chilean type is driven. The rolls of the chilean mill are steel burrs that have outlived their usefulness in an abandoned grist mill. These turn on a stone-floored wooden vat, and no screens are employed. The ore is simply dumped into the mill and ground until the mixture of ore and water seems sufficiently thin for amalgamation; the outfit is then stopped, the charge of the mill transferred to the amalgamator, a new charge put in the mill and operation continued. The main wheel runs at about 49 r.p.m., while the mill turns at about 3 r.p.m. The percentage of recovery was not obtainable, but the operators seem to be well satisfied with results.



AN INGENIOUS WATER-POWER-DRIVEN MILL, NEAR GEORGETOWN, CALIF.

Ferrotungsten Exports from the United States in May were 463,680 lb., the largest ever reported in one month. Practically no ferrotungsten was exported before the war. Ferrovanadium exported in May was 311,360 lb., a little less than in March, but more than in any other previous month.

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*Box R. R. 2 Hayward, Calif.

A Blast-Furnace Record

By F. K. Brunton

Smelting Superintendent, Consolidated Arizona Smelting Co.

Ten tons per square foot of hearth area is the re remarkable record made by a 14-ft. blast furnace at th smeltery of the Consolidated Arizona Smelting Co., a Humboldt, Ariz. The furnace is a rectangular water-jacketed furnace. The following table gives complet data concerning it:

FURNACE DATA

Width at tuyeres	52 in
Length of furnace	168 in
Sq.ft. hearth area	60. 6
Height of furnace	11 ft. 6 in
Distance tuyeres to top	8 ft. 6 i
Distance tuyeres to sole plate	3 ft
Diameter of tuyeres	4 in
Center to center tuyeres	15 i
Number of tuyeres	2
Tuyere area	276 46 sq.in
Tuyere area per sq.ft. of hearth area	4 56 in
Cu.ft. air per minute	20,00
Air pressure	26 to 30 oz
Tons smelted per 24 hours	60
Tons per sq.ft. hearth area per 24 hours	10 0
Per cent. coke	9.

It taps from the side through a water-cooled coppe breast jacket with a water-jacketed spout and a water-cooled copper lip into a pear-shaped settler 27 ft. long 13 ft. wide and 55 in. deep. It has practically no crucible as it is bricked up to within three inches of th tuyeres on each end and the bottom slopes toward th middle so that it is just below the connection hole at th center.

The furnace is fed mechanically with six charge car of the old Anaconda type, having a capacity of 60 cu.ft each, and dumped by means of an air lift.

The charge is put in as follows: Two cars of cok holding 800 lb. each are dumped in, followed by two car of ore of 8000 lb. each on top of it from the same sid of the furnace. This is repeated on the other sid of the furnace for the next charge. The charge consist of ore, converter slag and limestone, and has the following composition: 33.5% SiO_2, 26.8% Fe, 8.6% CaO 10.4% S, 3.12% Cu, which, with an 80% sulphu elimination, gives a 38% matte, and a slag running 40% SiO_2, 30% Fe, 10.2% CaO, 0.25% Cu.

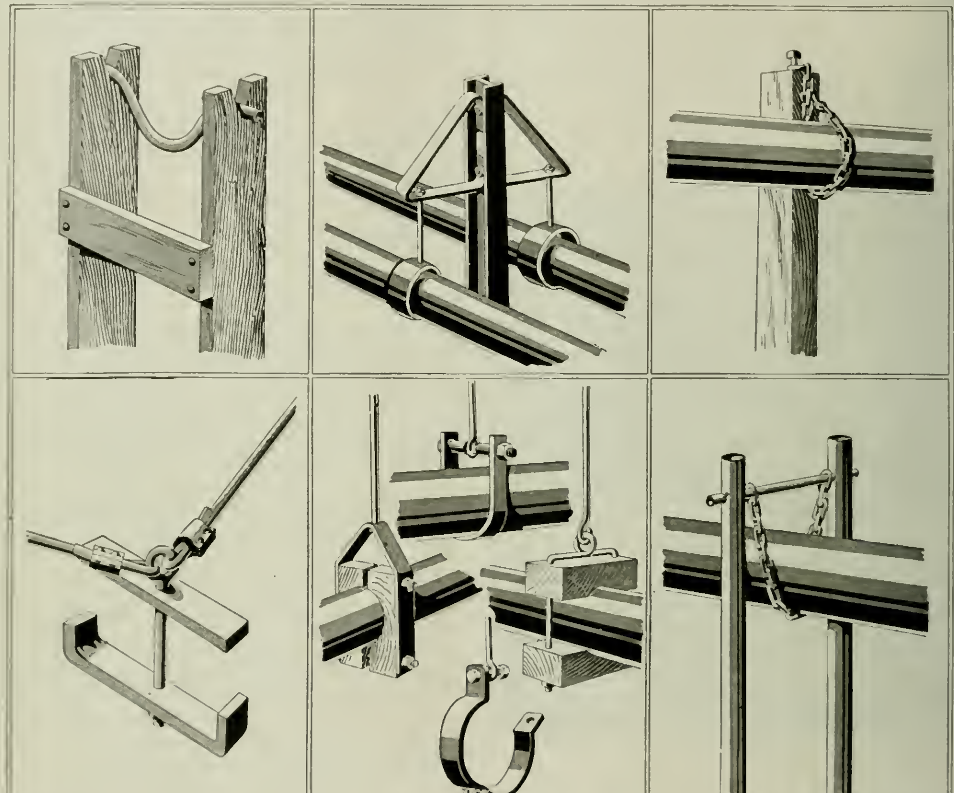
Use Mean Sea Level as Datum

In the pamphlet just published by the Coast and Geodetic Survey, entitled "The Use of Mean Sea Level as the Datum for Elevations," is discussed the desirabilit of having a single plane for the whole country, to whic all elevations would be referred. This plane is that o mean sea level, which is supposed to be a continuou plane throughout the country from ocean to ocean.

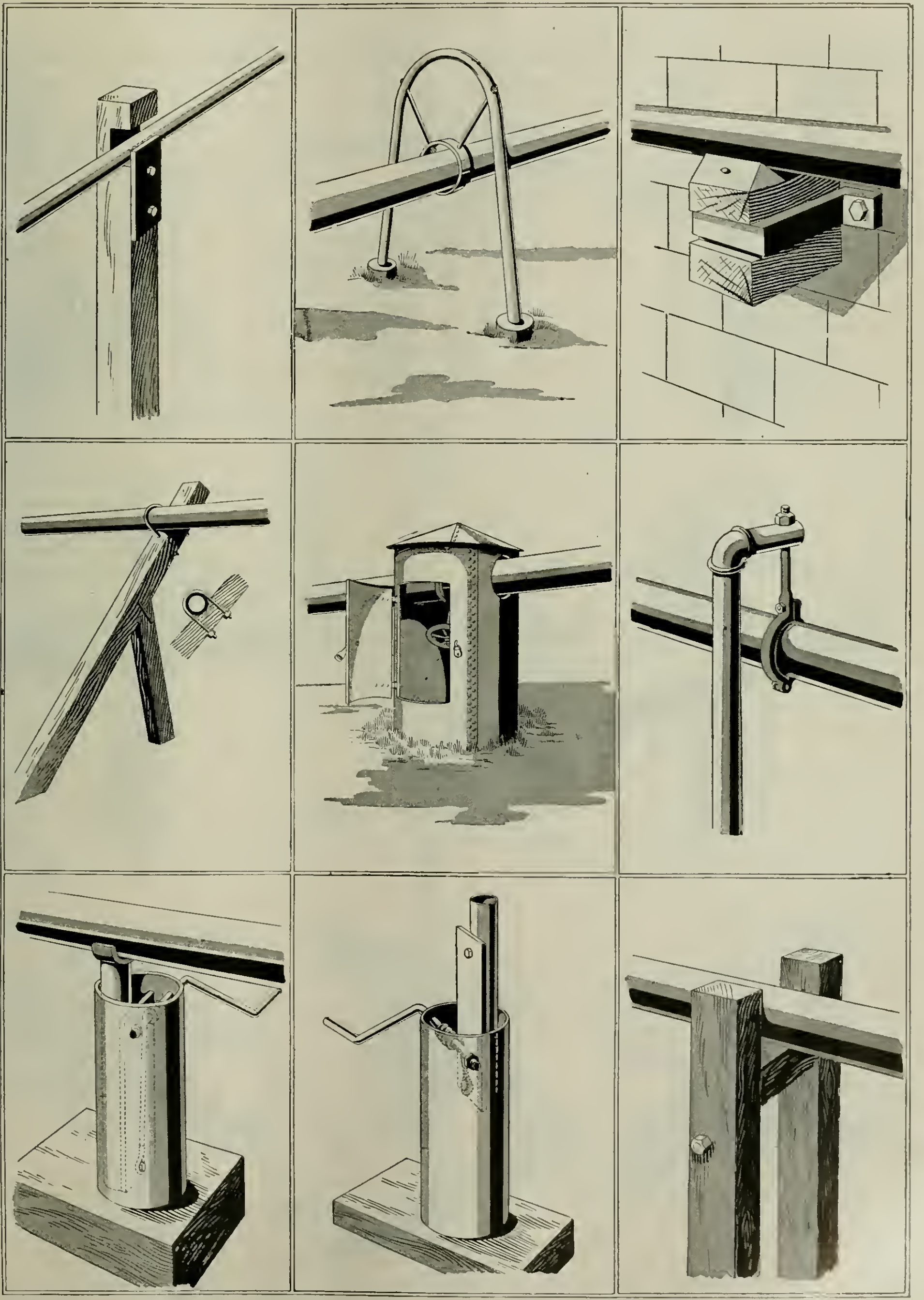
For a number of years the Coast and Geodetic Surve has extended a network of elevations of high accurac inland from the coasts, with the elevations of its monuments all referred to mean sea level. The publicatio of the present report is to encourage the adoption an use of mean sea level as the datum for elevations by al civil engineers and surveyors. It is believed that th adoption of this plane will aid in the commercial an industrial development of the country.

The pamphlet, which is called Special Publication No 41, of the Coast and Geodetic Survey, may be obtaine free of charge from the Division of Publications, Department of Commerce, Washington, D. C.

Means of Suspending Pipe

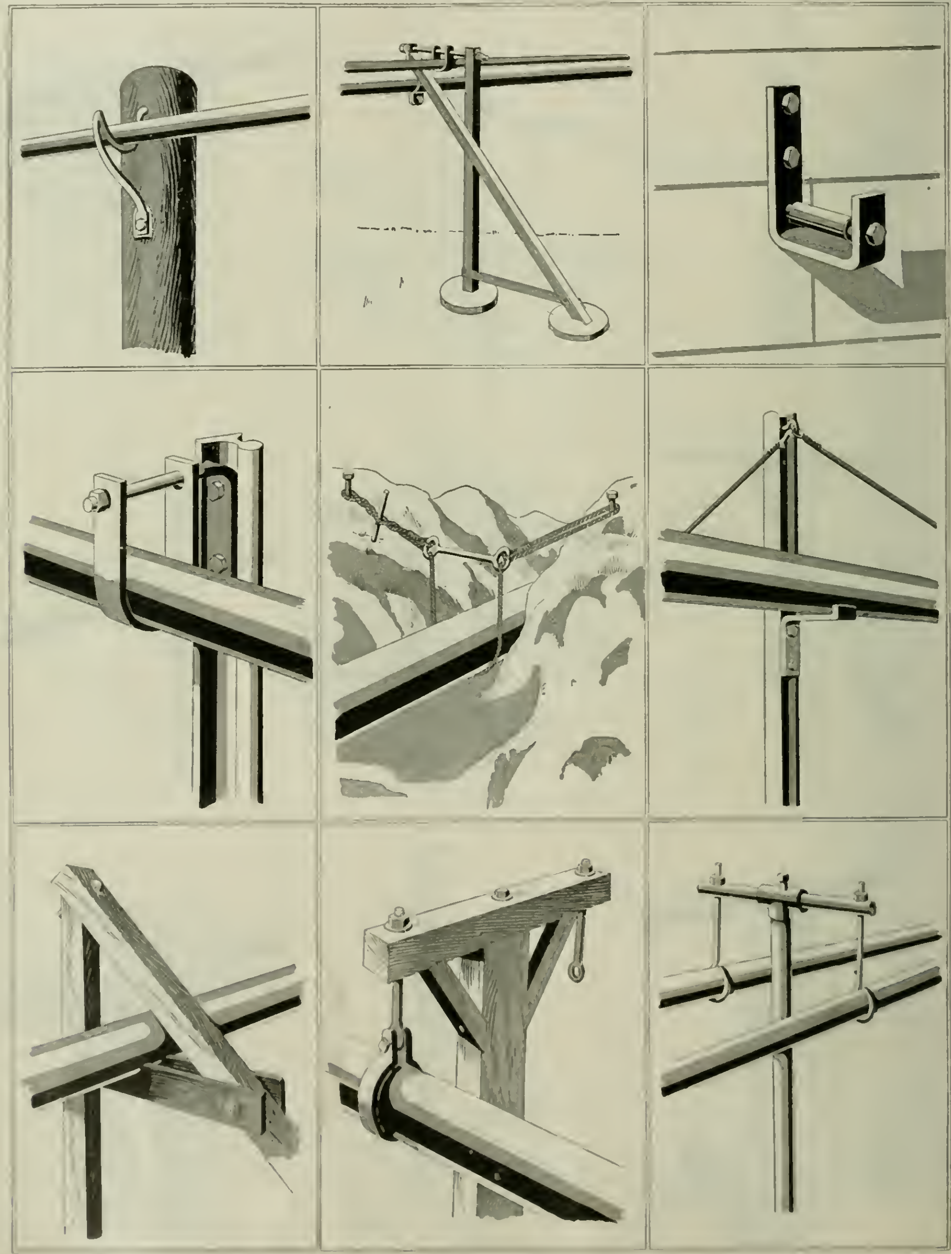


AT MINES AND METALLURGICAL WORKS MANY METHODS ARE USED FOR SUSPENDING THE LARGE

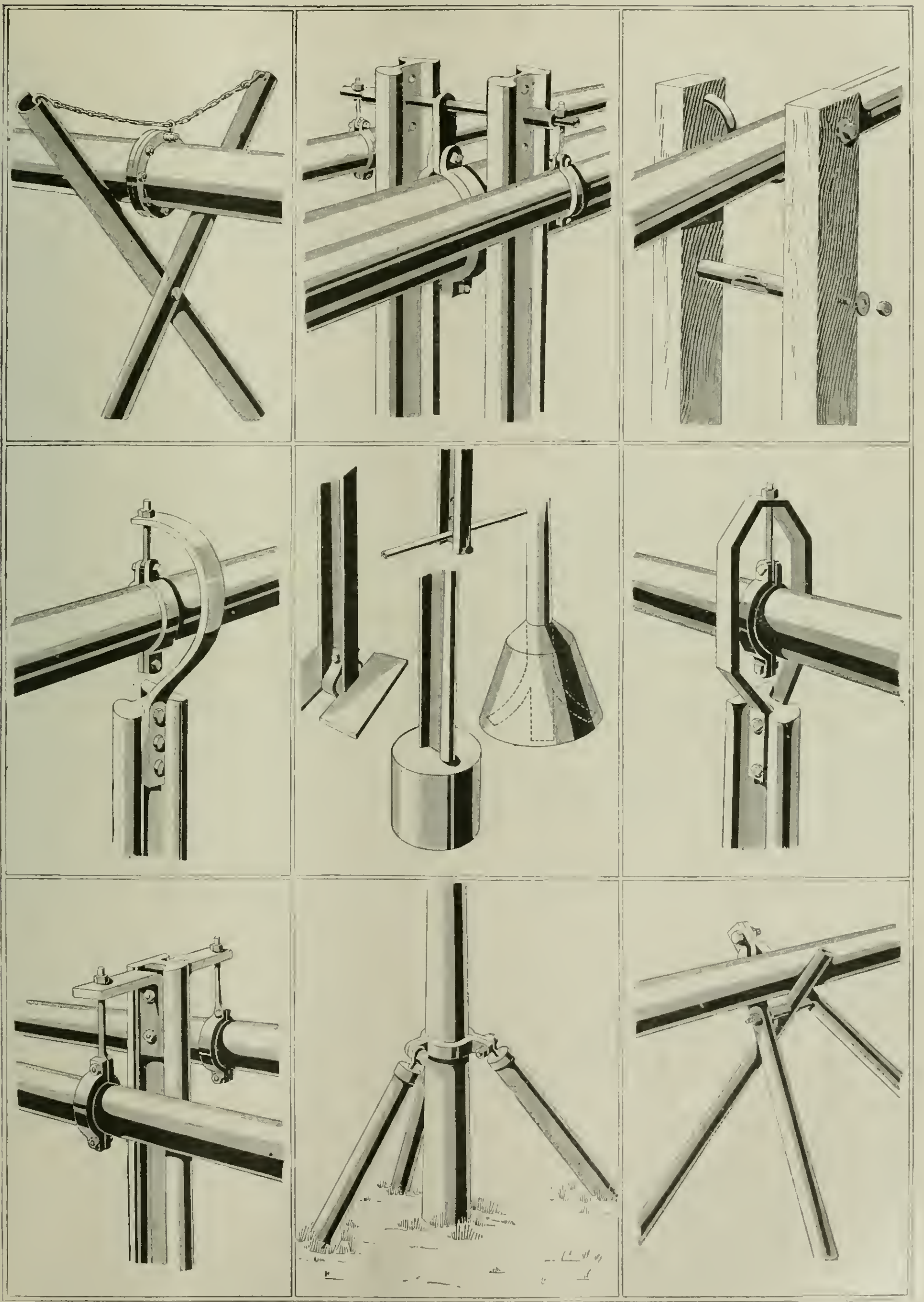


AMOUNT OF PIPE REQUIRED, THE PARTICULAR SCHEME ADOPTED DEPENDING UPON CONDITIONS

Means of Suspending Pipe



THESE PAGES SHOW THIRTY-SIX SCHEMES FOR PIPE SUSPENSION AND MAY



SERVE TO GIVE USEFUL SUGGESTIONS FOR MEETING ANY SET OF CONDITIONS

Events and Economics of the War

During the last week the British drive in Flanders absorbed the attention not only by reason of the possible results to be gained—the Belgian Coast—but also because of the power manifested against the German attack. The situation remains turbulent in Russia, with Kerensky again at the head. The Russians are being driven out of Bukowina by the Teutonic forces.

At home, Congress talks on the food and revenue bills. An embargo has been placed against the export of ship steel. Steel ships of over 2500 tons being built have been commandeered by the Government. Men for the National Army are being selected. Support of the Government is urged upon labor by Gompers. No visible move has been made as yet to suppress I. W. W. agitators throughout the country.

Work for Engineers

Brigadier General Black, chief of engineers of the army, says: American engineers must undertake large operations in construction and repair of bridges in France. They must repair and maintain roads and highways over which our supplies will be brought up to the battle line. To accomplish this work, the same kind of street and road equipment as is used in our leading American cities will have to be shipped to the front. Our engineers will equip piers and wharves in France utilized by American forces with terminal facilities required by our armies. Lumber for this work will be cut from European forests by regiments of American foresters.

Special mining companies will be formed for the purpose of carrying on the intricate operations involved in modern trench warfare. For this work expert miners will be chosen.

Avoiding Manganese Waste

A translation of a paper read at a meeting of the Association of German Ironmasters, made by Sir Robert Hadfield, appears in a recent issue of *Iron Age*. In the discussion of the paper, which is also reproduced, a member of the association said in regard to the creation of an Institute for Metallurgical Research:

> A plethora of problems will confront the Institute about to be founded. Among them are the desulphurization of blast-furnace coke and the saving entailed thereby of manganese in blast-furnace working, the desulphurization of and elimination of manganese from Thomas slag and the better utilization of the waste products of metallurgical working in general.
>
> Permit me to discuss briefly, in particular, one of these problems. Just picture to yourselves that, with the present utilization of our Thomas slag, we are causing each year 300,000 tons of iron and 150,000 tons of manganese, in the form of their oxides to be scattered on the fields and meadows of foreign countries, which is not particularly gratifying to these, nor can it afford any gratification to our economic life, seeing that it represents an annual loss of 20 to 30 million marks. If we can succeed in abstracting the manganese and iron from the Thomas slag, we shall not only save a great part of this loss, to the benefit of our national economy, but in consequence thereof we shall, moreover, reduce by many hundred thousands of tons the quantity of manganese and iron ores to be extracted from our mines by us per annum. I will only mention incidentally that in the end this will also afford some relief with regard to the whole labor question, which after the war will confront us in an accentuated form.
>
> Every practical man will clearly understand how important the solution of these questions is for our whole economic life. And, thanks to the high esteem in which we hold science, we may confidently hope that we shall find the key to the solution of most of them.

Shortage of Oil

Following closely on the warning of President Bedford of the Standard Oil Co. that we are headed directly for an oil famine, comes word that the Defense Council expects the supply to run short.

"Data secured by the navy," says the New York *Sun*, "indicate that the total shortage may amount to more than 120,000,000 bbl. Production is expected to decrease approximately 9,000,000 bbl. unless the navy reserves are tapped or the output of the Mexican field is increased. The Defense Council probably will urge upon the country the strictest conservation of oil, even if the output is increased by resorting to the reserves. The army's recent order for 25,000 motor trucks will be followed by other large contracts, so that added motor transportation alone will call for an enormous amount of gasoline. The great aircraft program and the ever-growing demand for oil by the navy for its ships will require millions of barrels more."

In view of the threatened shortage at home, the figures of the Foreign Commerce Bureau, showing the expansion in the country's export business in mineral oils, are of interest. According to these figures for the 11 months of the fiscal year ended June 30, as given in the New York *Times*, total shipments abroad of mineral oils of all classes reached the unprecedented total of 2,483,601,229 gal., the value of which was placed at $203,756,064. In the corresponding period of 1916 such shipments were 2,220,211,439 gal., worth $146,822,199, while in 1915 period the outgoing shipments aggregated 1,975,861,237 gal., valued at $120,243,484. These totals covered such products as crude, gas, fuel, refined, illuminating, lubricating and heavy paraffin oils, as well as gasoline and naphthas of various classes.

Nonessential Railroad Construction Undesirable

The Railroads' War Board earnestly recommends that during the war the railroads be required by the public authorities to make improvements and carry out projects involving the expenditures of money and labor only when they are absolutely essential for war purposes or public safety. The prevailing high interest rate on money, the difficulty of raising money in competition with the tax-free issues of the Government, the excessive cost of supply and labor, the delay in obtaining material, the possible blockade of traffic and the diversion of labor all contribute to make nonessential construction undesirable during the war.

The board considers that the erection of new stations and the elimination of grade crossings are among the nonessential improvements which should be deferred. It suggests that the basis for consideration of new projects at this time should be the increase in the capacity of the carriers for national service.

The Liberty-Loan Cycle

Through the sale of Liberty-Loan bonds the United States is borrowing large sums of money from its citizens, its business men, farmers, bankers, wage earners, merchants, manufacturers. The Government collects this money and disburses it in two ways. Part it expends itself and part it loans our allies. The United States and these other governments spend it for American products and American labor, and it goes back directly into the hands of the people, the American business man, farmer, banker, wage earner, merchant and manufacturer.

This is the cycle. John Smith, the farmer, and Thomas Brown, the wage earner, each has purchased a Liberty-Loan bond, paying down the initial payment of 2%. On June 28 they made the 18% payment, depositing the amount in their banks and sending checks to the Federal Reserve Bank of their district. The Federal Reserve Bank collects the check and redeposits the money with the local banks. Later the Treasury Department draws against it and the money is again lodged with the Federal Reserve Bank. It is almost immediately withdrawn from the Federal Reserve Bank either by the United States or by some foreign government engaged in war with Germany to which the United States has advanced money and is paid out for American products or labor.

Therefore the money paid in by the aforementioned John Smith and Thomas Brown, on June 28, in part payment of their Liberty-Loan bonds may have got back into their hands in time to make up part of their payments due on July 30.

Government Buys Rails

In its last issue, *Iron Age* says:

Chief of passing developments have been the buying of 150,000 tons of rails by the Government for the building of a double-track railroad from its French port to its battle front, a marked reduction in output of steel works and rolling mills due to the extreme heat in all producing districts, and the efforts of manufacturers in steel and metal-working lines to have exempted from conscription enough employees to hold output of war materials where it is.

The Government's railroad operations in France will be on a large scale, and a vast engineering program is involved. There will also be considerable buying of light rails for portable tracks. The standard sections just bought are 80-lb. rails. Either bessemer or openhearth rails will be accepted. For the Government's French railroad 300 locomotives have been ordered, and there are negotiations for 17,000 cars, About 100,000 kegs of spikes are wanted.

Du Ponts in Coal-Tar Dye Field

The entry into the coal-tar dye-making field is announced by E. I. du Pont de Nemours & Co. An extensive plant, says the New York *Tribune*, has been started at Deepwater, N. J., adjoining the company's chemical department.

After years of study of the dye industry the company now feels warranted in investing the millions needed to put the industry on a basis to meet the competition of the German manufacturers after the war. The great development of the company in the manufacture of explosives and chemicals has brought it logically into the field of synthetic-dyestuffs manufacture.

The development will be progressive, starting with certain products and increasing as rapidly as possible. The company's laboratories, with their experts, will be at the disposal of all consumers.

Changes in the Shafroth Bill

WASHINGTON CORRESPONDENCE

Material changes have been made by the House Committee on Mines and Mining in Senator Shafroth's bill providing for the suspenson of assessment work on mining claims. The amended bill will be reported to the House within the next few days as follows:

To suspend the requirements of annual assessment work on mining claims during the year 1917.

Resolved by the Senate and House of Representatives of the United States of America in Congress assembled, That in order that labor may be most effectively used in raising and producing those things needed in the prosecution of the present war with Germany, that provision of section 2324 of the Revised Statutes of the United States which requires on each mining claim located, and until a patent has been issued therefor, not less than $100 worth of labor to be performed or improvements to be made during each year, be, and the same is hereby, suspended during the year 1917: Provided, That every claimant of any such mining claim in order to obtain the benefits of this act shall file or cause to be filed in the office where the location notice or certificate is recorded on or before Dec. 31, 1917, a notice of his desire to hold said mining claim under this act.

This act shall not be deemed to amend or repeal S. J. Res. 33 of the Sixty-fifth Congress.

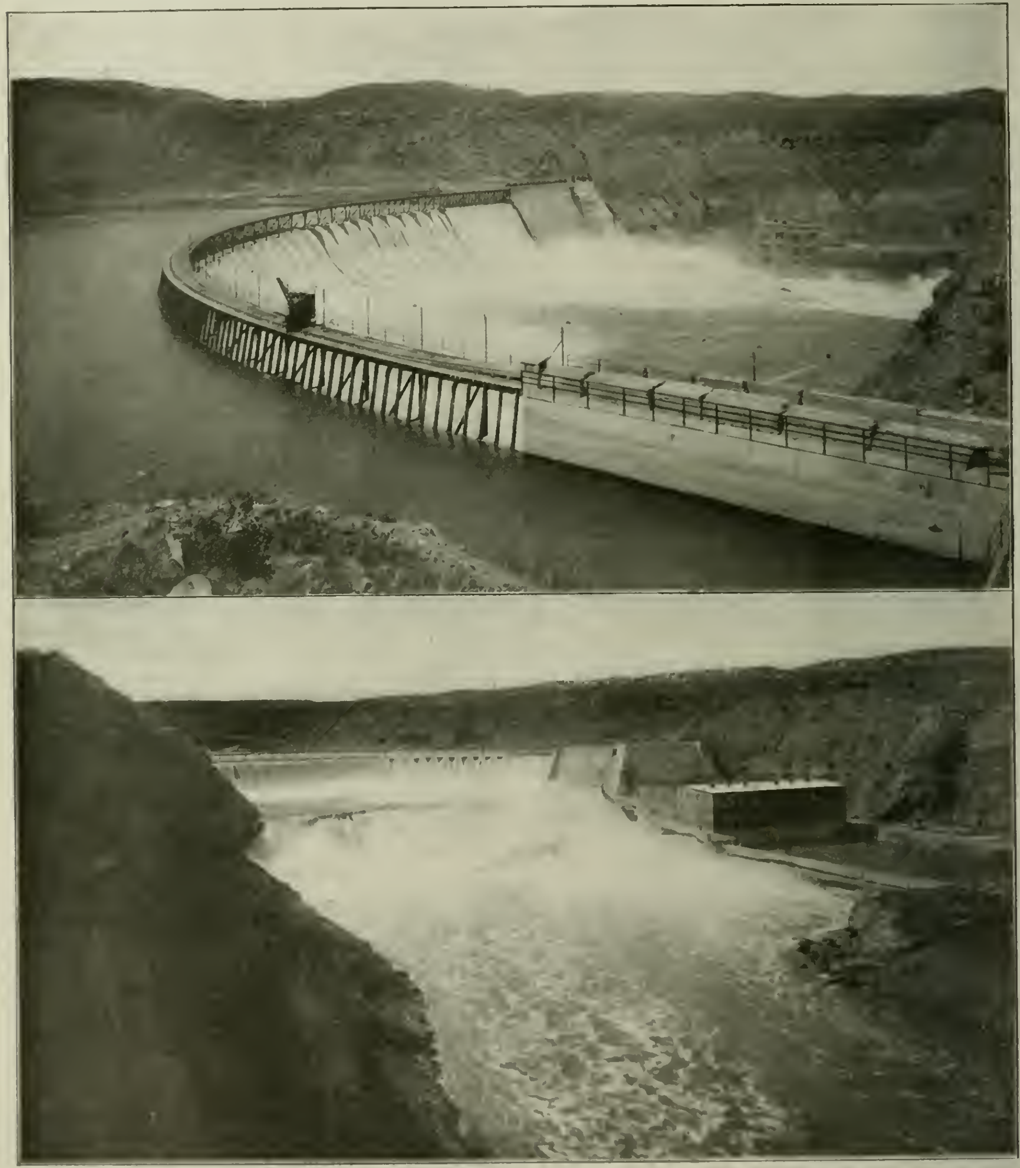
War Savings Certificates

The New York *Tribune* says the Treasury is considering the issuance of war-savings certificates, possibly in denominations as low as $5, in connection with the next installment of the Liberty Loan. Certificates may be purchased at post offices, to be converted into bonds when the owner has accumulated a sufficient number.

Director General of Railways

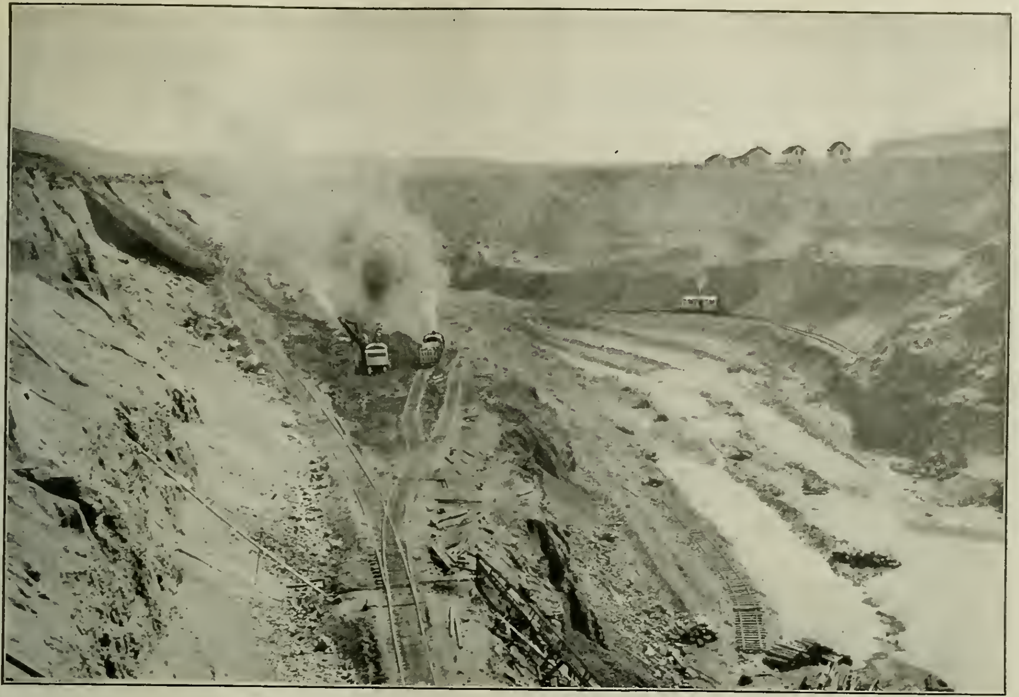
President Felton of the Chicago Great Western road, designated several months ago to direct operations for railroad rebuilding in France, has been given authority by the War Department to oversee all purchases of railroad materials by the department and supervise routing of troop trains in this country. He will have the title of Director General of Railways.

Photographs from the Field

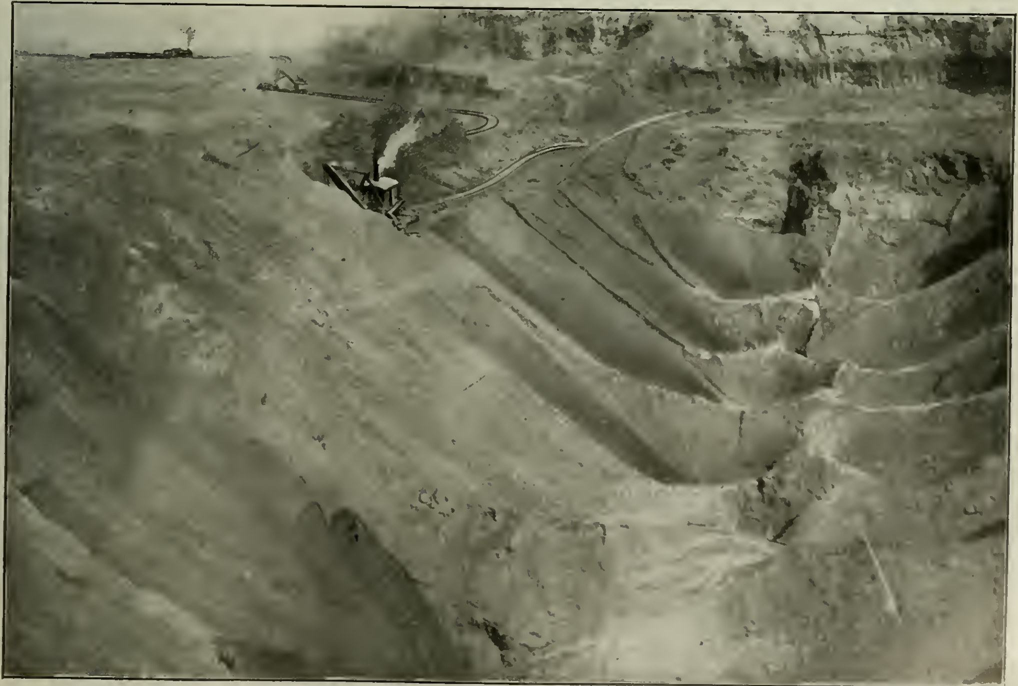


GREAT FALLS OF THE MISSOURI RIVER WHICH SUPPLY POWER TO THE ANACONDA SMELTING WORKS AT ANACONDA, MONT

This power development of the Montana Power Co. was completed in 1916. The Great Falls, the largest of the five falls of the Missouri River near the City of Great Falls, Mont., have a natural drop of 78 ft. The concrete dam, with 11-ft. steel flashing, develops a working head of 150 ft. About 60,000 hp. is developed at 6600 volts and stepped up to 110,000 volts for transmission. Besides the reduction works at Anaconda, power is supplied to two sections of the St. Paul's electrified railroad. A high-tension bus line also ties in this development with the Rainbow Falls power plant, and the Anaconda refineries and smelting works at Great Falls.



The Agnew, a typical small pit operation on the Mesabi range, near Hibbing, Minn.



The Albany mine, near Hibbing, where the milling system of mining is used; the Morris mine is shown in background

VIEWS SHOWING TWO METHODS OF MINING ON THE MESABI IRON RANGE IN MINNESOTA

Correspondence and Discussion

The Smelters and the Mines

I have not seen any reference in the *Journal* to the abnormal conditions existing between the custom smelters and the independent miners and operators that now prevail in the Southwest and throughout the mining sections of the country at large. Briefly, the situation is as follows: The high price of metals has brought about a large production of ore. Mines having contracts with the smelters or offering ore of high value can dispose of their products. Those properties having no contract and producing ores of only moderate value are unable to find a market.

This condition necessarily restricts the development of properties and discourages the prospector and independent operator, who are the real discoverers and developers of large properties. Without them there would be no properties.

The reason given by the smelters for refusing ore is that they are overstocked. This, in a measure, is true, but is not the whole truth. To the outsider the situation appears as follows: The smelters own mines or control mines and are constantly acquiring further control of other mines by purchase or otherwise. The mining department of the smelting firms never take over the property that is not already extensively developed and proven. They never risk money, as does the prospector and independent operator, to develop a small property or a prospect. The only property they will take over is one in which there is sufficient ore blocked out and in sight, not only to cover whatever money they pay out on purchase account, but to cover all costs of mining and further development. This, of course, is a safe business—not always good business—but it brings about a situation that ought to be analyzed.

The developer must sell his ore as mined. If he cannot do so, he has to stop. This places in the hands of the mining departments of the smelting firms the control of the ore production of the country.

A property, under the independent operator, producing a certain tonnage with reserves blocked out, is acquired by the mining department of a custom smeltery. The next steps are as follows:

Its production is forced to all it will bear, and the ore reserves are exploited; and often when the next option payment is due, no development has been done, the reserves are about exhausted and the mining department returns a deteriorated property to the original owner. To take care of this forced production, one or more independent producers whose contracts expire or who have been shipping without contract find they cannot get a renewal or are notified that no further shipments will be accepted; hence the closing down of the properties. Their only recourse then is to option or sell to the mining department of the smelting company at their figure, the properties thus forced out of business. This again leads to another condition through which the smelters acquire control of metal production.

It may be broadly stated that every mining property acquired or controlled by the smelters means a closing down of one or more independent producers. In other words, we are in a vicious circle, the independent mine owners and operators being the center, surrounded by the custom smelters and their mining departments. The inevitable result will be the curtailment of production by the independent mines as well as the discouragement of prospecting and developing of new properties.

This situation will result in placing in the hands of the smelters, which are controlled by two or three groups of extremely powerful corporations, the metal production of the country and, incidentally, its price.

Experience has shown that this is an extremely dangerous procedure for both the consumer and the independent producer of new material. It would be profitable to the mining industry to produce some solution of the problem fair to the smelters, the subsidiary mining departments of the smelting firms and to the independent mine operators, developers and prospectors.

Tucson, Ariz., July 12, 1917. ARTHUR C. WHEATLEY.

Professional Mistakes

It has frequently been suggested through the columns of the *Journal* that, since all contributions from operators tell of successes, either in methods or appliances, someone ought to relate his failures. Much could be learned from them. So far as is known, this has not been done. Naturally, many failures have been balanced by success accomplished at the same property during the same period, the negative results not necessarily appearing in the general results in such a glaring manner as would have been the case had the operations been confined to the detail involving the failure. At times justification might be found in the claim that while the work performed was apparently wrong, continuance along the same general lines might have eventually brought success.

If there is a pursuit that lends itself to plausible explanation as to why things went wrong, it is mining. Theory goes wrong, grade of ore falls off; ground caves; things that should have happened, did not happen; things that should not have happened, did. All plausible. The operator hears them from his staff and also at times tells them, and there is no way to prove that the cause is not in absolute accord with the explanation, or that the explanation is not in accord with the cause. The instances of failure noted here are actual ones and can either be admitted or "explained."

A moderate-sized orebody was encountered which, owing to its nature, had to be square-set. Filling costs were high; timber costs were high. Through orders (my own) no more timber was used than was absolutely necessary for safety and the stope was only partly filled. The result was a collapsed stope, 2500 tons of known ore lost. One thousand dollars expended judiciously might have earned $10,000 from known ore. (The term "known ore" is used here with the hope that the probable ore was not there to make the matter worse.)

That other orebodies, encountered later, made a profit which absorbed this loss does not justify the loss of the stope. The $10,000 is still there, now unrecoverable except at a cost far in excess of its value. Economy is no excuse for this loss, as there was no shortage of funds for the work and no reason for it other than bad judgment. At this same property considerable old equipment was used. First economy was later proved a great expense. Old boilers and hoists had to be replaced at a time when it was most inconvenient.

In a district of many parallel veins, some of which were barren, I became imbued with the idea that a certain vein near moderately profitable workings should carry workable values. Indications were that it was unsafe to cut this vein on account of water contained in the higher levels, where it had been prospected. A crosscut tapped both the vein and the water, and it took a year's profit and more to make up for bad judgment.

In a well-known copper district, where property adjoining the productive center was more or less mineralized, I had the choice of two prospects—one with a good surface showing of zinc, the other with a poor showing of copper. I picked the copper and a "lemon," and a tenth of a million went with the lemon. Half a million dollars profit came with the zinc property.

I was called upon to reorganize and develop a property which, having been operated for years, had been allowed to get into a bad state of repair. Work had never been done in a modern way. The tunnels were small and the shafts crooked; in fact, the property was in such shape that it was extremely difficult to decide what to do. I went to work to rejuvenate the old workings, modify old stoping methods and develop new territory. The development went fairly well; the modification of methods went worse well, while the rejuvenation went, Oh — well, and the money, close to $200,000, to — well!

When some of our fortunate operators are telling of their successes, they forgot to tell of their reverses, losses and blunders. Since this letter is written about blunders, there will be no compensation in the way of giving good results obtained. To continue: What is the cause of failure? Is there any basic cause for the bad judgment frequently displayed in mining operations? There are three underlying and unexplainable causes that produce the effect—snap judgment, poor judgment and no judgment.

Snap judgment is the forming of an opinion without the necessary data or information to justify it, and at the same time requiring an over-amount of evidence *in contra* to alter it. As examples: Mistrust of a claim and owner, absolutely a stranger, of whom one has no knowledge other than outward personal appearance, will often start an opinion that is hard to dispel and may operate against a favorable consideration of a prospect or mine. Dislike of a certain district, weather, accommodations, climate. Overestimation of one's own ability to do something a little better than the other fellow did it, or make good where he failed, before going into the details as to why he failed, or by making a comparison of what you know you can do under one condition against what you do not know that you can do in another.

Poor judgment is poor analysis of abstract data, in selection of methods, employees, materials, etc. Many times poor judgment might be considered as ignorance or ignorance as poor judgment—the resultant from either is likely to be the same.

No judgment is a subject that requires no discussion.

It is rather unusual to consider failures, therefore the classification is difficult. It is a question whether to begin with "no judgment" and ascend to "snap judgment," or to begin at "no judgment" and descend to "snap judgment." Perhaps "poor judgment" should be at the top or at the bottom. There are six ways to write the three classifications, and there are about six ways of applying each classification. In my own case, I think that the three classifications can be applied in the six ways to each of the cited failures, blunders or disasters that I have confessed.

Do not think that the mistakes or blunders cited are all that I have made. They are only a few of them, and please do not, everybody who has had about the same thing happen at their property, say: "Yes, that was ——," for perhaps it wasn't and that would be "snap judgment." If you really want to know, if you will write to the editor, he can tell you, but like the Chinaman in Mexico who was beaten by a bunch of revolutionists for yelling "*Viva Huerta*," and then by the *Huertistas* for yelling "*Viva Villa*," when asked the next time "*Quien Viva?*" answered, "You holler first." R. E. MORSE.

St. Louis, Mo., July 14, 1917.

The Corocoro Mill, Bolivia

In the *Journal* of June 16, 1917, in an article entitled "The Proposed Corocoro Mill, Bolivia," by Mark R. Lamb, I note that the author in his remarks on the native copper ores at Corocoro, makes the following statement: "In order to give an idea of the facility with which the native copper ores are concentrated as compared, for example, with the native copper deposits of Lake Superior, I would hazard a guess that a ½% ore at Corocoro would be more profitable than 3% ore at Lake Superior, taking into consideration the cost of mining and concentration, and this in spite of the fact that Corocoro is a long way from the machinery and copper markets."

Having had charge of some extensive examination work in Corocoro district in 1915-16, in the course of which I spent several months there and went quite fully into the matter of the working costs at the properties of both of the principal operating companies there—the Cia. Corocoro de Bolivia, mentioned in Mr. Lamb's article, and the Corocoro United Copper Mines Co.—Mr. Lamb's opinion is of considerable interest to me, particularly as it is radically different from my own opinion in this regard. I would be greatly interested if Mr. Lamb would state in detail the basis for this opinion which he has expressed. LEIGHTON STEWART.

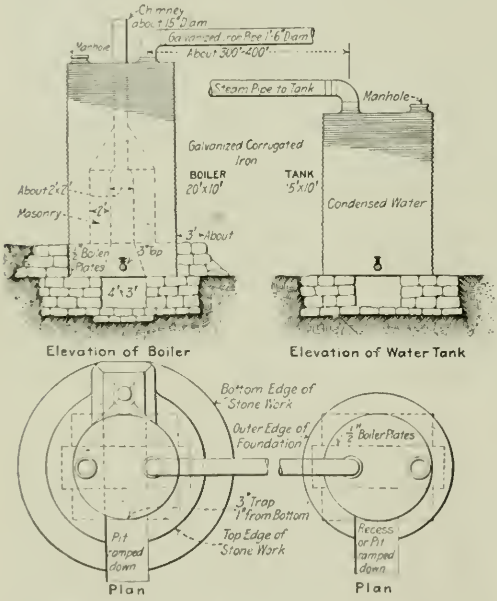
New York, July 10, 1917.

Details of Practical Mining

Condensation of Water at Coolgardie, Western Australia

By Leonard Goodday
Civil and Mining Engineer, Ottawa, Ont.

In the early days the want of water in the Australian bush was a serious drawback, as the rivers are few and far between. In the gold-mining districts of Coolgardie and Calgoorlie, Western Australia (which towns are about 387 miles east of Perth), where mining was started about the year 1892, water was obtained at depths varying from 60 to 300 ft., but it was in every case impregnated with soluble salts of various kinds, making it totally unfit for domestic purposes, unless distilled once, and sometimes twice. I should say that when lakes in Western Australia were dried up, the beds of most of them would have a layer of about 2 ft. or more of these salts.



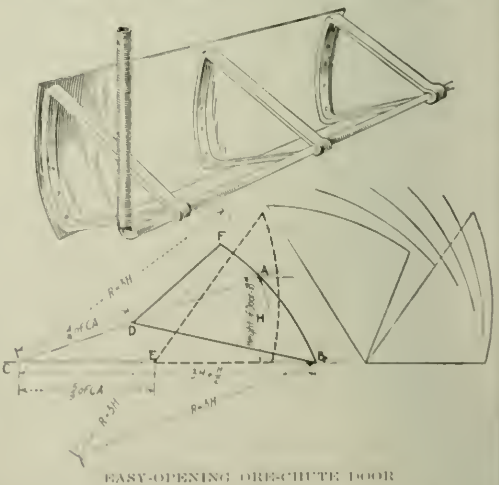
CONDENSATION PLANT ON COOLGARDIE GOLD FIELDS, AUSTRALIA

Having no means to condense water in the usual way, by allowing steam to pass through a pipe coil in a tank of circulating water, large tanks of corrugated galvanized iron were made from 7 to 10 ft. in diameter by 15 to 20 ft. in height, resting on ½-in boiler plates resting on solid stone foundation, with a furnace underneath the center for burning wood of which there is a plentiful supply.

Referring to the sketch, it will be seen that the condensation of steam is accomplished by means of galvanized piping from 12 to 15 in. in diameter, and having a drop of about 1%, connecting the boiler and condensed-water tanks which are placed 300 to 400 ft. apart; the difference of temperature between the boiling water and the atmosphere (highest in the summer about 180° F., and in the winter 120° F. in the sun, and at nights 60° to 70° F. in the summer to 40° F. in the winter) causing the condensed steam to trickle along this connecting pipe. The furnace, as will be seen, is made right through and connected to a chimney made of masonry and iron tubing, as shown, or with masonry only. The hardwood (gum and jarrah) gives out intense heat for some time. The pit in front is easy of access for firing. The tank is filled through the manhole at top. Two petcocks are fixed at the side of each tank for gaging the amount of water in the tanks. Some of the larger mining companies used to sell water to the smaller ones, in which case the condensed water or supply tank would be supported high enough to enable small tanks on trolleys to be backed up for filling. The boiler would be filled up to 4 ft. from the top, which would amount to about 7812 gal., say 35 tons, and the supply tank would be filled to about 33 tons. Water-works were erected about 1900, good water being obtained about 200 miles away.

Ore-Chute Door

The circular door frequently used on ore chutes and ore bins, swinging on a circle, frequently sticks, owing to the cutting and dragging of the sharp corners of ore or waste, or the sticking of a talcy material. A door that draws away from the material at the same time that it is raised may be easily made by following



EASY-OPENING ORE-CHUTE DOOR

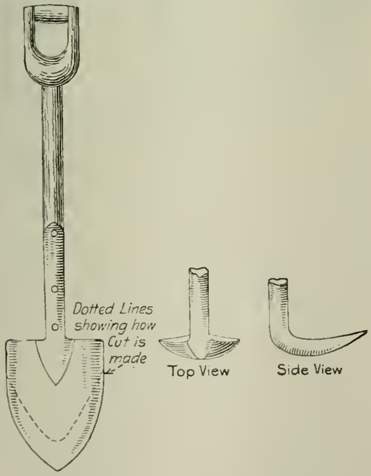
the directions given. Any blacksmith or boilermaker can lay this out in the shop, with a measuring stick and a piece of chalk. Bearings, hangers, lever, etc., are shown in the accompanying sketches.

To describe the arc for the door, take as an example a door 18 in. in height. From the point *C* on a horizontal line describe an arc taking as radius distance three times the height of door (18 in. × 3 = 54 in.). From the point *C* mark off the point *B* on horizontal line 3½ times the height of door. Run a line parallel to the base at the height of door, and at the intersection with the arc fix the point *A*. Describe an arc from *B* through *A* with the original (54 in.) radius. Extend the arc beyond *A* for a distance equal to 3/2 *AB*, to the point *F*, for height of door. Draw a line from *C* (original center) through *A* 4/9 of distance *C* to *A* =*D* (4/9 equals 1⅓ times the height of bin opening). Five-ninths of *AC* = *E*, point of swing of gate. The door will now be arc *FB*. Bracing will be *DF* and *DB*. Reverse the door, placing center *D* at the point E. With *B* up and *F* on chute bottom, the door will then open on the arcs as shown.

A Use for Old Shovels

By D. E. Charlton*

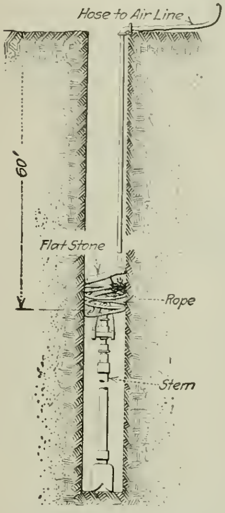
There is scarcely a mine or mining district where an accumulation of old shovels cannot be found either on the scrap heap or in old drifts and stopes, and that these can be put into practical use has been clearly demonstrated. In the well-established districts many of the companies have encouraged their employees to plant gardens, and during this year the practice has received a decided impetus owing to the possible food shortage and high prices.



FARMING IMPLEMENT FROM AN OLD SHOVEL

The much despised, worn-out "No. 2" offers the "makings" of an excellent hoe for garden use, particularly where the soil is heavy and requires considerable cultivating. The mine blacksmith can cut the worn edge to a V-shaped point and in one heating can bend it over. If a sharp cutting edge is required, a few minutes on a grindstone will suffice, and the carpenter can easily supply a suitable handle. It is best not to attempt tempering, as the steel has a tendency to split, but slight cooling and then immersion will secure the desired effect.

Removing a Rope from a Drill Hole



BURNING OFF ROPE FROM LOST DRILL BIT

A NOVEL method of recovering a lost drill stem is described by H. S. Carpenter, of Billmyer, Penn., in *Engineering News-Record*. During operation the drill rope broke when the stem was about 60 ft. down, and a loose flat stone apparently fell right on top of the coiled rope and prevented reaching it with a spear in the usual manner. Kerosene was then poured into the hole, and a piece of ½-in. pipe, attached to the air line, was lowered over the rope as shown in the sketch. A piece of waste was then ignited, dropped down the hole and the air turned on. The accelerated flame soon burned off the rope, and the stone slipped down beside the stem, permitting easy recovery of bit with usual fishing tools.

Proper Tension for Steel Tapes

By Alfred K. Friedrich*

Everyone knows correct measurement of distance is just as important as correct bearing, but far less care is usually employed than in measuring angles.

Most tapes when they come from the factory are correct at a 15 lb. pull when supported their entire length. Now, this condition is almost never met with in the field. The proper tension when unsupported is what the engineer usually desires. I made some tests recently that may be of general interest:

I first laid out 100, 200 and 300 ft. with a standard tape. This was done on a piece of perfectly level ground. Wooden hubs were driven flush with the ground and a scratch made at the graduation points in order to have as fine a mark as possible. I next laid out the tape to be tested (300 ft. in length), and found it correct at a 16-lb. pull. I next tried the tape unsupported. Lifting a 100-ft. section clear of the ground, I found it correct at 32 lb. In the same manner 200 ft. was correct at 48 lb. From these results I expected the 300-ft. total to require 64 lb., and was rather surprised to find that it only required 56 lb. to pull it up to the mark when entirely unsupported. The tensions were all less than I had expected to find them, as I was using an extra-heavy tape.

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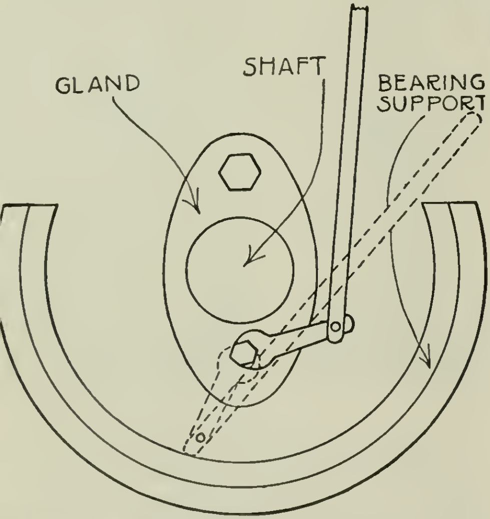
*Virginia, Minn.

*Carmichaels, Penn.

Mining and Metallurgical Machinery

Wrench for Special Uses

A special wrench and its use is described by M. Papworth, in *Power*. On one turbine there was considerable trouble with the carbon packing rings, so we substituted casing, forming a stuffing-box and gland for soft acking. As there was very little clearance left between he gland and bearing support, extending more than halfway round the under side of the shaft, the gland being longer than the original one, there was no room to get at the bottom nut with a wrench more than 3 in. long, so we had to devise some different way to tighten the gland. I cut an "end wrench" off 3 in. from the head and made a handle about 16 in. long, drilled through both and bolted them together, making a swing joint. This prevents burning the fingers and makes a handy little wrench that can be used in many close quarters.



WRENCH HANDLE JOINTED TO GO IN CLOSE SPACE

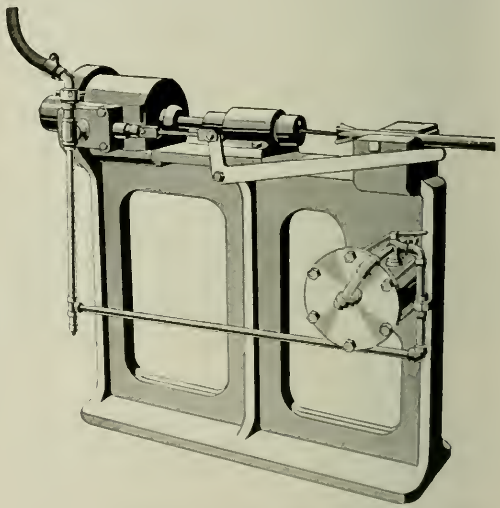
A Punch for Hollow Drill Steel

A machine designed to meet a growing demand for a process that will quickly and satisfactorily open up the holes in bits and shanks of hollow drill steel is being placed on the market by I. H. Proske, Denver, Colo. With this puncher the hole can be opened and enlarged in an instant. A powerful griping jaw to hold the steel is provided, and the punch is rammed into the hole, and pulled out again, the grip being powerful enough to hold the steel.

The operation is done so quickly that the steel loses very little of its heat in this operation, and the work is done very much more satisfactorily than can be performed by hand labor.

An auxiliary extension cylinder on the backhead of the punching cylinder provides a cushion to prevent the piston striking on the return stroke.

This machine is rigid and massive enough to stand up to the work it has to do. The punches can be taken out and exchanged in an instant. A four-way valve operates the gripping cylinder; all the operations are very simple and handy so that no time is lost, and the character of the work is good. The net weight is about 1200 lb.



PUNCH FOR HOLLOW DRILL STEEL BITS AND SHANKS

Tube-Mill Lining

A tube-mill lining carrying 94% silica, 2.4% hydrate of alumina and potash, 2% hydrous silicate of lime, 1.6% oxide of iron, and having a crushing strength of 45,300 lb. per square inch is being mined and placed upon the market in standard blocks for tube mill linings by the Jasper Quarry Co. of Sioux City, Iowa.

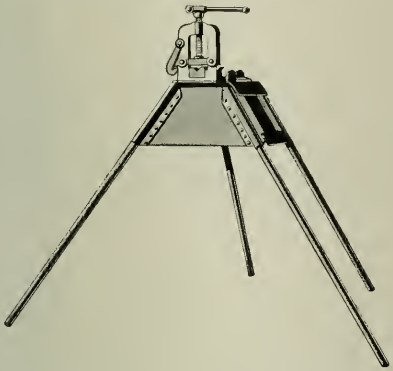
Tests show the abrasion of this material to be 4.6% by standard rattler test, with a coefficient of 21.5.

This is equal or superior to the material formerly imported and now unobtainable on account of the war.

The imports of silica for mill linings will probably never reach anything like their former operations, as we have deposits in this country equal to all demands.

Portable Vise Standard

A portable vise standard and pipe bender that is being used by many water companies for service work and described by *Engineering and Contracting*, is made of No. 16 sheet iron thoroughly riveted and braced with angle irons. The legs are made of ¾-in. pipe, which slip into sockets when the stand is set up. The stand is equipped with a vise for holding pipe when cutting or threading. The bending device during these operations acts as a guide and rest for the pipe. It will bend pipe or conduit from ⅛ to ¾ in. in diameter. It weighs about 45 lb., is easily transported and when set up is perfectly rigid. The device, manufactured by H. P. Martin & Sons, Owensboro, Ky., is shown in the illustration.



PORTABLE VISE STAND FOR PIPE CUTTING

A Pulverized Fuel Feeder

In the cement industry of this country, representing a total investment of $250,000,000 and producing 100,000,000 bbl. of cement annually, over 6,000,000 tons of coal is consumed in the kilns, under very wasteful and inefficient conditions. In order to prevent this waste, the Locomotive Pulverized Fuel Co., of 30 Church St., New York, is placing on the market a combined feeder and commingler, details of which are shown in the illustration. This feeder will deliver from 3000 to 4000 lb. of coal per hour, consuming only 5 hp. against 150 to 160 hp. required by the blast delivery now in common use at many plants.

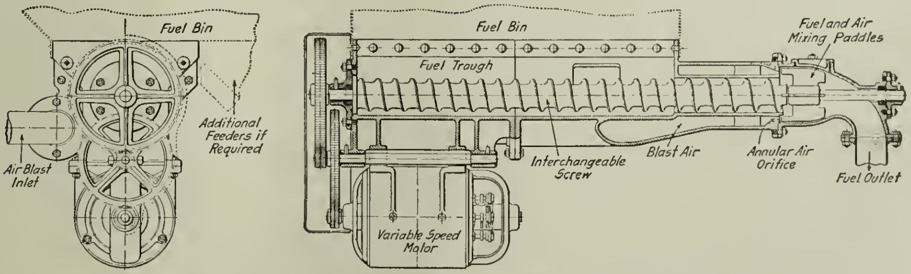
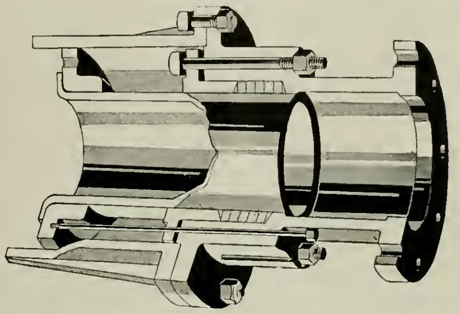


DIAGRAM OF THE APPLIANCE FOR FEEDING PULVERIZED FUEL

A New Expansion Joint

An expansion joint, manufactured by the Ross Heater and Manufacturing Co., of Buffalo, N. Y., uses a flange, machined to a sliding fit within a similarly machined cylinder in order to maintain perfect alignment.

The packing gland can be drawn up from the outside, without disturbing any point of the joint proper. Two single types are made, with traverse of 4 and 8 in. respectively, and two double types, having 8- and 16-in. traverse. The joint fits between standard flanges.



NEW STRAIGHT LINE EXPANSION JOINT

Decalescence-Point Finder for the Blacksmith Shop

As stated in George H. Gilman's article, "Drill Bits and Drill Steel for Metal Mining," published in the *Journal* of May 12, the proper heat for plunging a drill for tempering, regardless of the carbon content of the steel, is when it loses its magnetism. This temperature is known as the point of decalescence.

The Slocum, Avram & Slocum Laboratories, Inc., of 531 West 21st. St., New York, have placed on the market a decalescence-point finder which consists of a highly sensitive, carefully balanced magnet that may be suspended upon an extension arm over the forge, making it unnecessary to take the drill from the fire while determining whether the point of decalescence has been reached or not, although it is better to do so, as the magnet itself will be demagnetized if allowed to become too hot. The loss of magnetism may be overcome, however, by remagnetizing with an appropriate magnetizer which may be attached to any direct-current electric-light socket.

The Flat River, Mo., Strike

By H. A. Wheeler

Consulting mining engineer, 408 Locust St., St. Louis, Mo.

There is now little doubt that the recent strike in the Flat River lead district in southeastern Missouri was inspired and carried out by parties in the employ of the German war machine in their efforts to cripple the American industries, especially the two basic ones, of mining and farming.

When the strike broke out without any warning on the night of July 14, it was supposed to be the outburst of the native Americans over the increasing employment of foreigners, as only the latter were available for meeting the greatly increasing demands for labor in this district. All the Americans who are capable of holding a job have been steadily employed for years, and it has been necessary to ship in outsiders, mainly foreigners, to meet the urgent demands of increased activity.

Under the guise of calling themselves Americans and carrying the American flag at the front, the armed mobs drove the foreigners out of the district under the cry of "America for the Americans"—"that the foreigners were depriving them of a living." There was some "roughhousing" and beating up, with a liberal amount of shooting, but the latter was mostly in the air. The generous display of arms, the extensive shooting—although it was in the air—and the seeming unanimity of the large mob of natives sufficed to scare the foreigners so badly that most of them hurriedly left the district, many even abandoning houses and gardens that they had enjoyed for years.

After boasting of the success of their efforts, as "Americans," in running out the foreigners, the mob had the effrontery to applaud themselves for the humane methods employed and the slight amount of blood that was shed.

Ample Work for All, American Workmen Not Being Replaced by Foreigners

There was no question of wages, hours or unionism involved, and there were far more vacant jobs than men to fill them, while wages were never so high, as the miners are making $4 to $6 a day. It seemingly was a pure outbreak of "Americanism," and the press reports were most successfully manipulated to create this impression and that of the "humane methods" employed with "so little loss of life." It was "Americans protecting their homes and livelihood from foreign aggression," with "no I. W. W. complications," according to the reports disseminated to the outside world.

To understand more clearly the local situation, it should be stated that when this district began its present active career, at the close of the Rebellion, it was in the heart of a bushwhacking country and was made up entirely of Americans—mostly of the Tennessee mountaineer type. While very poor, living in log cabins and abominably underfed, they were a contented, easy-going lot who were remarkably independent and had to be handled with soft gloves to keep them at work. The 90c. to a dollar a day for surface hands and $1.15 for miners were big wages—more money than they had ever before received, and they were well paid, considering their low efficiency. Better housing, better living and increasing competition for "public-works jobs," as the natives call company work, improved their efficiency and wages increased.

With the rapid development of the district that started about 20 years ago, the supply of natives was simply inadequate, and the more recent employers were less tolerant of the slow, easy-going, highly independent character of the natives. Outside labor had to be shipped in, mostly Hungarians, and with the rapid growth of the district, their numbers have greatly increased. As the Hungarians were husky, strong, willing fellows, they were assigned to the shoveling and other heavy work, for which they were decidedly superior to the natives, but lately, especially since the contracting system has been adopted, they have been advancing as miners. The Hungarians were thrifty, satisfactory, hard workers who clanned by themselves and while occasional family squabbles occurred from indulging in too much "booze," they never bothered the Americans or indulged in shooting scrapes, which latter pastime is by no means a thing of the past among the natives.

Race Jealously Always Present

The natives resented at the outset the intrusion of the Hungarians, but beyond noncomplimentary discussions and talk, with an occasional wild pistol shot, it never resulted in any serious trouble, especially as at first the Hungarians were confined to the despised shoveling, which is too strenuous work for the average native. While the increasing number of foreigners created more talk among the natives, they would never have attacked them, as they recently did, of their own volition if no outside influence had not inspired, organized and led the cowardly outrages that were mainly perpetrated at night on the inoffensive foreigners. Having known this district for over 30 years and seen it emerge from the bushwhacking stage, I know whereof I speak, and while the natives have always resented the presence of the Hungarians, their objections were passive, as they have always lacked initiative and leadership; but the latent feeling has always been there for starting an uprising, if extraneous sources would furnish the initiative and leadership.

Outbreak Incited by Strangers

It now develops, under the investigation being conducted by the grand jury, that many strangers silently slipped into the district a few days before the outbreak and the active leaders of the mobs seem to have been exclusively strangers who have since completely disappeared.

Someone knowing of this race jealousy and of their lack of leadership and nerve, has taken advantage of the situation to furnish leaders, brains and sufficient money to win over the few flannelmouths that every working center contains and temporarily has heavily crippled this most important lead-producing center by scaring off most of the large and highly essential foreign element. There are some local complications, as usual, which more or less obscure the cause of the outbreak, but if the matter is later thoroughly threshed out, it will undoubtedly result in the discovery of a few agents of the "Devil Maximus," to whom should be donated a few ounces of Flat River lead through the medium of the firing squad.

Editorials

The Matter of Prices

THERE seems to be some prospect now that the business of buying supplies, both for the United States and the Allies, together with the matter of prices, will be coördinated by the newly created War Industries Board. That board comprises Frank A. Scott, chairman; Lieut.-Col. Palmer E. Pierce, representing the Army; Rear Admiral Frank F. Fletcher, representing the Navy; Hugh Frayne, a labor leader; Bernard M. Baruch, Robert S. Brookings and Robert S. Lovett. Herbert C. Hoover, although not a member of the board, will sit with the purchasing commission in cases where the purchase of foodstuff is involved.

It is understood that Mr. Baruch will be the chief purchasing agent for raw materials and Mr. Brookings for finished products, while Mr. Lovett will have charge of questions of priority. No policy has yet been declared, but Washington dispatches have talked about making the same price for the United States and for the Allies.

There is ground for satisfaction in that this matter is to be removed from the fog of ignorance, politics-playing and vacillation, in which it has been shrouded in the departments. There is further ground for satisfaction in that the purchasing committee is composed of men of decision, experienced in business affairs, even if the personnel be not ideal. We have no doubt that this committee will be governed by the idea of maintaining maximum production, above all things, and will agree with the producers as to prices, which prices will probably be changed from time to time. In other words, there will be a deference to the law of supply and demand, but the buying will be collective and squeezes due to foolish and unrestrained grabbing for scant supplies will be checked. The investigations by the Federal Trade Commission will probably be carried on to save the faces of some of the officials of the Administration who have made such a mess of things, but its advice will not amount to anything.

In the meanwhile a contract has been made with the committee of lead producers for 25,000 tons of lead, to be delivered during August, September and October, at 8c. per lb., the same price as for the July contract. The purchase of round lots of high-grade spelter having recently been made at 13@13½c. through the zinc committee, the latter has been requested to ask for bids on 5750 tons of prime Western spelter, f.o.b. St. Louis, to be delivered during the next 10 months. The zinc committee was authorized by the Secretary of the Navy and the Secretary of War to accept the lowest prices. This is a return to the old practice of the Government buying on lowest bid.

Thus, the Government is obtaining its supplies of lead and zinc without any great fuss, the snags being only in the cases of steeel and copper. As for copper, this is rather funny, for among the major metals it has been the one that has exhibited the least extravagance, all things considered, and at present is relatively lower than cotton or wheat. However, it may be prophesied that the true situation in this important industry will ere long be recognized.

Cost of Producing Copper

IT MAKES all the difference whose ox is being gored. Until recently, the managements of most of the copper-producing companies took the greatest pride in showing how cheaply they could produce copper. The brokerage houses, interested in promoting movements in the stock market, went the managements better, while the financial papers capped the climax with their tables of alluringly low costs and wonderful profits computed therefrom at a scale of prices for copper. But since the cost of producing copper has appeared likely to be a factor in the determination of price for the metal under Government control, all members of the old chorus have been singing in a different key. The producer who not long ago was blithely alleged to be making copper at 10c. per lb. is now lugubriously represented as being subject to a cost of 19 or 20c. Wherefore the remarkable change of tune? That question will doubtless be asked by some Senator from Missouri, who will find plain equivocation in the high figures talked about today.

Not so, dear Senator, the equivocation was in the low figures of yore. We are able to say this with some grace, inasmuch as for many years we have charged that many famous copper-producing companies did not really produce at such low figures as they represented, our intimations to that effect usually drawing out a cloud of brickbats. In what ways were the old figures, even those officially reported, misrepresentations? In a great variety of ways.

In the first place, companies reported figures analogous to the cost of running an automobile on new tires. In other words, there was not proper allowance for repairs and renewals. In the next place, expenses that properly belonged to repairs and renewals were often charged to capital account, where they were forgotten by the stockholder who merely examines reports from year to year, although the treasurer never forgot about them when he was called upon to supply cash for the payment of dividends or other purposes. This is one reason why dividend disbursements constitute only a percentage of what a copper-mining company has been earning apparently. There are few, if any, companies that have allowed for the amortization of the plants that they have been wearing out or depreciating in other ways. The way that works is that a company after 10 years or so finds that it needs a new mill or smeltery and then has to cease paying dividends until the new plant is paid for.

Another common way of misrepresenting things has been by giving the mine credit for the earnings on large sums of capital invested in railways or other branches of business. In some cases the railway is used simply for the transportation of ore from the mine to reduction works, but in many cases mining companies operate railways not only for the transportation of ores and metallurgical products, but also for a general carrying business. Thus, the Nevada Northern of Nevada Consolidated, Bingham & Garfield of Utah Copper Co., Mississippi River & Bonne Terre of the St. Joseph Lead Co. In many cases the earnings from such railroads are deducted from the cost of producing copper. In some cases this interrelation between mine and railway may be the subject of hocus-pocus. Sometimes there is opened an ore deposit in a remote part of a rough country, which ore deposit becomes valuable only when a railway is built to bring out the product. Sometimes such a railway must be built through a country that has no other immediate resources to speak of. The cost of producing copper from such a deposit must, therefore, include the cost of the railway. However, it is a common practice to have one corporation for mining and another corporation for railway building and operating. The promoters of such a concern may give things a decidedly different look according as to whether they choose to figure a cheap mine and a dear railway, or vice versa.

Another fallacy in the matter of costs pertains to those mines that produce valuable substances other than copper. Most of the copper producers work ores that yield a little gold and silver. It is the common practice to deduct the value of such byproducts from the cost of producing copper. So long as that does not amount to much, and so long as it is the common practice among producers, there is no great misrepresentation. When, however, the ore yields a good deal of value other than copper, there may be a great deal of misrepresentation. Thus, there are some mines whose classification is doubtful. For example, should the mines of the Cœur d'Alene in Idaho be classed as lead mines or as silver mines? At one time their lead value might predominate, at another time their silver value, according to market conditions. Among the copper mines, the Anaconda and United Verde are especially noteworthy for their high silver value, Anaconda being not only the largest copper producer of the United States, but also, with its output of 10,790,705 oz. of silver (in 1916), the largest silver producer. Possibly, in the case of the Anaconda company the matter of determining the cost of copper reaches the climax of difficulty. For that company is not only a producer of copper, zinc, silver, gold, lead, and various byproducts, but also is an operator of custom smelteries and refineries, railways, coal mines, factories of several kinds, public utilities, mercantile stores, etc. The company itself has never attempted to state its cost of producing copper.

Finally, there is the great question of the investor in a copper mine getting his money back; that is, the principal invested in the business, both for the acquisition of the orebody, in the first place, and the subsequent equipment of it with plant. For the latter a factor can be approximated. Experience has shown that the equipment of a copper mine costs about 15c. per annual pound of production, wherefore, reckoning 10 years of use and 7% interest on the money invested, about 2½c. per lb. copper should be allowed on this account. But for amortization of the capital invested in purchase of orebodies, human ingenuity has not yet been able to devise a general rule. In some cases, especially those of flat-lying orebodies that can be delimited by the drill, we can make fairly reliable estimates. But with all other classes of orebodies, like those of Butte, Mont., Jerome, Ariz., and Bisbee, Ariz., nobody can say what is going to be their duration and what should be the annual allowance for depletion.

This is the problem into which the Federal Trade Commission was lightly launched. Its report cannot possibly be anything but a hodgepodge of fragmentary data, which will not be of value to anybody.

The Commodity Committees

THE system of appointing subcommittees for the several commodities among the producers of those commodities was bound sooner or later to invite adverse criticism in Congress. That criticism has been ignorant, malicious and vituperative. A fitting retort is *honi soit qui mal y pense.* None but the evil minded could think of some of the things that have been said. Those who are dishonest in mind cannot conceive how anybody can be honest. No group of more high-minded, sincere, patriotic men could be found than those who head the several committees connected with the mining and metallurgical industries.

Nevertheless, the system is wrong, partly for the way it looks to the public generally which is not well informed, as witness how it looks to Congress, and partly for its destruction of competition—the producers now being practically required to work together. This is a direct consequence of the meddling with natural conditions. There are some things wherein coöperation is absolutely necessary. This would better be brought about through a disinterested metal board. On the other hand, complete separation of interest in all activities of the Government cannot reasonably be expected, as Mr. Rosenwald has pointed out. Active men are engaged in business. If their services may not be employed, we might find it necessary to intrust the great commercial affairs of the Government to backwoodsmen and barkeepers.

It is gratifying that the committee appointed by the Colorado State Legislature to investigate smelting charges in that state has secured the advice of an engineer of the experience of O. R. Whitaker.

BY THE WAY

Russia has her Lenine and her Trotsky. America has her La Follette, her Gronna and her Reed.

Alaska has adopted the eight-hour day, says the *Sun*, but no prospector seeking his fortune will be arrested for violating it.

The Union High School at Bakersfield is arranging to do assaying in its mining department for the accommodation of miners and prospectors, who will be charged a moderate fee. The work will be under county supervision and the direction of W. S. Mills, who is in charge of the mining department of the school.

A distinguished mining and metallurgical engineer, who has long been an operator in foreign countries, found in connection with a search for a certain chemical expert, that he was hard to find. The following paragraph from a letter from him is interesting: "The chemical experts are not like the members of *our* profession. They are hard 'to get on to,' even though 'the woods are full of them. And, I believe, they are all very secretive and not as communicative as our own people; that is, in regard to what they know. I think *we* belong to the noblest minded profession of all the technical 'bunch,' and am mighty gratified that the administrative capacity which mining seems to inculcate is being recognized by this nation in the appointment of such men as Hoover."

A gas well belonging to the Ouchita Natural Gas and Oil Co. and situated about 17 miles west of Monroe, La., became ignited and for six days consumed gas under 1500 lb. pressure at the estimated rate of 30,000,000 cu.ft. per day. William Guerin, of the Pyrene Manufacturing Co., of New York, formerly a deputy chief of the New York Fire Department, who was called in in an advisory capacity, suggested that two streams of water be played on the base of the well casing so that they converged from an angle of 90°. The streams were slowly raised up to and through the column of gas until they reached the base of the flame. The men were ordered to squeeze their thumbs against the stream at the nozzle so as to spread the water in fan shape. This water cut off the flame from the gas, which was extinguished by steam as quickly as the snuffing out of a candle can be accomplished.

How Cecil Rhodes started his mining career is told by John Hays Hammond in the July *American Magazine*. "Ill health dogged his youth; at 17 he was shipped from his home in England to the warmer climate of Natal, where an elder brother was trying to cultivate cotton. A year after the arrival of young Rhodes, diamonds were discovered in Kimberley, several hundred miles away. Rhodes decided to join the rush. His oufit consisted of a team of oxen, a Scotch cart, a bucket, a spade, several volumes of classics and the thumb-worn Greek lexicon. In this fever-ridden spot, with poor sanitation and worse food, he worked and brooded and studied, with winter trips to England and Oxford on his scanty savings. One year he was too poor to go. Another year his health failed and the physician told him he had only six months to live. While yet in his teens he formed the holders of several small claims into a syndicate. Always he preached the folly of cut-throat competition. Gradually he began a consolidation, of which he naturally became the leader."

Miss Jeannette Rankin made her first extended remarks in the House of Representatives on Aug. 7. It was regarded as unfortunate as her first vote, which was cast against the war resolution. The "lady from Montana" spoke in defense of workers who have tied up the copper mines in Montana and in criticism of the Government for failing to prevent the lynching of Frank H. Little, an I. W. W. leader. Representative Johnson, of Washington, asked her if she was aware that the I. W. W. workers are anarchists who disclaim allegiance to any government. Failing to obtain a direct answer, Mr. Johnson made the following interrogatory statement at the conclusion of Miss Rankin's speech: "I would like to ask the lady if she knows if these members of the I. W. W. who were responsible for the assassination of the Governor of Idaho some years ago, who threatened to assassinate the Governor of Utah and who threatened numerous other prominent officials with assassination and death and who themselves declared they owe no allegiance to the United States or to any other country, have any right to squeal when citizens of this country hang one of them occasionally?" This question, which evoked loud applause from the floor, was not answered.

The Driller's Troubles

The ground is as hard as the devil,
  The steel won't cut at all,
The smith knows a lot about temper!
  The boss ought to give him a call.

One piece is as hard and brittle,
  The next one's as soft as lead,
If he don't give us stuff we can work with
  I'll bend a length over his head.

My partner blocked up like a farmer,
  The bar's coming down by the feel,
The air hose and water is leakin',
  And I'm most as wet as a seal.

The machine takes oil like a furnace,
  And blows it all over the face;
Some son of a gun has swiped my wrench
  And left a bum one in its place.

We'll ne'er get the round in by tally,
  It's a cinch that the shifter is sore.
If the muckers had gotten the dirt out,
  We'd have finished it long before.

The powder and caps are rotten,
  The fuse is a genuine fake,
The air is chock full of water,
  And the blasted ground won't break.

There's no need in sweating your life out,
  This job is awfully tough,
So I think it's time to taper off,
  I guess she's in deep enough.

B. A. PRICE.

Hoover Comes to Town[*]

How Hoover descended on Washington, having sailed for America fifteen days after war was declared. Many mining engineers on volunteer staff of "aids," who, living together on Sixteenth Street, are put on war rations by Mrs. Hoover. The new Food Administrator thinks quickly, acts quickly and gets things done.

NOBODY else—at least it defies the memory to recall a parallel—has ever come to Washington in circumstances quite like those that brought Herbert C. Hoover there. Certainly, nobody who had achieved abroad an international status so conspicuous was ever called upon to make good, so to speak, his reputation for the benefit of his countrymen at home. For in one respect Mr. Hoover is quite unlike all the other strong American personalities who have come to Washington. He came preceded by no illustrious achievements in city or state of his own land, but with a record and experience obtained across the seas, esteemed alike by the statesmen of Germany, England and France, modest but aggressive, bluntly assertive when necessary, a dynamo of human energy—a genius in executive organization.

"Belgian Relief" Efficiency To Be Applied to the Distribution of America's Food Supply

Therefore in Hoover's descent on Washington is a story which, regardless of what its sequel may be in the vicissitudes of food administration, must be included in the inner history of this war. How he found bewilderment and indecision in the early days of our entry into the war—earnestness, to be sure, and a good intent, but a lack of direction, peace-time speed and peace-time modes of thought; how he quickly won the sympathetic attention of President Wilson—the factor of propulsion that soon meant headway; how the newcomer of European experience drew about him strong men, tried and tested, men he had known for years, men who had worked with him on the Belgian Relief Commission and who knew, therefore, the serious side of war, men who talked his own language of executive action; how he was puzzled at first and impatient as the novice over the irritating delays of Congress, the personal attacks—all this is a travail analogous no doubt to that of many another organization in embryo, but it means the birth of a great movement that must ultimately contribute incalculable war strength to the nations aligned against the Central Powers.

"Food conservation" and "increased production" are no longer mere phrases of agricultural parlance. They mean supplies for the greatest armies that have ever been mobilized by the united democracies of the world. They mean that the great American granary is being unselfishly opened to the kinsmen and friends across the sea who have been making for nearly three years the supreme sacrifice in defense of principles identical with the tradition and spirit of America.

War was declared on Apr. 6, and Mr. Hoover was promptly called to service by President Wilson. Quickly he arranged for the management of the Belgian Relief Commission, gathered food statistics in England of value to him in future work, and on Apr. 21 was standing on the deck of a liner moving slowly out of Liverpool. The ship was halted outside the harbor by the Admiralty and held there for three days, an exasperating delay to a man anxious to get home to begin the work to which he had been summoned. Finally, the vessel crept out and, passing northward almost as far as the Arctic Circle, managed to escape all dangers, including two submarine mines fastened together by a fifty-foot cable.

No Rest on Landing in the United States

Twelve days of such a journey and one would suppose a man worn out and anxious at least for a good night's sleep on landing in New York. But Hoover didn't stop. He took the midnight train that day for Washington, climbing into an upper berth in a crowded Pullman. Next morning he was having a conference at breakfast with officials of the Department of Agriculture! He had telegraphed them of his coming, and from that morning on, conferences in the temporary offices established in his rooms in the Willard Hotel continued for nearly two weeks, all day long and far into the night. Two thousand letters had accumulated, some referred to him already by the White House and Government departments for reply, others inquiring directly for information about prospective food control, or containing suggestions from the canning trades, the millers, the flour men, and that great army of Americans whose business it is to feed the nation and the world. Hoover had with him only Ben Allen, whom he drafted from the Associated Press Bureau in London, and the stream of callers was stemmed, diverted, and drained by Allen with a suavity typically Californian.

It was from California that Hoover himself came originally before he won fame as an international mining engineer, and about the new Food Administrator are gathered a half-dozen Californians, associated with him at Leland Stanford University, of which he is a trustee, or in the business life of San Francisco. Hoover has picked as assistants the men whom he knows are absolutely loyal and indefatigably zealous for the success not of themselves but of the cause.

"The Chief" Has "Aids" Not "Aides"

There is no rank in the Hoover contingent—all are aids, counsellors, executives. Titles mean nothing, for each is subordinate to the direction and command of "the Chief," as he is familiarly called. First, there is Dr. Ray Lyman Wilbur, president of Leland Stanford University. Wilbur happened to be in Washington attending a convention of college presidents when asked by Hoover to take charge of a department of education on questions of food conservation. Dr. Wilbur knows something about organization himself, and quickly mobilized under the Food Conservation Department some of the finest talent in the country. Many came to volunteer. There was, for instance, Miss Sally Splint, of *Today's Housewife,* who brought a suggestion that was promptly acted upon for the mobilization of the editors of women's magazines. From this grew a division on home economies, with several women editors giving four and five days a week to the the United States Government's campaign. Conferences with the editors of farm publications, the heads of agricultural colleges, advertising and publicity men, have been handled by Dr. Wilbur, while Hoover has been busied with President Wilson and Congressional leaders clearing up misunderstandings over food legislation.

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[*] From an article by David Lawrence, published in the New York "Evening Post Magazine," July 21, 1917.

To Dr. Vernon L. Kellogg, who was in charge of the Brussels office of the American Commisson for Belgian Relief, a professor of biology at Leland Stanford, was given the task of keeping in touch from Washington through the American diplomatic service with the latest work of the food controllers in Europe.

Mining Engineers Called Back to the States

Another thing with which Mr. Hoover wanted to keep in constant communication was the neutral relief committees of Belgium. Edgar Rickard, a mining engineer from California, who was drafted by Mr. Hoover in London to be secretary of the American Commission for the Relief of Belgium, was called to Washington to cooperate with W. L. Honnold, director of the London office of the American Commission, in relieving Mr. Hoover of much of the work delegated to him by the British government in directing the expenditure of funds for the feeding of the Belgian people. Mr. Honnold also is a mining engineer, among the best known of Americans in South Africa.

Hoover, it will be seen, picked mining engineers—friends and associates in the big job of Belgian relief abroad. But he found other ready volunteers, too, on this side of the water. All have caught the spirt of energy which shoots through the Hoover personality. And they work together smoothly and enthusiastically. Hoover has rented a big house on Sixteenth Street for his staff. They live together and discuss over the dinner table each night the whole job to a part of which each has applied himself during the day. To Mrs. Hoover must be given the credit for the organization of the Hoover "kitchen cabinet." Men may know a lot about food conservation, but for picking a good house amid the real-estate sharks of Washington, the shrewdness of a woman was needed. And Mrs. Hoover smilingly put the household of a dozen or more on rations.

As yet the organization of the food bureaus is not complete. But the principles of the Hoover plan are virtually established. His success already in persuading the heads of the various food industries to fix reasonable prices gives him confidence that while possessing broad powers he never will be required to use them. Indeed, the organizations of the various trades have come forward with suggestions for price arrangements involving a much more drastic regulation of themselves than could possibly be obtained from Congress.

The National Capital is full of commissions, those that agree once in a while and get things done and others which are dominated by a single mind who might have better been named executive in the first place. Hoover is a commission in himself. He thinks quickly and acts quickly. That is why there have been revolutionary things done in Washington since Hoover came to town.

Chronology for Mining for July, 1917

July 1—Strikes at copper mines in various parts of country started by I. W. W. organizations, especially at Clifton, Morenci, Miami, Globe, Bisbee and Butte.

July 5—Federal troops sent to Globe, Ariz., to prevent Austrian strikers from interfering with pumpmen and others endeavoring to keep copper mines open.

July 12—About 1000 I. W. W.'s interfering with miners working in Bisbee district, Arizona, were deported by Sheriff Wheeler, assisted by Citizens Protective League—Governor Campbell of Arizona requested President Wilson to send Federal troops to preserve order in Clifton, Morenci, Bisbee, Jerome, Humboldt, Ray, Ajo and in Mohave County—Conference of steel men and Secretary of Navy, Secretary of War and Bernard M. Baruch, chairman of raw-material committee, agreed upon plan to have Government fix price of steel.

July 13—M. A. Hanna Co., of Cleveland, Ohio, leased large area of Great Northern ore lands.

July 14—Rioting between Americans and foreigners occurred in Flat River and other southeastern Missouri towns, native miners refusing to permit foreigners to work in the lead mines.

July 16—Montana Power Co. and mining companies on one side and Metal Trades Council and electrical workers on other side reached agreement and concluded terms satisfactory to both, but no agreement made with I. W. W. miners' union, though most of the mines have worked on day shift and are gradually increasing their forces.—Price of silver reached 81¼c. per oz., highest price in 25 years.

July 18—M. A. Hanna Co., of Cleveland, Ohio, purchased Pennsylvania R.R. Co. coal lands.

July 20—Strike of miners in Leadville district occurred, resulting in shutting down of mines.

July 26—Explosion in No. 12 colliery at New Waterford, N. S., belonging to Dominion Coal Co., of Sidney, killed 62 miners.

July 30—Iron miners on Gogebic range in Michigan struck, following I. W. W. agitation.

July 31—Commandeering of iron mines of Cumberland and Lancaster Counties by British Minister of Munitions announced by U. S. Consul General Skinner. of London.

The Determination of Silica

In the article written by H. A. B. Motherwell and published in the *Journal* of June 30, 1917, Mr. Motherwell is reported as saying at the top of column 2, page 1155, "the SiO_2 loss increases with the amount of silica present." This is an error. The reading should be "the SiO_2 loss decreases as the amount of silica present in the sample increases"; that is, proportionately the more SiO_2 present the less the loss.

Continuous Drum Filters

In the article by Carl J. Trauerman on drum filters in the *Journal* of July 14, 1917, one of the figures on page 87 was reversed through a typographical error. In the table the last figure under the heading "Filtered Dry Tons" should be 105 instead of 051 as published.

Personal

C. M. Weld, of New York, will be in Cuba for a month.

B. A. Hardy has been appointed manager for the Montana Mines Co., at Ruby, Ariz.

E. H. Gary left New York on Aug. 2 for Alaska, where he will be for several weeks.

George A. Packard is spending two months in the West in Colorado, Arizona and Nevada.

E. L. S. Wrampelmeier has resigned as manager of the Montana Mines Co. at Ruby, Ariz., and is now at Tucson.

J. M. Boutwell, consulting geologist of the Cerro de Pasco Copper Corporation, is in Peru on professional work.

D. H. Walker, formerly with the United States Geological Survey, is now with the Nevada Chemical Co., Tonopah, Nevada.

George S. Weinberg, of the Engineer Officers' Reserve Corps, will leave soon for Russia on a three months' leave of absence.

Kosaku Yamada, a mining engineer of Japan, inspected the Goldfield Consolidated mines and mill recently at Goldfield, Nevada.

S. W. Eccles of New York, vice president of the American Smelting and Refining Co., was in Spokane recently, accompanied by Mrs. Eccles.

George A. Tweedy, formerly at Rosario, Mex., has gone to Honduras to examine the old mines at Opetika in the department of Comayagua

Edwin E. Chase has been examining gold properties in the new Herb Lake district in northern Manitoba. He will return to Denver about Aug. 11.

Guy J. Johnson, safety engineer of the Alaska Treadwell company, has accepted a similar position with the Homestake Mining Co. at Lead, South Dakota.

Alvin B. Carpenter and **E. E. McIntyre**, mining engineers, have changed their address to the Citizens' National Bank Building, Los Angeles, California.

E. F. Larsen, of the Geological Survey, is helping Frank L. Hess in a study of tungsten, vanadium, molybdenum, nickel and other metals used to harden steel.

Braxton Bigelow, an American mining engineer serving as captain in the Royal Engineers was wounded in a raid on the German lines on July 23 and is reported missing.

Arthur C. Terrill, professor of mining engineering at the University of Kansas, is spending several weeks in the Kansas-Oklahoma zinc field for the Kansas Geological Survey.

Harry J. Wolf, of the Maim-Wolf Co. of Denver, has completed mine examinations in San Juan and San Miguel Counties, Colo., and has gone to St. Louis on professional business.

A. W. Hudson, of the Phelps-Dodge Corporation research staff, has moved to the Burro Mountain Copper Co. branch at Tyrone, N. Mex., to make some large scale experiments for the company.

F. W. Denton has resigned as general manager of the Copper Range Co., but continues as vice-president. **William H. Schacht**, assistant general manager since 1911, becomes general manager succeeding Mr. Denton.

E. C. Harder sailed from New Orleans on Aug. 3 for Panama, en route to Rio Janiero, where he is due Sept. 1. Private business connected with his iron properties in Brazil occasions the trip. He expects to resume his research work on Minnesota iron ores some time in October.

Major Peter N. Nissen, inventor of the Nissen stamp and later of the Nissen hut, who is well known to engineers in North America, has been promoted to the rank of lieutenant-colonel in the Royal Engineers and is at present stationed at general headquarters in France

W. R. Appleby and **Edmund Newton**, both of the Minnesota School of Mines, have been in Washington conferring with the directors of the Bureau of Mines and the Geological Survey in regard to establishing coöperative work on the manganiferous iron ores of the Minnesota ranges

Guy C. Riddell, formerly superintendent of the East Helena smeltery of the American Smelting and Refining Co., is expected to arrive in New York in September from Australia, after a year at Port Pirie as consulting metallurgical engineer during the reorganization and enlargement of the lead smeltery and refinery of the Broken Hill Associated Smelters Proprietary, Limited

Obituary

Myron Knox Rodgers died in Pittsburgh, Penn., on July 23 at the age of 55 years. He was a graduate of Washington and Jefferson University, of the class of 1886. Upon leaving college he went West where he became associated with Marcus Daly. During this period he examined the Nickel Plate mine in British Columbia. Daly acquired the property, which was subsequently sold to the Hedley Gold Mining Co. Mr. Rogers was largely responsible for the development of the Hidden Creek mine at Anyox, B. C., and was a director and organizer of the Granby Consolidated company that later took over that property. He was a member of the American Institute of Mining Engineers and of other engineering societies. He was interested in educational, church and Y. M. C. A. work and contributed liberally to these causes.

Societies

Chemical, Metallurgical and Mining Society of South Africa held its 21st annual general meeting at Johannesburg on June 23, 1917. Papers were read on the "Construction and Maintenance of Slime Dams," also on "Explosions of Fire Damp and Occurrences of Gob Fires in Natal." G. Hildick Smith was declared elected president, other nominees having resigned.

Industrial News

Byron Jackson Iron Works, of San Francisco, Calif., is erecting a new $100,000 machine shop at its plant at West Berkeley. The new shop will be ready for occupancy about November 1.

Walworth Manufacturing Co. purchased the Kewanee plant of the National Tube Co., located at Kewanee, Ill., on Aug. 1. The National Tube Co. retired from the fittings business on that date.

Receivers of the Aetna Explosives Co., Inc., have been ordered by the United States Court to continue the company's business in all its branches. They will devote particular attention to domestic business and will continue the established Aetna line of dynamites, gelatins and blasting supplies.

Chas. A. Schieren Co., of New York, will start manufacturing immediately in the newly built addition to its tannery at Bristol, Tenn. A force will be employed at the start sufficient to make 24,000 linear feet daily of the highest grade machine belting. This will be increased gradually, as skilled help can be secured, until the full capacity of the plant, 50,000 ft. daily, is reached.

P. H. & F. M. Roots Co. of Connersville, Ind., has brought out a rotary vacuum pump for handling a varying mixture of air, water and steam. The sides of the impellers of this pump are straight and there are no pockets in which water can be trapped which is the unique feature of the pump. It has been successful in heating service and in other fields, such as paper-mill works, where a vacuum of 10-20 in. is required with a discharge head of five or ten pounds.

Pearlman Co., Inc., and the **Clarksburg Zinc Co.**, announce that the United Zinc Smelting Corporation of New York has taken over the ownership and management of their plants located at Clarksburg, W. Va. The United Zinc Smelting Corporation has therefore assumed all outstanding liabilities, obligations and contracts of the above named corporations and all communications hereafter should be addressed to the United Zinc Smelting Corporation, at 99 John St., New York.

Westinghouse Electric and Manufacturing Co., of East Pittsburgh, Penn., has recently received orders for motors for mine hoists aggregating 1350 hp. The largest of these is a 700-hp. motor for a 300-ft. coal hoist at the Inland Steel Co.'s mines at Harmarville, Penn. This hoist will make three trips per minute. On the same property a 200-hp. motor will drive a man hoist making two 300-ft. trips per minute. Other items are: Diamond Coal and Coke Co., Sharpsburg, Penn., one 350-hp. motor; Republic Iron and Steel Co., Youngstown, Ohio, one 300-hp. motor; E. & G. Brooks Iron Co., Birdsboro, Penn., one 200-hp. motor; Mt. Pleasant Coal and Coke Co., Greensburg, Penn., one 200-hp. motor; Valley Smokeless Coal Co., Pittsburgh, Penn., one 200-hp. motor; Eclipse Gas Coal Co., Pittsburgh, Penn., one 150-hp. motor. All the motors are Westinghouse Type CW wound-rotor induction motors with Type F magnetic control.

Trade Catalogs

Messiter Conveyor Scales. Electric Weighing Co., 180 13th Ave., New York. Bulletin No. 10. Pp. 20; 6 x 9 in.; illustrated.

Internal Combustion Locomotives. The Baldwin Locomotive Works, Philadelphia Penn. Record No. 85. Pp. 32; 6 x 9 in.; illustrated.

Chicago Giant Rock Drill. Tappet Type Chicago Pneumatic Tool Co., Fisher Building, Chicago, Ill. Bulletin No. 137. Pp 16; 6 x 9 in.; illustrated.

Sperry Filter Press. D. R. Sperry & Co. Batavia, Ill. Catalog No. 14. Pp. 60; 6 x 9 in.; illustrated. Charts showing weights and capacities of the various filters are shown.

Handbook of Conveyor Practice. Robins Conveying Belt Co., 13-21 Park Row, New York. Pp. 96; 6 x 9 in.; illustrated. This contains tables and charts concerning capacities, power requirements, speeds of conveyors, etc.

Oxy-Acetylene Welding, Cutting and Decarbonizing Apparatus. The Imperial Brass Mfg. Co., 1200 W. Harrison St., Chicago, Ill. Catalog No. 140. Pp. 36; 7 x 10 in.; illustrated. A new line of lead burning equipment is also shown.

Hoisting Machinery for Industrial Works Shepard Electric Crane & Hoist Co., Montour Falls, N. Y. Hand Book. Pp. 116 5 x 8 in.; illustrated. This describes the various types of hoists and cranes and contains tables of dimensions, etc.

New Patents

Aluminum Nitride—Process for the Manufacture of Aluminum Nitride. Ottokar Serpek, Paris, France, assignor to Société Generale des Nitrures, Paris, France. (U. S. No. 1,233,926; July 17, 1917.)

Annealing Furnace—Truck or Stand for Use in Annealing-Furnaces. Thomas Alexander Morris, Llanelly, Wales. (U. S. No. 1,234,789; July 31, 1917.)

Ball Mill — Ore-Pulverizing Ball-Mill Henry Eggers, Denver, Colo. (U. S. No. 1,235,449; July 31, 1917.)

Bearing Metal—Process of Making Bearing Metals. William H. Kelly, Los Angeles Calif. (U. S. No. 1,234,547; July 24, 1917.)

Concentrator—Mechanical Mineral-Concentrator. Alfred Molander, Sault Ste Marie, Ontario, Canada. (U. S. No. 2,235,497; July 31, 1917.)

Electric Melting Furnace — Method an Apparatus for Electrically Reducing Refractory Substances. John G. Webb, Richmond, Va. (U. S. No. 1,234,836; July 31 1917.)

Electric Smelting Furnace—Cooled Bottom Electrode for Electric Smelting-Furnaces. Martin Sperling, Essen-on-the-Ruhr Germany, assignor to Fried. Krupp Aktiengesellschaft, Essen-on-the-Ruhr, Germany (U. S. No. 1,231,947, July 31, 1917.)

Flotation — Oil-Flotation Concentratio Process. Emanuel Wagner, New York, N Y. (U. S. No. 1,235,083; July 31, 1917.)

Furnace-Charging System. Leslie Douglass Anderson, Midvale, Utah, assignor t United States Smelting, Refining & Minin Co. (U. S. No. 1,234,998; July 31, 1917

Furnace Electrodes—Electrode-Packin for Melting-Furnaces. Martin Sperling Essen-on-the-Ruhr, Germany, assignor t Fried. Krupp Aktiengesellschaft, Essen-on the-Ruhr, Germany. (U. S. No. 1,231,946 July 31, 1917.)

Ingot-Mold. Clinton R. Stewart, Johns town, and George E. Thackray, Westmon borough, Penn. (U. S. No. 1,235,166; Jul 31, 1917.)

Pneumatic Separator. Milton F. Williams, St. Louis, Mo., assignor to William Patent Crusher and Pulverizer Co., St Louis, Mo. (U. S. No. 1,235,174; Jul 31, 1917.)

Sampling — Apparatus for Samplin Streams of Wet Ores and the Like. Charle John Williams, Perranwell, Cornwall Coun ty, England. (U. S. No. 1,235,090, Jul 31, 1917.)

Stamp-Mill. Charles M. Mullen and Ra E. Hall, Portland, Ore., said Hall assigne to said Mullen. (U. S. No. 1,235,149; Jul 31, 1917.)

Editorial Correspondence

SAN FRANCISCO—Aug. 4

Schedule for Merit Rating California metal mines for compensation insurance, it has been decided, will not be put into effect until a trial rate of practically all the mines in the state has been made so as to be certain that the schedule is practicable before it is made effective. This merit-rating schedule has presented numerous difficulties and has been the cause of much hard work both on the part of H. M. Wolflin, the Bureau of Mines engineer who is assigned to coöperative work with the Industrial Accident Commission of California, and on the part of George S. Rice, the chief mining engineer to whom the schedule was referred for improvements and approval.

BUTTE—Aug. 7

(By Telegraph)

Labor Situation in Butte is gradually righting itself and additional men are reporting for work daily. The I. W. W. trouble is still a factor and its agitators will succeed in holding off permanent settlement. Under I. W. W. influence, smeltery employees of the Washoe works at Anaconda made exorbitant and ridiculous demands on company today, the demands including recognition of the I. W. W. union of the miners and all their demands. The answer they got from Vice President C. F. Kelly was a point-blank refusal and there is little liklihood of the strike spreading to the smeltery employees. Many of the smaller unions are voting to accept the wage propositions made by the mining companies and nearly all of them are refusing recognition and support of the I. W. W. strikers, though some of them are giving money to their strike fund. The strikers, realizing their defeat, are bombarding Washington with telegrams and letters asking for Federal intervention and investigation. The companies have long ago practically conceded every essential demand made by the strikers and the hoopskirt hysteria in the House of Representatives today was due entirely to false information furnished the lady by the I. W. W. and their sympathizers. Statements were made according to press reports that are absurdly false and ridiculous, a fact that must have been known to the Washington authorities who investigated conditions in Butte and had representatives here to look into affairs. It is a well-known fact that if the miners were given protection against thugs who waylay them in going to and returning from work, 95% of the miners would be working today as they are glad to accept the offers made by the mining companies. The street-railway employees suffering from the general infection have gone on a strike under I W. W. influence and are remaining out although the street-railway company has offered them in many respects more than they asked for. The various craft and workingmen's strikes are not designated "strikes" by them because they have all acted without authority or sanction of their international bodies and so they call it "an individual lockout for vacation purposes." The I. W. W. and other radicals have sought to make much capital out of the lynching of Frank H. Little, the I. W. W. executive-board member, but they have failed in this although they staged a big funeral parade on Sunday for the benefit of the motion-picture camera men who had been engaged for the event. It may be a shameful fact but it is a fact nevertheless that there is general sympathy for and unexpressed approval of the act of the lynching party. A coroner's jury has completed its inquest on this case without finding even a clew to the lynchers.

DENVER—Aug. 4

Leadville's Strike has come to an abrupt termination. To the end, the operators refused any recognition of the union or any suggestion emanating therefrom. This was not in repudiation of the rights of the miners but was the fixed policy of the district's operators who preferred to close down their mines rather than yield, in the least degree, to any demands from organized labor. Last week, no investigation at Leadville having been undertaken by the governor's mediators—Messrs. Rogers and Liddell—appointed the preceding week, the officials of the Leadville union waited upon Governor Gunter and requested the appointment of a third member on the board by President Wilson. Upon learning of this request, the operators "sat tight" and July 30, through George O. Argall, manager of the Iron-Silver Mining Co., sent the governor a long telegram inquiring whether or not his excellency's mediators proposed taking any action, at the same time protesting against further delay and publicly declaring the operators' refusal to enter into any negotiations involving representatives of the union. Meanwhile the operators were holding conferences among themselves and they finally reached an agreement that they were willing to raise wages 50c. per shift. Upon announcement of this decision the miners of the district, union and non-union, met in mass meeting, which continued through the greater portion of last night. Although stormy at times, the net result was the acceptance of the operators' proposition, and the agreement to return to work this morning. The following is the wage schedule under the new arrangements: Miners, muckers and trammers, $4; hoisting engineers on double-drum hoists, $5; on single-drum hoists, $4.50; pumpmen, $4.50 in dry stations and $5 in wet places; men sinking shaft, $5; machine runners, $4.50; timbermen, $4.50; firemen, $4. The district will continue on the "open-shop" plan.

Investigation of Custom Smelting in Colorado proceeds slowly. Since the official investigators are not required to submit reports prior to the convening of the legislature next January, statements of an official nature are not now to be obtained. The legislative committee has thus far canvassed only the mine owners' side of the issue, visiting all the mining districts of the state, obtaining settlement sheets covering actual shipments of about 700 different lots of ore, and taking testimony from the shippers. The nature of this work was admittedly one-sided in that it solicited grievances against the smelters. The committee has done a vast amount of work in analyzing the settlements rendered by the ore purchasers and in endeavoring to establish correlation between figures appearing at great variance. O. R. Whitaker, the mining engineer appointed to handle the technical features of the investigation, in proceeding with his inquiries, is being granted most courteous and helpful assistance by the smelters. It is his purpose to go into the costs, efficiencies and charges of the smelting practices and the prevalent bases of payment for the metals. It is believed he will complete these investigations by Sept. 1. When he is ready to report, it is planned that the experts and metallurgists of the smelting companies will be given opportunities to testify before the committee and thus to place the corporations' version officially on record.

SALT LAKE CITY—Aug. 4

Report of Surveyor General, I. C. Thoreson, for Utah, shows 836,860 acres to have been surveyed during fiscal year. Up to June 30, 1916, there had been surveyed 33,254,661 acres, with 20,294,828 acres in the state still remaining to be surveyed. Total acreage of Utah would therefore be about 54,386,375. Large force at present is in the field—1 double party, 3 single parties, 5 surveyors, and 36 assistants. In the mineral survey department 79 surveys were received and 267 locations. Thirty-one surveys and 108 locations were returned for correction. There were approved 44 surveys and 115 locations. Average cost per location was $19.99. June 30 1917, there were pending 57 surveys and 222 locations.

Oil Shales from Utah and neighboring states are being made the subject of experimentation at the University of Utah, with a view to extracting tar, oil, gas and other products. Samples of about five tons each coming from eastern Utah, the promontory section near Ogden, and from Elko, Nev., will furnish material for experiments The shale will be distilled in a retort built on the campus after model of retorts successfully used in Scotland for same purpose The heavy tars will first be thrown down, then petroleum, oil and gasoline, the oil, gas and nitrate products remaining uncondensed. These products will be used for fractional distillation, and many products are expected—all grades of oil, ammonia, paraffin, etc. The gas obtained from retort will be returned back into the retort and used in heating for further distillation—to take place of coal and cut down expense.

WALLACE, IDAHO—Aug. 4

Federal Troops Will Guard the mines and mills of the Coeur d'Alene district. This was the decision of Governor Moses Alexander after a visit to this city the first of the week and conferring with representatives of the mining companies and particularly upon representations made by Harry L. Day. The governor came here to investigate the I. W. W. situation and he found that there was no necessity for soldiers for general guard purposes, the local authorities with support of citizens who have organized for the purpose being equal to any probable emergency. With respect to the mines and mills, however, Mr. Day pointed out that the mining companies were already maintaining guards to protect their property, and inasmuch as they had entered into an agreement to furnish one-sixth of the lead required by the government, it was felt that the government should relieve them to the extent of furnishing soldiers for guard duty, both as a matter of fairness to the companies and to afford greater security. The governor was favorably impresed with this view and agreed to take the matter up at once with the war department.

CALUMET, MICH.—Aug. 3

The Labor Situation in the Lake Superior copper camp seems to be clearer right now than at any time in the past 4 or 5 months and with common labor for underground work more plentiful than in some time. A great many men have been coming in of late and the employment agencies have been instructed by all employing companies here to be careful to pick only good men, who are not affiliated in any way with the notorious I. W. W. organization which has been attempting to stir up strife between employees and employers here and in the Lake Superior iron mining camps. A few of this class of men have slipped in, of course, but in general they have been quickly found out and have been let go. Few have remained in the district. The organization again of the Citizens' Alliance, the pledge of which is strictly anti-I. W. W., has perhaps done more to clear up the situation than any other happening. More than 90%, for instance, of the employees of the Calumet & Hecla and its 10 or more subsidiary and associated companies, both mining and milling corporations, have joined the Alliance, and signed its pledge. The members are making it uncomfortable in the district for the I. W. W. agitators and followers with the result that the copper camp has had no trouble such as that being experienced about Ironwood and Bessemer in the iron districts. Furthermore, many of the employees of these companies have associated themselves in the "home guard" units here or have enlisted in the new Michigan Troops, a state protective military association. Practically all I. W. W. agitation has died out and the strike threatened by the few members remaining in the district for last Monday and a week ago last Monday absolutely failed to materialize. Not a man refused to go into the mines. The mining companies, furthermore, have been assured by committees of men of the latter's satisfaction with wages and working conditions. Governor Sleeper, while here, assured the men and the companies full and complete protection and stated that no labor or other disturbances would be countenanced by the state.

PHOENIX, ARIZ.—Aug. 2

Workmen Must Be Paid at Once, on being discharged or on quitting work voluntarily in Arizona, the state supreme court having affirmed a decision of the Yavapai County Superior Court in this matter The act when passed was understood to have reference particularly to strike conditions. The case in point was that of a workman for the Arizona Power Co., who would not wait five days till the regular payday. Defense was made that the workman had entered into a contract with the corporation that included recognition of a semi-monthly payday

JOPLIN, MO.—Aug. 4

First Important Sale in the New Lawton-Waco field, northwest of Joplin was recently recorded. L. P. Buchanan, of Joplin, who sold a one-fifth interest in the Blue Mound mine at Baxter last winter for $100,000, some time ago took an option on a lease of the Nichols land north of Lawton, Kan., from T. F. Coyne, of Webb City. The consideration was $50,000. Last week Buchanan announced that he had resold the lease to E. A Wiltsee and New York associates for $100,000. Considerable drilling has been done by Buchanan on the tract, and rich cuttings have been shown. The tract adjoins that of the High Five Mining Co., where some of the richest holes ever brought in in the history of the district have been recorded in recent weeks. The new owners of the lease have purchased a mill in the Carterville camp and will move it immediately to the tract and fully develop the property.

Independent Lead Smeltery with a capacity of 500 tons of lead ore per week, is to be erected at some point near Quapaw or Picher, Okla., in the near future by the Ontario Smelting Co. Options have been aken on three different proposed sites and he problem of deciding which is the best s the only thing holding back actual building operations. Much of the material has been ordered, and the building force is being organized. It is expected the plant will be completed within 90 days. It will be built of brick and steel and will be modern-y equipped. R. A. Farnham will have charge of plans and construction, and the plant will cost approximately $150,000. Frank E. Maulson, of Toronto, Can., will, with his associates, hold one-half the $25,000 stock, and the remainder will go to C. V. Jones, of Joplin. Mr. Jones is vice president of the Blue Mound Mining Co., which is headed by William Kenefick, of Kansas City, but Jones says Kenefick is not interested in this smelting project. The proposition is looked upon with favor by lead-ore producers, as they believe it will improve the local market. The plant will be about the size of the Eagle-Picher Lead Co.'s plant at Galena. Officers of the Ontario Smelting Co. are: C. V. Jones, president and treasurer; A. W. Thurman, vice president and Miss Catherine Scott, secretary. All live at Joplin.

WASHINGTON—Aug. 4

Occurrence of Manganese being studied by the Geological Survey, is entering a more intensive phase G W Stose and F J Katz, Survey geologists, have left Washington to make physiographic and geologic study along the west slope of the Blue Ridge mountains between Vesuvius and Front Royal, Va They will point out areas most likely to contain manganese deposits and which are most worthy of prospecting They will be joined later by other Survey geologists. The special investigation of manganese is not to be confined to Virginia. J. B Umpleby will proceed at once to Leadville and Silver City to investigate the manganese deposits in those localities. J T Pardee will study the appearance of manganese in the Butte district. R W. Stone assigned to investigation work in the State of Washington. E L Jones, Jr., is en route to the Southwest where he will make a general inspection of manganese deposits in Arizona and other states in that section. Manganese occurrence in the region east of the Allegheny Mountains has been studied by certain members of the Geological Survey and some important geological conclusions have been reached It has been shown fairly conclusively that most of the manganese ore was laid down under several types of structural associations during stages of planation of the region. During these stages manganese, originally disseminated through the Cambrian limestones and the lower Cambrian quartzite, was carried to favorable sites of deposition There is also good reason for the belief that limestones or possibly some other rocks at higher stratigraphic horizons have also yielded deposits of ore during the same stages of planation. The exact stages of the physiographic cycle have not yet been determined fully and at least one unknown quantity is yet to be ascertained as to the conditions under which the residium accumulated As far as investigations have proceeded, it appears probable that most of the deposits are related to one group of planation. Further studies of the problem requiring the services of experienced Appalachian stratigraphers and physiographers now are being conducted by the Geological Survey. Due to the fact that manganese deposits are almost invariably close to the surface, and to the fact that relatively little equipment is necessary for its mining, the government's specialists are taking a much more hopeful view of the domestic manganese situation. In fact some of them go so far as to say that the needs of the country can be met if the necessity should arise. The deposits are small but by the dissemination of knowledge as to their occurrence, greatly increased supplies are likely to continue to be produced since the deposits are readily available and the simplest kind of sorting, picking and washing machinery can be used to advantage There are some deposits sufficiently extensive to permit the use of steam shovels.

TORONTO—Aug. 4

Lignite Briquette Plant to be established by the Canadian government will be at Estevan, Saskatchewan. The government has appropriated $250,000 for the manufacture of fuel briquettes from the lignite coal of Saskatchewan. If the proposed process can be made commercially successful it will be an important step in solving the fuel problem for western Canada.

Mining Prohibited at Rickard, the new gold camp, owing to the fact that the surface rights are controlled by the Abitibi Pulp & Paper Co., which is constructing a large dam at Twin Falls. This, when completed, will flood a considerable area in the immediate vicinity of the recent gold discovery. Applications for mining claims in the district affected have been refused until some arrangement can be made that will secure the Abitibi company from having to make good any damages occasioned by flooding. This will probably be effected at an early date.

Manitoba Mining Retarded and investment has been discouraged by the provision of the Federal mining law, under which title to mining lands under Federal jurisdiction is given by lease only. Prior to 1914 the law provided for a grant in fee simple of mineral claims upon applicant proving 5 years work thereon. It is asserted that this puts Manitoba mining claim owners in an unfavorable position for attracting capital, as compared with Ontario and British Columbia, where a fee simple title can be obtained. Mining men are petitioning the Federal government for reversion to the former law, under which mining titles may be given in fee simple.

The Mining News

ALASKA

STRIKE at Kennecott Copper Corporations mines, which began on June 16, reported ended satisfactorily to company and men returning to work Production for July was 3,848,000 lb., compared with 5,848,000 lb in June

MOTHER LODE COPPER MINES CO (McCarthy)—Bought the Kennecott's small experimental mill and will haul same from Kennecott, 16 miles, to its millsite The 500-kw power plant is to be completed this month

ADMIRALTY-ALASKA GOLD MINING (Funter)—Constructing 2000-ft power pipe line under 700-ft head to secure several thousand horsepower Installed 12-drill compressor and expect another 10-drill one shortly Also to have 25 drills working in tunnel by autumn Contemplating 1000-ton reduction plant to be built next spring Company has 52 gold quartz claims

ARKANSAS

SHIPMENTS from state's zinc and lead fields for July amounted to but 60 cars However production was larger than this, but uninviting price caused many to hold ore J C Shepherd Mining Co, with mines at Rush, Buffalo and Pindall continued biggest producer Shipments from various districts as follows Rush, 2,101,000 lb; Pindall, 1,052,950 lb Gilbert 376,000 lb; Zinc 478,760 lb, and Ponca, 210,000 lb. One or two small "Arkansas" mills completed during month Much interest shown by operators in dry-concentration mill being built near Yellville

Newton County

ALLIED (Ponca)—Purchased Eleventh Hour mine, developed by J Vancil, of Joplin, and associates. Produced 40 cars of ore last year. Charles E. Crawford, of Pettigrew, Okla., president.

Searcy County

BALD HILL (St. Joe)—Holding 750 tons silicate of zinc for better prices

TOMAHAWK (St Joe)—Small furnace completed Only operating copper mine in state

BIG HURRICANE (Pindall)—Two mills operating on property One, regular Joplin type, other ball mill and slime tables Chats from slime plant now being run through the third time for good recovery Ore is carbonate of zinc

ARIZONA

Cochise County

SHATTUCK ARIZONA (Bisbee)—Company's report for second quarter ended June 30 shows development amounting to 5763 ft New orebody, high-grade copper-lead-silver ore opened on Iron Prince claim in intermediate level from 211-ft raise Exposed for 36 ft Small ore showings on 400 and 600-ft levels, and ore body encountered on 600-ft level in Leo claim

Gila County

SIERRA ANCHA DISTRICT, 50 miles northwest of Globe, disturbed by uprising of Apache Indians who are reported on the warpath Two largest asbestos mines suspended operations Also said that forest fires were being started in vicinity of mines Two I W W organizers have been active among the force of 150 Mexicans and Indians employed Posse left Globe in automobiles for Rice, Ariz where they will obtain horses for ride to the mines to subdue the uprising

MIAMI COPPER (Miami)—Production for June amounted to 5,349,000 lb. of copper, but since no further production made Mediation under way between miners and officials but nothing definite resulted

Mohave County

PAYROLL (Chloride) — Superintendent H. M. Henning is sending 30 tons lead-zinc ore daily to Steffy custom mill. Just finished new road to the mill. Chappell Brothers' truck hauling five tons each trip; makes six round trips daily.

Pima County

COMOBABI (Tucson)—Walter Harvey Weed, consulting engineer for Magnate Copper company recently made examination of Comobabi mine. Located midway between Magnate and New Cornelia mines at Ajo, 53 miles west of Tucson.

Yavapai County

ARKANSAS & ARIZONA (Jerome)—Drilling campaign discontinued on account of excessive cost, until conditions become more favorable for development work.

UNITED VERDE EXTENSIOIN (Jerome)—Directors' report states that no new developments of importance occurred Ore extraction for April, 11 419 tons yielding 6,203,992 lb copper, May, 7663 tons yielding 3,851,393 lb copper, June, 8997 tons yielding 3,956,157 lb May and June output curtailed by 10-day strike Car shortage also reduced June output New shaft and tunnel making fair progress Course of tunnel changed to keep extension inside company's property throughout entire length Length will be greater but development of unproven ground belonging to company considered more advantageous

CALIFORNIA

Amador County

KENNEDY MINING AND MILLING CO. (Jackson)—The 100-stamp mill and chlorination plant in operation and no change has been made or contemplated. Zeila mine owned by the same company situated about 2 miles south of the Kennedy has not been reopened since its purchase by this company and no flotation plant has been installed or contemplated.

Calaveras County.

CALAVERAS COPPER (Copperopolis)—Has installed steam shovel to load dump ore for flotation mill. New vertical shaft being sunk on North Keystone group. Discovery shaft reached No. 9 level.

Contra Costa County

PACIFIC ELECTRO-METAL CO. (Bay Point)—Metallurgical plant to be constructed under supervision of Lindgren & Co. of San Francisco to cost about $50,000. Buildings will be of reinforced concrete.

Mono County

PITTSBURG-LIBERTY (Masonic)—Said to be in shipping class again, under leasing operations of Conway & Fredericks. New vein recently disclosed in prospecting beyond barren ground where the early-day miners quit.

Nevada County

WISCONSIN GRAVEL (Grass Valley)—New electric hoist and rotary blower to be installed.

COLUMBIA (Ormonde)—Mill being doubled in capacity by installation of 10 stamps. New electric hoist to be installed and aerial bucket-tramway connecting German and Ocean Star mines. Ocean Star shaft sunk to 300-ft. point disclosing good ore.

ALLISON RANCH (Grass Valley)—Ten stamps of new mill tested on July 17 were satisfactory. Other 10 stamps started following day. Remainder of surface and underground installations completed. Mine unwatered to 500-ft. point and development proceeding on 300- and 400-ft. levels.

Plumas County

REILLY (Seneca)—Lloyd Groover is hauling ore with "jitney" train made up of Ford engine installed on truck arranged to drive forward or backward, to which are hitched wagons for carrying ore.

IRON DYKE (Taylorsville)—Tunnel now in 1200 ft. from portal. Development produced 70 tons shipping ore of high grade; 25 men employed. W. W. Adams, superintendent.

Sierra County

HILO (Downieville)—Rich cleanup made from last year's gravel; work resumed taking out gravel for next spring's washing. Bernhardt Bros., owners and operators.

WINKEYE (Howland Flat)—This and Fillmore and Miners' Home gravel mines have full crews working in good ground.

OXFORD (Downieville)—A $500 pocket of free gold and sulphurets extracted by Casserly and Hertz who have surface lease.

GOLD BLUFF-OXFORD (Downieville)—Twenty stamps started on test run from drift on 90-ft. level. F. Meinecke, in charge.

IRONSIDES (Downieville)—Milling resumed on quartz from winter's underground work. Geo. Gruss of San Francisco in charge.

MONTE CARLO (Downieville)—Large body of gravel recently opened, paying 50 cts. per carload, has gradually increased to $10 and continues growing richer. Adjoins Downieville serpentine belt. A. Lavezzola and associates, owners and operators.

MOHAWK (Downieville)—While prospecting old gravel channel another bonanza quartz strike made on Allegheny-Downieville serpentine belt. Seven employes of The Union Oil Co. are owners. John N. Cubit, in charge.

CITY OF SIX (Downieville)—On serpentine belt, former high grade producer, under option to Hodgkinson & Henderson of Los Angeles. Contract let for 200 ft. of tunnel and upraise to tap old shaft which yielded bonanza ore. J. R. Mackay, contractor.

COLORADO

Boulder County.

TEXAS (Ward)—Development work resumed.

NATIONAL TUNGSTEN MINING CO. (Ward)—New milling plant will be completed within few weeks. Mine has been steady producer.

BOULDER TUNGSTEN PRODUCTION CO. (Boulder)—Ferro-tungsten unit of new refinery operating; acid plant will be completed soon. Crew of 60 to 70 men will be employed.

GOOD-FRIDAY (Boulder Falls)—Large tonnage, tungsten ore, developed; steady production made.

Gilpin County

PRIMOS CHEMICAL CO. (Empire)—Work resumed at molybdenum mine at Camp Boericke.

AMERICAN METALS CO. (Black Hawk)—Now receiving lead-zinc ores for custom treatment; business has increased considerably.

TWO-FORTY (Central City)—Mine plant electrified; 46-hp. motor being installed. Unwatering now under way. Mill overhauled and flotation installed.

LABOR SHORTAGE acute in district. Many small properties prevented from opening up this summer, and those now operating find difficulty in keeping sufficiently large crews.

Ouray County

PAYMASTER (Ironton)—Lease and bond secured. New shaft being sunk on ore chimney. Old shaft workings filled to first level with water.

San Juan County

ANTI-PERIODIC (Silverton)—Shipments of gold-silver-lead ore begun; worked entirely through adit levels. Milling- and shipping-grade ore developed.

HERMES (Silverton)—Development work on 5 tunnel levels carried on for 4 years and large tonnage developed. New tunnel being driven to cut veins 100 ft. below lowest adit; this tunnel now in 800 ft. and 500 ft. more to be driven. Ore consists of lead and zinc sulphides in vein 10 to 12 ft. wide. Mill will be built in near future. Wm. Callum is manager.

San Miguel County

SANTA CRUZ (Ophir)—Ore shipments being made to Durango.

BUTTERFLY (Ophir)—Lessees running 15 stamps of milling plant on ore from mine.

JUNTA GOLD MINING & MILLING CO. (Telluride)—Milling plant sold and dismantled.

FAVORITE (Ophir)—Shipping- and milling-grade ores being mined by lessees; milling-grade ore treated at Suffolk mill.

BLACK BEAR (Telluride)—Flotation making excellent recovery from tailings; ore treated at Smuggler-Union mill.

Summit County.

BLUE FLAG (Breckenridge)—Mine will be reopened. Equipment includes milling plant. Same company operating in Cripple Creek district.

BUNKER HILL (Breckenridge)—Three-foot vein opened in repairing workings of this Nigger Hill property. New development work will be done through Bunker Hill shaft.

MOLYBDENUM MILL may be built on Colorado & Southern railroad at Climax. Molybdenum prospects worked from time to time in this district; recently one company acquired control of group.

I. X. L. (Breckenridge)—Churn-drill hole being sunk to prospect ore body under "big stope" in main tunnel. Saw mill built to cut mine timbers and lumber for new milling plant. T. A Brown, manager.

Teller County.

HIAWATHA (Cripple Creek)—Lessees shipping 1-oz. ore from 50-ft. level.

LITTLE MAY (Cripple Creek)—Denver leasing company on Little May and Little Blanche fractions mining milling-grade ore.

ROOSEVELT TUNNEL cut new water course in Old Ironsides claim of United Gold Mines Co., and flow increased to 6000 gal. per min.

CATHERINE GOLD MINING CO. (Cripple Creek)—Mine plant at Last Dollar mine, destroyed recently by fire, will be replaced as soon as insurance adjusted.

COPPER KING (Cripple Creek)—Lessees reopening Grouse Mountain mine, not worked for years, and developing on 50-ft level.

ROSE NICOL (Cripple Creek)—Shaft now 60 ft. deep, will be sunk to meet raise from lateral driven in leased ground from 1000-ft. level of Portland No. 2 shaft. Property being worked by Camp Bird Mining, Leasing & Power Co.

FOREST QUEEN (Cripple Creek)—Under 5-yr. lease to Edwin Gaylord, of Denver. Main shaft being sunk from 650-ft. to 800-ft. level. Station enlarged at 650-ft. level, and underground hoist installed so production can be continued undisturbed on upper levels.

IDAHO

Shoshone County

AMAZON-DIXIE (Wallace)—Important strike announced on Amazon-Dixie, just across state line in Montana. Main tunnel proved ore shoot 600 ft. long of lead-zinc ore. Winze from this level sunk 250 ft., from which crosscut to vein showing ore of milling grade, mostly lead. Property largely owned by citizens of Cleveland, Ohio.

NATIONAL (Mullan)—Crosscut from shaft at depth of 535 ft. below main working tunnel cut vein, penetrated 35 ft., showing copper ore all the way of better grade than in upper workings. Management announces new strike insures profitable operation and will start 500-ton mill within 2 weeks. Shut down since Jan. 1. Former operations unprofitable, and theory that better ore would be found with depth seems to be confirmed

GEORGIA

MATTHEWS IRON AND MINING CO. (Rome)—Leased 640-acre tract brown-ore land at Cartersville to assure full supply for mixing with Taylor Ridge red ore in furnace at Rome. Company purchased 100-ton stack at Rome, formerly operated by R. G. Peters Mining Co. and Silver Creek Furnace Co. Has sold entire output for last half of 1917 and considerable tonnage for first quarter, 1918. Furnace blown in about July 14

MARYLAND

CHROME deposits in the Soldiers Delight serpentine area, northwest of Baltimore, are being reopened by J. H. Buxton, Jr., of Owings Mills, who has about 4500 acres under contract. The area embraces lode and placer chromite. Old lode mine being reopened and a new shaft sunk.

MICHIGAN

Copper

OSCEOLA (Osceola)—Ground south of only shaft in operation, No. 6, continues to produce good ore, which is found as high as 38 level; will be mined by raise and rock chute from 42d level.

CALUMET & HECLA (Calumet)—Average daily tonnage about 9,840, including 18 cars or about 855 tons Tamarack rock. American Bridge Co. pushing rapidly work on addition to leaching plant, one tank already in place.

HANCOCK (Hancock)—Output for June was 393,000 lb. copper, new high record. Three Whitcomb storage-battery locomotives will go to Quincy Shaft, No. 7. Two trolley locomotives to No. 2 Shaft, to operate on 49th and 53d levels.

NEW BALTIC (Baltic)—Now cutting station at 250 level of New Arcadian so levels of both mines will correspond. First level opened in New Arcadian; will start drifting soon. Good copper ore encountered in lode wherever cut by hanging-wall side of shaft, as occurred last week. Previously lode folded away, but gives signs of returning.

Iron

STRIKE of miners of the Gogebic range now ended. Miners returned to work according to agreement Aug. 6 at same wage and hours as formerly.

MINNESOTA

Mesabi Range

WHITESIDE (Buhl)—Shenango Furnace Co. is cleaning up its stockpile at this mine and running same through the drier.

CARSON LAKE (Hibbing)—Combined engine and boiler house being built. Shaft to be sunk as soon as machinery arrives.

MISSOURI

Joplin District

TRUSTEE (Joplin)—Has encountered fine run of lead ore, while sinking for water at mine northwest of Picher, Okla.

YELLOWSTONE (Joplin)—Sinking shaft to 160 ft. Planning to sink third shaft several hundred feet south of one now used.

FIRST NATIONAL (Quapaw, Okla)—Hand jigs installed ahead of mill, due to recent strike of rich ore in shaft at 109 ft. Mill will be built later.

THOMAS (Miami, Okla.)—Have water beaten at old broom-corn factory site, west of Treece, Kan., will start producing from 230 ft. level. Mill completed for some time.

BLUE MOUND (Baxter, Kan.)—Will start construction of second mill at once west of present plant. Originally intended to build mill east about half a mile, but this site will be used for No 3 mill later

DOMANDO (Miami, Okla.)—Mill, owned by Bethel Mining Co., completely destroyed by fire first of week. Thought to have started from electric wiring in derrick. Plant valued at $40,000, mostly insured. Will immediately rebuild.

PICHER MINES (Picher, Okla.)—Have fifth concentrating plant now in operation. For fiscal week ended Aug. 1, output was 948 tons. Manager A E. Bendelari says with new plants now planned, company will be making 1500 tons weekly in few months.

MONTANA

Broadwater County

HYANTHA MINE (Winston)—Two car- ıds. silver-lead ore shipped to East Helena ıeltery per week. Ore from 300-ft level. ıarles S Muffly, superintendent

HOGEM PLACERS (Townsend)—Flume bedrock being put in to wash 50-ft. bank gravel Flume to be completed in next weeks Hydraulic operating in other ound near-by J H Smith, superin- ıdent

Jefferson County

BLUE BIRD (Wickes)—Shipments of pper ore going out to west side smeltery.

ECONOMY COMPANY (East Helena)—ectric transformer of large capacity re- ıved at East Helena for Economy Mining . in Mitchell gulch.

BUTTE & CORBIN (Corbin)—Helena ratch Gravel Co. working Butte & Corbin operty at Corbin on lease Developed by nnel and winze. Ore, lead-silver.

MT WASHINGTON (Wickes)—Shipping e 12 ft wide encountered in lower work- gs Large tonnage of second-class ore to treated in new mill. Ore, lead-silver.

Lewis and Clark County

WHITLATCH MINE (Helena)—Mill run gold ore from 400 level made at Union- lle.

PRODUCER (Helena)—Upraise in tunnel r air Gold ore Tunnel to be extended yond diorite dike which cuts and faults in.

ILLINOIS EXPLORATION CO (Wolf eek)—Extensive work under way. De- loping copper claims by shaft. Propose sink shaft 1000 feet

Madison County

RUBY VALLEY (Virginia City)—Devel- ing at this gold-silver-lead group. Elec- ic equipment planned.

RAINE (Virginia City)—Exploration be- g continued on this low-grade group up ring Gulch. Occasional high-grade pock- s encountered.

THOMPSON (Virginia City)—Rich strike ade on these claims in Barton Gulch. old, silver and lead. Will make shipment on. W. O. Thompson, owner.

Silver Bow County

CZAR MINE (Butte)—When electric wer line completed shaft will be sunk to 0 level and will start crosscut to vein. eliminary exploration indicated presence copper vein from 20 to 30 ft wide ıne fully equipped with hoist, compressor d all other facilities. Robert Green, ıtte, manager

NORTH BUTTE (Butte)—Report for arter, ended June 30, shows production, 01,067 lb. copper, 224,071 oz of silver d 304.67 oz., gold. Also 676,263 lb. of ıc and 4319 oz. silver recovered from e ore Earnings amounted to $257,756 ırplus given as $5,855,541. Considerable velopment work carried on resulting in ening up of copper-silver orebodies In stern section, 4-compartment shaft started Sarsfield claim about 150 ft east of ntinental fault Will serve to develop idized ores lying along fault and explore stward continuation of veins found pro- ıctive in adjoining properties Granite ountain shaft damaged by recent fire be- g relined with steel and reinforced con- ete from 1600 to 3000 level and timbers om surface to 1600 level will be cemented make shaft fireproof Will take 5 os to complete repairs during which time eculator shaft will be utilized for hoist- g ore

NEVADA

Esmeralda County

FLORENCE GOLDFIELD MINING CO oldfield)—Petition in bankruptcy filed me time ago Appraisers appointed and rface improvements including mill ordered ld subject to court's confirmation J S eBeth, attorney for corporation and A D ırker, president

Lander County

COPPER CANYON (Battle Mountain)—ipping about 50 tons per day Shaft un- atered from 450-ft to 590-ft level, which being unwatered now Not extracting e from either 530 or 590 level, as else- here reported Has 3 veins; Virgin, Su- rior and Estes First 2 worked 35 yrs o, Estes is discovery of present manage- ent and has produced all ore shipped nounting to $250,000 gross smelting re- rns Shoot is 100 ft long stoping 20 ft width, high-grade copper with negligible ld and silver contents Ore freighted 9 iles by teams and caterpillar to point on evada Central, then to Battle Mountain narrow-gage railway, distant 20 miles ence to Salt Lake Experimental concentrating work satisfactory so far Using Layne & Bowler electric centrifugal pumps; power generated by three 50-hp. Fairbanks Morse oil engines.

Nye County

TONOPAH ORE PRODUCTION for week ended July 28 was 9079 tons valued at $158,882, comparing with 9290 tons for previous week. Producers were: Tonopah Belmont, 2744 tons; Tonopah Mining, 1800 tons; Tonopah Extension, 2380 tons; Jim Butler, 800 tons; West End, 987 tons; Rescue, 258 tons; North Star, 55 tons; Cash Boy, 55 tons.

TONOPAH EXTENSION (Tonopah)—Monthly report shows June receipts amount to $119,884 and current expenses were $81,080. Operating profit, $38,804.

JIM BUTLER (Tonopah)—Total net income for first six months $297,863. Receipts for ore shipped, $360,319; operating and administration expense, $112,800. Profit on stored silver sold, $47,772.

NEW MEXICO.

Grant County

CHINO (Hurley)—June copper output 7,193,262 lb., comparing with 6,984,457 lb. in May, and 7,243,432 lb. in June, last year

JIM CROW-IMPERIAL MINES (Steeplerock)—Under bond and lease since November to W P Dunham of New York, and associates, J. W. Dunham, G. A. Whiteford and E G Thomas of Los Angeles, Calif. Sinking 200-ft shaft to greater depth. Consists of group of eight patented claims; gold-silver producer. Have also optioned New Year's Gift group in same district; developing.

OREGON

Clackamas County

WILLIAM PIGOTT, of Seattle, Wash., head of the Pacific Coast Steel Co., has purchased the old blast-furnace plant of the Oregon Iron and Steel Co. on the Willamette River, at Oswego. Ores may be brought from Chile.

Josephine County

GOLD KING (Kerby)—After long idleness this gold mine has been relocated by T. P. Johnson and Mrs. J. M. Finch. Unwatering shaft. Development work was done few years ago but given up as it was unprofitable. With modern machinery new owners believe it can be put on paying basis T P. Johnston, manager

SOUTH DAKOTA

Lawrence County

GLADIATOR (Deadwood)—Drifting on high-grade vertical. Property will be thoroughly developed.

REPUBLIC (Maitland)—Sol Burns and associates leased a part of property; making regular shipments to Trojan Mill.

HOMESTAKE (Lead)—Norberg hoist at B. and M shaft placed in commission Two 6-ton skips used in ore transportation: 1200 to 1400 tons handled in 8 hours.

TROJAN (Deadwood)—Leased greater part of Republic ground in Black Tail Gulch. Incline tunnel will be driven to quartzite and ore gained will be sent to company mill at Trojan.

Pennington County

BLACK HILLS TUNGSTEN (Hill City)—Work started on property. Concentrator will be overhauled and additions made Custom ore will be handled in addition to that of company's.

TENNESSEE

SOUTHERN FERROALLOYS CO (Chattanooga)—Leased Southern Steel Co's plant Expect to produce ferrosilicon in November at rate of 3000 tons per year, using 3 electric furnaces now being installed Power will be obtained from Tennessee Power Co's hydro-electric plant Manufacture of other ferroalloys contemplated Hall J Kruesi, Chattanooga, president; Geo L Davison, general manager

TEXAS

GRAPHITE deposit, being developed in Llano County by Ceylon E. Lyman, of 813 Lumber Exchange Building, Minneapolis, Minn., and associates, opened about two miles in length; eight veins opened in a width of 1500 ft; additional veins indicated by recent development

UTAH

Juab County

CHIEF CONSOLIDATED (Tintic)—Company's report for quarter ended June 30, shows development work amounted to a total for all mines of 3645 ft of which drifts were 3137 ft, raises, 139 ft and winzes, 69 ft Total shipments of ore was 16,353 dry tons of which lead ore amounted to 13,371 tons, dry ore, 2618 tons and zinc ore, 364 tons, yielding net after smelting and transportation charges, $420,987. Metal contents were 2481 oz gold, 435,322 oz silver, 2,652,113 lb. lead and 259,468 lb. zinc. Average gross value per ton, $40.40; smelting freight, sampling per ton, $14.65; average net value, $25.75; net profits after payment of all charges was $153,243.

Summit County

IOWA COPPER (Park City)—Shipping regularly and expect to continue until next winter. No 1 incline down 200 ft. in ore on both sides Sponner crosscut, 100 ft from No 1 incline, shaft sunk 50 ft., struck 2 ft. high grade copper ore at bottom on quartzite and lime contact. Installing air line, donkey engine and machine drills to complete developments R. T. Kimball, secretary.

CANADA

Alberta

MANGANESE DEPOSITS in Cypress Hill mentioned in Journal last week are not being developed by Milton Hersey Co. as reported.

British Columbia

CANADA COPPER CORPORATION (Copper Mountain)—To continue development of Copper Mountain property and install 3000-ton mill Stockholders meeting called to authorize issuance $2,500,000, 10-year, 6%, first-mortgage bonds and increase authorized amount of stock

Manitoba.

GOLD PAN (Rice Lake)—Capt. I L. Church, superintendent, and force of 10 men engaged in development with sufficient equipment to sink to 300-ft level.

Ontario

ELLIOTT-KIRKLAND (Kirkland Lake)—Difficulty caused by flooding of mine overcome, work resumed.

WEST DOME CONSOLIDATED (Porcupine)—Official statement estimates ore reserves at 356,960 tons valued at $2,443,746.

KERR LAKE (Cobalt)—Output for June was 231,367 oz silver, being new high record for recent years.

ANCHORITE (Porcupine)—Mining plant from Aguinico property being removed to this location. Being developed by Coniagas Co. of Cobalt.

ASSOCIATED GOLDFIELDS (Larder Lake)—Installed another turbine at Raven Falls power plant, bringing the capacity up to 1800 horsepower.

PORCUPINE CROWN (Porcupine)—Winze now at 900-ft. level will be put down to depth of 1100 ft. Mill re-treating old tailings from dump.

HOLLINGER CONSOLIDATED (Timmins)—Increased working force since wages of underground workers increased to flat rate of $4; employing 40 machines on development work which is proceeding at rate of about 5000 ft. per month Abandoned practice of issuing monthly statements, but understood current production is larger than for some time past

CUBA

DAVISON SULPHUR AND PHOSPHATE CO. (Cumanayagua, Santa Clara)—The Carlotta pyrite mine of this company, subsidiary of Davison Chemical Co., of Baltimore, Md., was examined recently by Pope Yeatman, who estimated a profit of $2.75 per ton on an annual production of 175,000 tons, under ante-bellum conditions, and a profit of $3.31 per ton with prices and freight rates estimated to prevail for several years after the war.

PERU

CERRO DE PASCO (La Fundicion)—July production of copper according to cable advices was 6,262,000 lb comparing with 5,032,000 lb in June

AUSTRALASIA

QUEENSLAND GOLD PRODUCTION in May was 15,449 oz or $319,331, compared with May, 1916, this was decrease of 12,348 oz The large falling off due chiefly to strike at Mount Morgan this year For 5 months ended May 31, total production was 71,126 oz., or $1,470,171, a decrease of 28,767 oz from last year

MT LYELL MINING AND RY CO (Mt Lyell)—Directors report for half-year ended Mar 31, shows ore mined 145,464 tons, comparing with 166,197 tons for the previous period; reduction due to shortage of labor Only two furnaces operated New converter plant about completed Parcels of Lyell-Comstock ore and of flotation concentrates sent to Edwards Pyrites Works, Ballarat, for test by leaching process. Lake Margaret power installation to be extended to 800 hp., and the additional power is to be applied to an electrolytic zinc plant

The Market Report

Metal Markets

SILVER AND STERLING EXCHANGE

Aug.	Sterling Exchange	Silver		Aug.	Sterling, Exchange	Silver	
		New York, Cents	London, Pence			New York, Cents	London, Pence
2	4 7556	80	40⅝	6	4.7556	80¾	...
3	4.7556	80¾	41	7	4 7556	81¼	41½
4	4.7556	80¾	41	8	4.7556	82½	41⅞

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

DAILY PRICES OF METALS IN NEW YORK

Aug.	Copper	Tin	Lead		Zinc
	Electrolytic	Spot.	N. Y.	St. L.	St. L.
2	26½ @27	63¾	10½ @11	10.50 @10.90	8.40 @8.50
3	26½ @27	63⅝	10½ @11	10.50 @10.90	8.40 @8.50
4	26¼ @26¾	63⅝	10½ @11	10.50 @10.90	8.40 @8.50
6	26¼ @26¼	63⅝	10½ @11	10.50 @10.90	8 45 @8.50
7	26 @26½	63⅝	10½ @11	10.50 @10.90	8 45 @8 50
8	26 @26½	63¾	10½ @11	10.50 @10.90	8 45 @8 50

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

The quotations for electrolytic copper are for cakes; ingots and wirebars. Electrolytic copper is commonly sold on "regular terms" (r.t.), including freight to the buyer's works and is subject to a discount for cash. The difference between the price delivered and the New York cash equivalent is at present about 0.25c. on domestic business. The price of electrolytic cathodes is 0.05 to 0.10c. below that of electrolytic. Quotations for spelter are for ordinary Prime Western brands. We quote New York price at 17c. per 100 lb. above St. Louis.

LONDON

Aug.	Copper			Tin		Lead	Zinc
	Standard		Electrolytic				
	Spot	3 Mos.		Spot	3 Mos.	Spot	Spot
2	125	124½	137	247½	243½	30½	54
3	125	124½	137	246	242½	30½	54
4	...	...	...				.
6	125	124½	137	246	242½	30½	54
7	125	124½	137	246	242½	30½	54
8	125	124½	137	247	243½	30½	54

NEW YORK—Aug. 8

The metal markets this week were on the whole unsatisfactory to the producers, but they exhibited many interesting features. Copper was weak, while lead was stationary, but strong, and zinc was stationary, but dull.

Copper, Tin, Lead and Zinc

Copper—At the close of our last week of record, the general sentiment in the copper market was bullish and the market was apparently strong. However, it developed on the following day that an important producer, while very careful not to show its hand in this market, was freely offering in France copper for deliveries beginning with September, at 26⅝c., f.o.b. New York. Not succeeding in booking any business at that figure, it solicited counter-bids. Immediately afterward, the same producer, which had been nominally asking 29c., regular terms, in this market, stole a march on its competitors by inviting domestic manufacturers to discuss matters, which discussion was concluded by booking business with them at 27c., regular terms, which corresponds to 26¾c., net cash, New York. In a market that was already stagnant and uncertain, owing to the mystery shrouding affairs in Washington, these maneuvers had the effect of destroying such incipient demand as there had been previously, whereupon sellers who had previously turned bullish tentatively reversed their position, offered copper at lower prices and made a few sales. In the latter part of the week August-September copper was offered at 26¾c., net cash, New York, and August-December at 26c., and some business was done on those terms. It is noteworthy that there is no longer any premium on prompt copper; also, that the backwardation on fourth-quarter delivery has contracted, and at present is not to exceed ½c. per lb. This is considered to anticipate the strong statistical position that will probably be exhibited in copper a little later, owing to the recent curtailment of production at the mines.

Statements that further sales of copper have been made to the European Governments are without foundation. However, it appears that they want copper for early delivery.

Copper Sheets are quoted at 37c. per lb. for hot rolled, and 1c. higher for cold rolled. Wire is quoted nominally at 33c. per lb., f.o.b. mill.

Tin—Prices were practically stationary throughout the week. Stagnation continued unabated. The market was exceedingly small. Quotations were practically nominal, representing transactions of only five or 10 tons per day. At the beginning of the week, Banka tin was quoted at 60c., and at the close at 60⅝c.

Lead—Some large business was done at prices ranging from 10½ to 11c., New York. Included in the sales were some for export, and more inquiries from abroad are pending. During the last two days there has been a substantial increase in domestic inquiries. The statistical position is very strong, especially for August delivery, owing to the curtailment of production in Missouri, while the Mexican output has been disappointing and has fallen off from the high figures reported not long ago. An easier situation is expected later, in anticipation whereof October-December lead is offered in round lots at 10c.

The situation in the mining district of southeastern Missouri is improving. A force of 300 Federal troops is now in the district, the commanding officer is handling the situation with great good sense and foreigners are gradually returning to work. The St. Joseph Lead company has kept its smelting works in operation, but has been obliged to suspend its shipments of concentrates to other smelters.

A strike at the smeltery of the St. Louis Smelting and Refining Co., at Collinsville, Ill., put that plant out of commission on Aug. 4. However, on the same day, the Pennsylvania Smelting Co., of Pittsburgh, Penn., resumed smelting, the strike at its plant having been settled.

The U. S. Government has arranged with the Lead Committee for 25,000 tons of lead, August-October delivery, at 8c. per lb., the same price as for the July contract.

Zinc—Fairly large business was done, including some round lots for export. The bulk of the business was taken at 8.45c., St. Louis basis. The zinc market was very sluggish.

The New Jersey Zinc Co. has begun rolling sheet zinc at Palmerton, Penn.

The Zinc Committee has been requested to call for bids on 5750 tons of Grade C spelter (prime Western) for the War and Navy Departments, on basis of f.o.b. St. Louis, deliverable within the next 10 months. Bids must be in the hands of A. P. Cobb, secretary of the Zinc Committee, 55 Wall St., New York, by noon, Aug. 10, 1917. The Zinc Committee has been authorized by the Secretary of the Navy and the Secretary of War to accept the lowest prices based on carload lots.

Some producers expressed uncertainty about bidding on the Government's requisition, while others expressed disinclination to do so at all. It is probable, therefore, that some bids will go in at high prices that the bidder has no expectation of getting, the bids being made out of politeness. The producer who has a mine or the producer who has a large accumulation of unsold stock may be able to enter into a contract for delivery 10 months ahead, but the smelter who has to rely on the open ore market finds it difficult and hazardous to commit himself at present level.

The U. S. Geological Survey reported today that production of spelter in the United States during the first six months of 1917 was 364,000 short tons, compared with 351,000 short tons during the last half of 1916. About 35,000 retorts were reported idle on July 1. Stocks of spelter in hands of smelters on July 1, were 33,000 tons.

Besides the stocks in hands of smelters, there is believed to have been a large stock in warehouses in St. Louis and elsewhere. Such stocks are not included in the report of the Geological Survey.

Zinc Sheets—Price of zinc sheets has not been changed. Market is still at $19 per 100 lb. f.o.b. Peru, Ill., less 8% discount.

Other Metals

Aluminum—The aluminum market is weaker. Quotations seem to be nominal and there is no interest in the market. Offers are reported as low as 48 @ 50c. per lb. for No. 1 ingots at New York; futures slightly lower.

Antimony—The market was unchanged at 15@15¼c. for spot. If anything, the tone of the market was slightly easier, it being believed that the accumulation of stocks has not yet been fully liquidated. September shipments from China are quoted at 14½@15c., c.i.f., in bond.

Bismuth—Quoted at $3.50 per lb.

Cadmium—Quoted at $1.40 @ 1.60 per lb.

Cobalt—Quoted at $1.70 per lb.

Magnesium—Ingot is quoted at $2 per lb

Nickel—Steady at 50@55c. per lb., premium of 5c. per lb. for electrolytic.

Quicksilver—Stocks in New York continue light, and quotations are made here at $115. San Francisco reports by telegraph $110: market strong.

Gold, Silver and Platinum

Silver—The market has ruled strong in London with advancing tendency due to small offerings on a market bare of supplies. The demand for coinage from England and the Continent continues and the need of silver for commercial purposes as well as for the mint in India is pressing. China exchanges have also advanced, so the future of silver looks promising for higher prices.

Mexican dollars at New York Aug. 1, 61¼c.; 2, 61¼c.; 3, 62⅝c.; 4, 62⅝c.; 6, 62⅝c.; 7, 63¼c.

Platinum—Steady at $105.

Palladium—Strong at $115 @ 125.

The U. S. Geological Survey reports that the present stock of unmanufactured platinum in the United States is 45,000 oz., 70% of which is available for industrial use, this report being based on the recent inquiry in the industry. It is considered that this stock is large enough to meet the requirements of the necessary industry, but is not enough to permit the manufacture of platinum jewelry. The most important demands will be from the gasoline-motor builders and for telegraph and telephone extensions. Sulphuric-acid contact-process plants are well supplied.

Zinc and Lead Ore Markets

Platteville, Wis., Aug. 4—Blende, basis 60% Zn, $70 for premium ore down to $65 for medium grade. Lead ore, basis 80% Pb, $112 per ton. Shipments reported for the week are 2916 tons of zinc ore, 63 tons of lead ore and 428 tons of sulphur ore. For the year to date the figures are: 83,906 tons of zinc ore, 3906 tons of lead ore and 17,335 tons of sulphur ore. Shipped during the week to separating plants, 3681 tons of zinc ore.

Joplin, Mo., Aug. 4—Blende, per ton, high $76.90; basis 60% Zn, premium $75; medium to low $70@65; calamine, per ton 40% Zn, $42@40; average selling price, all grades of zinc, $66.22 per ton.

Lead, high, $124.80; basis 80% Pb $120@110; average selling price all grades of lead, $118.16 per ton.

Shipments the week: Blende 8485 tons; calamine 717 tons; lead 1744 tons. Value, all ores the week, $815,320.

Shipment and production lower than in June. Hot weather and the draft are seriously affecting the situation. Some of the miners who were on the first call have refused to work since their names were published. These belong to the shifting population, and they may shift to some other locality.

Other Ores

Antimony Ore—Sales of high grade ore were reported at $2.25 per unit.

Chrome Ore—The quotation is unchanged at $1 per unit, f.o.b. California, for ore containing a minimum of 46%.

An important buyer of chrome ore has criticized our recent quotations, reporting that it has lately closed contracts for about 3000 tons at 55c. per unit from various producers. While occasional cars are bought by small users needing ore at high prices, this concern reported, under date of Aug. 1, that it knew of no sale in excess of about 70c. per unit for high grade ores. We believe that it is a fact, however, that buyers needing high-grade chrome ore have paid $1 per unit and that their demand is not yet satisfied.

Iron Ore—Prices, delivered lower Lake ports are for old-range bessemer, $5.95; old-range nonbessemer, $5.20; Mesabi bessemer, $5.70; and Mesabi nonbessemer, $5.05.

Manganese Ore—The market is easier, high grade metallurgical ore being quoted at $1.07 per unit, Pittsburgh and Chicago. Supplies have been stimulated and consumers are now said to be in a more comfortable position. It is reported that chemical ore, assaying 80% manganese dioxide, for shipment from Japan, is offered at $85 per ton, c.i.f., New York.

Molybdenum Ore—Small sales were reported at $2.45 per lb of molybdenum sulphide in concentrates assaying 90%.

Pyrites—Spanish lump quoted at 15c. per unit on basis of 10s. ocean freight, buyer to pay war risk, excess freight and any duty. Ocean freights are 42s. 6d. from Huelva to southern ports, contracts having been made at that figure lately. This price is practically prohibitive; many inland fertilizer plants are turning to brimstone as a source of sulphur; some works may close if high ocean rates continue.

Tungsten Ore—The demand is still unsatisfied, high grade ore being sold without difficulty, and the market continues strong. We quote $25 for wolframite and $26 for scheelite, the prices varying considerably according to quality of ore. Present stocks of tungsten ore in New York are said to be less than 100 tons.

Iron Trade Review

PITTSBURGH—Aug. 7

Production of steel continues to be restricted by hot weather, to the extent of at least 15%, but there is no greater pressure for deliveries. Scarcely any new projects are being undertaken that would involve the consumption of steel but the ordinary manufacturing consumers of steel seem to expect approximately as heavy consumption in the future as in the past, provided the steel can be secured at a reasonable price.

Pig Iron—Transactions are few and involve very small tonnages, for early deliveries only. Consumption is not reduced, except on account of hot weather and that affects production of pig iron equally as much. The market remains quotable as formerly: Bessemer, $55; basic, $52; malleable and foundry, $53@55, f.o.b. valley furnaces, 95c. higher delivered Pittsburgh.

Steel—Asking prices are unchanged but there are no bids, and steel could hardly be sold except at much below asking prices, which remain $95@100 for billets and $105@110 for sheet bars.

Ferroalloys

Ferromanganese—The market is a shade easier on all positions, at $375@400 for prompt and second half and $350@375 for first half, delivered.

Coke

Connellsville—The market has continued to stiffen, on account of both car and labor shortage, spot being now quotable at $12.50@13.50 for furnace and at $13.50@14.50 for foundry, per net ton at ovens.

STOCK QUOTATIONS

N. Y. EXCH.†	Aug. 7
Alaska Gold M	5
Alaska Juneau	3½
Am.Sm.& Ref.,com.	103¼
Am. Sm. & Ref., pf	114
Am. Sm. Sec., pf., A	98½
Am. Sm. Sec., pf. B	91½
Am. Zinc	25
Am. Zinc, pf	59
Anaconda	77½
Batopilas Min.	1½
Bethlehem Steel	127½
Bethlehem Steel, pf.	115
Butte & Superior	38½
Cerro de Pasco.	34¼
Chile Cop	20
Chino	55½
Colo Fuel & Iron.	50¼
Crucible Steel.	84¾
Dome Mines.	10
Federal M. & S	26½
Federal M. & S., pf.	53¼
Great Nor., ore ctf.	34¼
Greene Cananea	42½
Gulf States Steel	116
Homestake	101
Inspiration Con	57½
International Nickel	40
Kennecott.	44½
Lackawanna Steel	93
Miami Copper.	39
Nat'l Lead, com.	55½
National Lead, pf	105
Nev. Consol	23½
Ontario Min	5¼
Quicksilver	1½
Quicksilver, pf.	1½
Ray Con	27½
Republic I &S.,com.	92¼
Republic I. & S., pf	103½
Sloss-Sheffield.	55½
Tennessee C. & C.	18¼
U. S. Steel, com	126½
U. S. Steel, pf	118
Utah Copper.	106½
Va. Iron C. & C.	69½

N. Y. CURB†	Aug. 7
Big Ledge.	1½
Butte & N. Y.	1¼
Butte C. & Z	8½
Caledonia	69
Calumet & Jerome.	1 11/16
Can. Cop. Corpn	2¼
Carlisle	4
Cashboy	07
Con. Ariz. Sm	2 11/16
Con. Coppermines.	8¼
Con. Nev.-Utah.	06
Emma Con	1 1/16
Ferber	‡ 60
First Nat. Cop	2½
Goldfield Con.	58
Goldfield Merger.	05
Greenmonster.	1
Hecla Min	8¼
Howe Sound	5½
Jerome Verde.	1 11/16
Kerr Lake	5½
Magma	52
Majestic	40
McKinley-Dar-Sa.	51
Milford	1¼
Mohican	11/16
Mother Lode	38
N. Y. & Hond	14
Nipissing Mines.	7½
Ohio Cop	1 1/16
Ray Hercules	3½
Richmond	55
Rochester Mines	.54
St. Joseph Lead.	20
Standard S. L.	11/16
Stewart	1/16
Success	30
Tonopah	6½
Tonopah Ex	2½
Tribullion	.25
Troy Arizona	19
United Cop	50
United Verde Ext	37½
United Zinc	4¼
Utica Mines	21
White Knob, pf.	1½
Yukon Gold	2

SAN FRAN.*	Aug. 7
Alta	.03
Andes	.11
Best & Belcher.	03
Bullion	02
Caledonia	09
Challenge Con	01
Confidence	05
Con. Virginia	23
Gould & Curry	‡ 02
Hale & Norcross	01
Jacket-Cr. Pt	09
Mexican	10
Occidental	60
Ophir	12
Overman	01
Savage	07
Seg. Belcher	‡ 01
Sierra Nevada	08
Union Con	14
Utah Con	01
Belmont	4 40
Jim Butler	80
MacNamara	11
Midway	10
Mont.-Tonopah	19
North Star	10
Rescue Eula	17
West End Con.	60
Atlanta	11
Booth	07
Comb. Frac	04
D'field Daisy	03
Florence	16
Jumbo Extension	23
Kewanas	13
Nevada Hills	20
Nevada Packard	31
Round Mountain.	36
Silver Pick	10
White Caps	‡ 17½
Big Jim	69
United Eastern	4 10

BOSTON EXCH.*	Aug. 7
Adventure	2
Ahmeek	99
Algomah	.60
Allouez	63
Ariz. Com., ctfs	12½
Arnold	25
Bonanza	21
Butte-Ballaklava.	55
Calumet & Ariz	79½
Calumet & Hecla.	545
Centennial	17
Copper Range	61½
Daly West	1¼
Davis-Daly	5½
East Butte	11¼
Franklin	6
Granby	81
Hancock	14¼
Hedley	16
Helvetia	25
Indiana	2
Isle Royale	30
Keweenaw	2
Lake	10½
La Salle	3¼
Mason Valley	7½
Mass	11¾
Mayflower	2
Michigan	1¼
Mohawk	80½
New Arcadian	3
New Idria	14
North Butte	18
North Lake	1
Ojibway	1½
Old Dominion.	57½
Osceola	84½
Quincy	86
St. Mary's M. L.	‡77
Santa Fe.	1
Seneca.	9
Shannon	7½
Shattuck-Ariz.	24½
So. Lake	3
So. Utah	.15
Superior	8
Superior & Bost.	4
Trinity	6¼
Tuolumne	87
U. S. Smelting	58
U. S. Smelt'g, pf.	49
Utah Apex	2 11/16
Utah Con	16
Utah Metal	4
Victoria.	3½
Winona	3
Wolverine	47
Wyandot	.40

BOSTON CURB*	Aug. 7
Alaska Mines Corp.	62
Bingham Mines	12½
Boston Ely	1
Boston & Mont.	73
Butte & Lon'n Dev.	15
Calaveras	3½
Calumet-Corbin.	01
Chief Con	2½
Cortez	15
Crown Reserve.	26
Crystal Cop	93
Eagle & Blue Bell.	2½
Houghton Copper	‡ 95
Intermountain	1½
Iron Cap, Com	15½
Iron Cap Cop., pf.	15½
Mexican Metals	.26
Mines of America	1½
Mojave Tungsten	52
Nat. Zinc & Lead.	40
Nevada-Douglas	1½
New Baltic	1½
New Cornelia	18½
Oneco.	‡ 50
Pacific Mines	‡ 30
Rex Cons	23

SALT LAKE*	Aug. 7
Bannack	55
Big Four	17
Black Jack	‡.06
Cardiff	5 50
Colorado Mining	18
Daly-Judge	8 00
Empire Copper.	1 30
Gold Chain	18
Grand Central	58
Grand Gulch	‡ 19
Iron Blossom	89
Lower Mammoth.	03
May Day	06½
Moscow	15
Prince Con	1 02½
Silver-King Coal'n	2 97½
Silver King Con.	3 70
Sioux Con	21
So. Hecla	1 55
Uncle Sam	20
Wilbert	.22
Yankee	07½

TORONTO*	Aug. 7
Bailey	‡ 03
Beaver Con	33
Buffalo Mines	1 00
Chambers Ferland.	13
Coniagas.	3 50
Hargraves	11½
La Rose	45
Peterson Lake	10½
Right of Way	05
Temiskaming	32
Wettlaufer-Lor.	05
Dome Exten	15
Dome Lake	17
Foley O'Brien.	60
Hollinger	4 25
McIntyre	1 50
Newray	66
Porcu. Crown	38
Schumacher	42
Teck-Hughes	48
Vipond	31
West Dome	18

STOCK QUOTATIONS—Continued

COLO. SPRINGS	Aug. 7
Cresson Con.	6 00
Doctor Jack Pot	04½
Elkton Con.	06¼
El Paso	25
Gold Sovereign.	04½
Golden Cycle	2 05½
Granite	45
Isabella	09¼
Mary McKinney	10
Portland	1 42
United Gold M	20½
Vindicator	68

LONDON	July 26
Alaska Mexican	£0 10s 0d
Alaska Tre'dwell	0 15 0
Burma Corp.	4 1 10½
Cam & Motor	0 8 6
Camp Bird	0 6 6
El Oro	0 9 6
Esperanza	0 9 0
Mexican Mines	4 7 6
Nechi, pfd	0 12 6
Oroville	0 15 9
Santa Gert'dis	0 10 6
Tomboy.	0 18 6

* Bid prices. † Closing prices. ‡ Last Quotations

MONTHLY AVERAGE PRICES OF METALS

Silver	New York			London		
	1915	1916	1917	1915	1916	1917
January	48.855	56.775	75.630	22.731	26.960	36.682
February	48.477	56.755	77.585	22.753	26.975	37.742
March	50.241	57.935	73.861	23.708	27.597	36.410
April	50.250	64.415	73.875	23.709	30.662	36.963
May	49.915	74.269	74.745	23.570	35.477	37.940
June	49.034	65.024	76.971	23.267	31.060	39.065
July	47.519	62.940	79.010	22.597	30.000	40.110
August	47.163	66.083		22.780	31.498	...
September	48.680	68.515		23.591	32.584	...
October	49.385	67.855		23.925	32.361	.
November	51.714	71.604		25.094	34.192	.
December	54.971	75.765		26.373	36.410	
Year	49.684	65.661		23.675	31.315	

New York quotations cents per ounce troy, fine silver. London, pence per ounce, sterling silver, 0.925 fine.

Copper	New York		London			
	Electrolytic		Standard		Electrolytic	
	1916	1917	1916	1917	1916	1917
Jan	24.008	28.673	88.083	131.921	116.167	142.895
Feb	26.440	31.750	102.667	137.895	133.167	148.100
Mar	26.310	31.481	107.714	136.750	136.000	151.000
April	27.895	27.935	124.319	133.842	137.389	147.158
May	28.625	28.788	135.457	130.000	152.522	142.000
June	26.601	29.962	112.432	130.000	137.455	142.000
July	23.865	26.620	95.119	128.409	125.500	140.409
Aug	26.120		110.283	..	126.304	
Sept	26.855		113.905		134.071	
Oct	27.193		122.750	..	142.523	
Nov	30.625		134.659	..	155.432	
Dec	31.890		145.316	..	162.842	..
Year	27.202	.	116.059		138.281	....

Tin	New York		London	
	1916	1917	1916	1917
January	41.825	44.175	175.548	185.813
February	42.717	51.420	181.107	198.974
March	50.741	54.388	193.609	207.443
April	51.230	55.910	199.736	220.171
May	49.125	63.173	196.511	245.114
June	42.231	62.053	179.466	242.083
July	38.510	62.570	168.357	242.181
August	38.565		169.870	
September	38.830	..	171.345	
October	41.241		179.307	
November	44.109		186.932	
December	42.635		183.368	
Av. year	43.480		182.096	

Lead	New York		St. Louis		London	
	1916	1917	1916	1917	1916	1917
January	5.921	7.626	5.826	7.530	31.167	30.500
February	6.246	8.636	6.164	8.595	31.988	30.500
March	7.136	9.199	7.375	9.120	34.440	30.500
April	7.630	9.288	7.655	9.158	34.368	30.500
May	7.463	10.207	7.332	10.202	32.967	30.500
June	6.936	11.171	6.749	11.12.	31.011	30.500
July	6.352	10.710	6.185	10.644	28.137	30.500
August	6.244		6.088		29.734	
September	6.810		6.699		30.786	
October	7.000		6.898		30.716	
November	7.042		6.945		30.500	
December	7.513		7.405		30.500	
Year	6.853		6.777		31.359	

Spelter	New York		St. Louis		London	
	1916	1917	1916	1917	1916	1917
Jan	16.915	9.619	16.745	9.449	89.810	48.329
Feb	18.420	10.045	18.260	9.875	97.762	47.000
Mar	16.846	10.300	16.676	10.130	95.048	47.000
April	16.695	9.459	16.525	9.289	99.056	54.632
May	14.276	9.362	14.106	9.192	94.217	54.000
June	11.752	9.371	11.582	9.201	68.591	54.000
July	8.925	8.643	8.755	8.473	50.750	54.000
Aug	8.730		8.560		51.587	
Sept	8.990		8.820		52.095	
Oct	9.829		9.659		54.159	
Nov	11.592		11.422		56.023	
Dec	10.665		10.495		55.842	
Year	12.804		12.634		72.071	

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton.

Pig Iron, Pitts.	Bessemer‡		Basic‡		No. 2 Foundry	
	1916	1917	1916	1917	1916	1917
January	$21.60	$35.95	$18.78	$30.95	$19.70	$30.95
February	21.16	36.37	18.93	30.95	19.51	30.95
March	21.81	37.37	19.20	33.49	19.45	35.91
April	21.65	42.23	18.95	38.90	19.45	40.06
May	21.78	46.94	19.11	42.84	19.58	43.60
June	21.95	54.22	18.95	50.05	19.34	50.14
July	21.95	67.45	18.95	53.80	19.20	53.95
August	21.95		18.95		19.22	
September	22.88		19.58		19.53	
October	24.61		21.26		21.61	
November	30.07		28.18		26.85	
December	35.16		30.95		30.79	
Year	$23.88	.	$20.98		$21.15	

‡ As reported by W. P. Snyder & Co.

Current Prices—Materials and Supplies

IRON AND STEEL

SHEETS—Price in cents per pound:

Blue Annealed	Large Lots. Pittsburgh	St. Louis	Chicago	San Francisco	New York Aug. 6, 1917	New York One Yr. Ago
No. 10	8.25	9.55	9.50	10.50	10.00	4.25
No. 12	8.65	9.60	9.55	10.55	10.05	4.30
No. 14	8.65	9.65	9.60	10.60	10.10	4.35
Black						
Nos. 18 and 20	8.55	9.65	9.30	10.80	10.30	3.45
Nos. 22 and 24	8.60	9.70	9.35	10.83	19.35	3.50
Nos. 26	8.65	9.75	9.40	10.88	10.40	3.55
No. 28	8.75	9.85	9.50	10.98	10.50	3.65
Galvanized						
No. 10	9.50	10.45	9.70	....	....	....
No. 12	9.60	10.45	9.70	12.15	....	4.50
No. 14	9.75	10.45	9.70	12.15	12.10	4.50
Nos. 18 and 20	9.90	10.65	10.00	12.45	12.40	4.60
Nos. 22 and 24	10.30	10.80	10.15	12.62	12.55	4.55
No. 26	10.45	10.95	10.20	12.77	12.70	....
No. 28	10.75	11.25	10.50	13.06	13.00	5.00

STEEL RAILS—The following quotations are per ton f.o.b. Pittsburgh and Chicago for carload or larger lots. For less than carload lots 5c. per 100 lb. is charged extra:

	Pittsburgh Aug. 4, 1917	Pittsburgh One Year Ago	Chicago Aug. 4, 1917	Chicago One Year Ago
Standard bessemer rails	$60.00 to 80.00	$33.00	$38.00	$33.00
Standard openhearth rails	60.00 to 80.00	35.00	40.00	35.00
Light rails, 8 to 10 lb.	83.00*	50.00	68.00	43.00
Light rails, 12 to 14 lb.	82.00*	49.00	67.00	42.00
Light rails, 25 to 45 lb.	75.00*	47.00	65.00	40.00

*Demand for light rails active and mills are obtaining premiums. Rerolled rails as valuable as new.

TRACK SUPPLIES—The following prices are base per 100 lb. f.o.b. Pittsburgh for carload lots, together with the warehouse prices at the places named:

	Pittsburgh Aug. 4, 1917	Pittsburgh One Year Ago	Chicago	St. Louis	San Francisco
Standard railroad spikes, 9/16-in. and larger	$7.00	$2.65	$5.00	$5.75	$5.75
Track bolts	7.00	3.25	6.25	Premium	7.30
Standard section angle bars	4.00	2.00	4.00	Premium	4.65

STRUCTURAL MATERIAL—The following are the base prices f.o.b. mill, Pittsburgh, together with the quotations per 100 lb. from warehouses at the places named:

	Pittsburgh	New York Aug. 4, 1917	New York 1 Yr. Ago	St. Louis	Chicago	San Francisco	Dallas
Beams, 3 to 15 in.	$4.50	$5.25	$2.50	$5.05	$5.00	$7.75	$6.00
Channels, 3 to 15 in.	4.50	5.25	2.50	5.05	5.00	7.75	6.00
Angles, 3 to 6 in., in. thick	4.50	5.25	2.50	5.05	5.00	7.75	6.25
Tees, 3 in. and larger	4.50	5.30	2.50	5.05	5.05	7.75	6.25
Plates	9.00	9.00	2.90	8.05	8.00	10.00	9.00

RIVETS—The following quotations are per 100 lb.:

STRUCTURAL

	Mill, Pittsburgh	Warehouse New York	Warehouse Chicago	Warehouse St. Louis	Warehouse San Francisco	Warehouse Dallas
¾ in. and larger	$5.25	$7.00	$5.50	$5.55	$6.65	$8.40
CONE HEAD BOILER						
¾ in. and larger	5.35	7.10	5.60	5.65	6.75	8.50
⅝ and 11/16	5.50	7.25	5.75	5.80	6.90	8.65
½ and 9/16	5.85	7.60	6.10	6.15	7.25	9.00

Lengths shorter than 1 in. take an extra of 50c. Lengths between 1 in. and 2 in. take an extra of 25c.

HORSE AND MULE SHOES—Warehouse prices per 100 lb. in cities named:

	Cincinnati	St. Louis	Denver	Birmingham
Straight	$6.75	$7.00	$7.75	$6.50
Assorted	7.25	7.15	8.00	7.00

WIRE ROPE—Discounts from list price on regular grades of bright and galvanized are as follows:

	New York Aug. 4, 1917	New York One Year Ago	St. Louis	Chicago	San Francisco
Galvanized	10—2½%	25—2½%	10—2½%	10—2½%	15%
Bright	20—2½%	35—2½%	20—2½%	20—2½%	5%

SWEDISH (NORWAY) IRON—This material per 100 lb. sells as follows:

	Aug. 4, 1917	One Year Ago
New York	$14.00	$6.00
Cleveland	12.30	6.30
Chicago	12.00	5.25

In coils an advance of 50c usually is charged:

PIPE—The following discounts are for carload lots f.o.b. Pittsburg as per basing card of July 2, 1917, for iron; May 1, for steel:

Steel Inches	Steel Black	Steel Galvanized	Iron Inches	Iron Black	Iron Galvaniz
BUTT WELD					
¾ to 3	49%	35½%	¾ to 1½	33%	17%
LAP WELD					
2	42%	29½%	2	26%	12%
2½ to 6	45%	32½%	2½ to 4	28%	15%
7 to 12	42%	28½%	4½ to 6	28%	15%
13 and 14	32½%	....	7 to 12	25%	12%
15	30%	....			
BUTT WELD. EXTRA STRONG PLAIN ENDS					
¾ to 1½	47%	34½%	¾ to 1½	33%	18%
2 to 3	48%	48½%			
LAP WELD. EXTRA STRONG PLAIN ENDS					
2	40%	28½%	2	27%	14%
2½ to 4	43%	31½%	2¼ to 4	29%	17%
4½ to 6	42%	30½%	4½ to 6	28%	16%
7 to 8	38%	24½%	7 to 8	20%	8%
9 to 12	33%	19½%	9 to 12	15%	3%

From warehouses at the places named the following discounfs ho for steel pipe:

	Black New York	Black Chicago	Black St. Lou
¾ to 3 in. butt welded	38%	42.8%	34.27
3½ to 6 in. lap welded	28%	38.8%	27.27
7 to 12 in. lap welded	20%	35.8%	21.27

	Galvanized New York	Galvanized Chicago	Galvanized St. Lou
¾ to 3 in. butt welded	22%	27.8%	19.27
3½ to 6 in. lap welded	10%	24.8%	13.27
7 to 12 in. lap welded	10%	20.8%	6.27

Malleable fittings, Class B and C, from New York stock sell at 5 a 5% from list prices Cast iron, standard sizes, 34 and 5%.

MISCELLANEOUS

FLOTATION OILS—Prices of oils for flotation, in cents per gallc in barrels:

	New York	Denv
Pure steam-distilled pine oil	$0.50½	$0.80
Pure destructively distilled pine oil	.40	.46
Pine tar oil	.26	.38
Crude turpentine	.37	.59
Hardwood creosote	.19½*	.50

*F.o.b. Cadillac, Mich.

SODIUM CYANIDE—New York price is 30c. per lb; Denver, 44 46c.

SODIUM SULPHIDE—In New York the price per pound is 3¾c. f concentrated, 2c. for crystals. The Denver price for concentrated quoted at 8 to 9c. Concentrated comes in 500-lb. drums, the crystals 400-lb. barrels.

ZINC DUST—New York price is 18c. per lb. in 1600-lb. barr Denver, 15 to 16c.

CALCIUM CARBIDE—Price f.o.b. cars at warehouse poin east of Mississippi (except in Alabama, Georgia and Florida) $82.50 for Cameo, $87.50 for Union. In territory between Missi sippi River and the Rockies and in Alabama, Georgia and Florid add $5; west of Rockies, add $10 to $15.

HOSE—

Fire

	50-Ft. Lengt
Underwriters' 2⅝-in.	65c. per
Common, 2½-in.	40–10%

Air

	First Grade	Second Grade	Third Gra
¾-in. per ft.	$0.55	$0.30	$0.25

Steam—Discounts from list

First grade... 30% Second grade... 30-5% Third grade... 40-10

RUBBER BELTING—The following discounts from list app to transmission rubber and duck belting:

Competition	50–10%	Best grade	25
Standard	40%		

LEATHER BELTING—Present discounts from list in the fc lowing cities are as follows:

	Medium Grade	Heavy Gra
New York	40%	35%
St. Louis	50%	40%
Chicago	40—5%	35—10%
Birmingham	35%	35%
Denver	40%	45%

RAWHIDE LACING—40%.

MANILA ROPE—For rope smaller than ⅝-in. the price is ½ 2c. extra; while for quantities amounting to less than 600 ft. the is an extra charge of 1c. The number of feet per pound for th various sizes is as follows: ⅝-in., 8 ft.; ¾-in., 6; ⅞-in., 4⅓; 1-in., 3 1⅛-in., 2 ft. 10 in.; 1¼-in., 2 ft. 4 in. Following is price per poun for ⅝-in. and larger, in 1200-ft. coils:

Boston	$0.34	New Orleans	$0.31
New York	.33½	Seattle	.31
Denver	.36	St. Paul	.31
Kansas City	.31¼		

ACKING—Below are prices each per pound in cities named:

Asbestos

		St. Louis	New York	Denver	Birmingham
alve oor affing ox	Twisted plain, 25-lb. cartons	$1.25	$0.65 @ 0.70	....	$1.50
	Twisted graphite, 25-lb. cartons	1.25	.90	$1.40	1.50
	Braided plain, 25-lb. cartons..	1.50	.80	.60	1.50
	Braided graphite, 25-lb. cartons	1.50	1.00	.60	1.50

Asbestos wick in balls, ¼, ½-, 1-, 25- and 50-lb. cartons, $0.65 @ 0, New York, $1, Chicago.

Rubber asbestos compressed sheet, medium grade about $0.80, New rk .45c. St. Louis, $1, Chicago.

STEAM

Following in 25- and 50-lb. cartons:

	New York	Denver	Birmingham	St. Louis
st grade	$0.83	$0.80	$1.00	$0.80
ond grade	.55	.60	.90	....

RUBBER AND DUCK

	New York	Denver	Birmingham	St. Louis
rh grade	$0.50	....	....	$0.60
d water	.30	...	....	.40

PISTON

	New York	Denver	Birmingham	St. Louis
bestos, duck and rubber..	$1.75	$0.80	$0.90	$1.50
x, first grade	.94	.60	.32	.75
bber and duck	.90	.60	.60	.60

RAILWAY TIES—For fair-size orders, the following prices per hold

	Material	6 in. x 8 in. by 8 Ft.	7 in. x 9 in. by 8 Ft. 6 In.
w York	Yellow Pine	$1.06 to 1.11	$1.25
Louis	No. 1 White Oak	1.00	.75
cago	White Oak	.97	.82
Francisco	Green	.77	1.01
Francisco..	Creosoted	1.20	1.62

GREASES—Prices are as follows in the following cities in t sper pound for barrel lots:

	New York	Denver	Chicago	Birmingham	St. Louis
	5 to 7	8	7½	6	10½
er or sponge.	5 to 7	15	7¾	6	5⅞
nsmission	5 to 7	15	6¼	6	6
e	3 to 7	5	5	3	4½
r	4 to 5	5	6½	6	10
journal	6½ to 7¼	20	6	..	3½ to 7½

WIPING CLOTHS—In Cleveland the jobbers' price per 1000 is follows:

x 13¼	$35.00	13¼ x 20½	$45.00

In Chicago they sell at $30 to $33 per 1000.

COTTON WASTE—The following prices are in cents per pound:

	New York		Cleveland	Chicago
	Aug 4 1917	One Year Ago		
ite	11.00 to 13.00	12.50	15.00	13.00 to 15.00
ored mixed	8.50 to 12.00	9.00	13.00	10.00 to 12.00

LINSEED OIL—These prices are per gallon:

	New York		Cleveland		Chicago	
	Aug. 4, 1917	One Year Ago	Aug. 4, 1917	One Year Ago	Aug. 4, 1917	One Year Ago
r in barrels	$1.16	$0.71	$1.20	$0.73	$1.17	$0.73
l. cans	1.26	.81	1.35	.83	1.27	.83

WHITE AND RED LEAD in 500-lb lots sell as follows in ts per pound

	Red				White	
	Aug. 4, 1917		1 Year Ago		Aug 4 1917	7 Yr Ago
	Dry	In Oil	Dry	In Oil	Dry and In Oil	Dry and In Oil
-lb keg	13.25	13.50	10.50	11.00	13.00	10.50
and 50-lb kegs	13.50	13.50	10.75	11.25	13.25	10.75
-lb keg	13.75	14.00	11.00	11.50	13.50	11.00
to 5-lb. cans	15.25	15.50	12.50	12.50	15.50¼	12.50

NUTS—From warehouse at the places named, on fair-sized ers, the following amount is deducted from list

	New York		Cleveland		Chicago	
	Aug 4 1917	One Year Ago	Aug 4, 1917	One Year Ago	Aug 4, 1917	One Year Ago
pressed square	List	$2.00	$1.05	$2.75	$3.00	$3.25
pressed hexagon	List	2.00	1.50	3.00	3.00	3.25
punched square	List	1.50	1.40	2.50	1.75	3.00
punched hexagon	List	2.00	1.10	3.00	2.25	3.50

Semifinished nuts sell at the following discounts from list price

	Aug 4 1917	One Year Ago
York	50%	50—10%
eland	50%	60%
ago	50%	65%

MACHINE BOLTS—Warehouse discounts in the following es

	New York	Cleveland	Chicago
r ¾ in. and smaller	30%	35—5%	25—5%
ger and longer up to 1 in. by 30 in.	15%	20—5%	20—2½%

WROUGHT WASHERS—From warehouses at the places named following amount is deducted from list price

York	$5.00	Cleveland	$4.50	Chicago	$4.50

For cast-iron washers the base price per 100 lb. is as follows

York	$2.25	Cleveland	$1.50	Chicago	$3.50

EXPLOSIVES—Price per pound in small lots at cities named:

	Low Freezing	Gelatin			Black
	20%	40%	60%	80%	Powder*
New York	......	$0.26½	$0.33½	....	$2.35
Boston	......	......	.33¼	$0.40¾	....
Kansas City	$0.19	.25¼	.30¼	.36½	....
New Orleans	.20¼	.24¼	.29¼	......	....
Seattle	.17½	.23¾	.30¾	......	....
St. Paul	.19	.25¼	.32¼	.42½	2.35
St. Louis	.15½	.21½	.29½	.34¾	1.95
Denver	.18	.24¼	.31¼	.41½	....

*75%.

FUEL OIL—Price variable, depending upon stock. New York quotations not available owing to this fact. In Chicago and St. Louis the following prices are quote:

	Chicago	St. Louis
Domestic light, 22-26 Baume	7¾c.	8.5c.

Note—There is practically no fuel oil in Chicago at present time.

OILS—Price per 50-gal. bbl. is as follows:

City	Fuel	Black	Red Engine	Steam Cylinder	Gasoline
Seattle	$4.45	$6.25	$11.00	$21.00	$20.25
Denver	3.00	9.00	13.00	25.00	12.00
Los Angeles	1.20	5.00	10.50	25.00	10.00
St. Paul	3.00	5.50	11.00	17.50	10.05
Cincinnati	5.00	5.50	10.50	17.00	12.00
Boston	5.00	8.00	12.50	18.75	12.50
Kansas City	6.95	4.35	10.35	17.35	9.65

CONSTRUCTION MATERIALS

PREPARED ROOFINGS—Standard grade rubbered surface complete with nails and cement costs per square as follows in New York and Chicago:

	1-Ply		2-Ply		3-Ply	
	c.l.	l.c.l.	c.l.	l.c.l.	c.l.	l.c.l.
No. 1 grade	$1.15	$1.30	$1.45	$1.60	$1.75	$1.90
No. 2 grade	1.00	1.15	1.25	1.40	1.50	1.65

Asbestos asphalt saturated felt (14 lb. per square) costs $5.35 per 100 lb

Slate-surfaced roofing (red and green) in rolls of 108 sq.ft. costs $1.85 per roll in carload lots and $2.10 for smaller quantities.

Shingles, red and green slate finish, cost $4.75 per square in carloads, $5 in smaller quantities, in Philadelphia.

ROOFING MATERIALS—Prices per ton f.o.b. New York or Chicago:

	Carload Lots	Less Than Carload Lots
Tar felt (14 lb. per square of 100 sq.ft.)	$59.00	$60.00
Tar pitch (in 400-lb. bbl.)	15.00	17.00
Asphalt pitch (in barrels)	29.00	30.50
Asphalt felt	60.00	62.00

CORRUGATED SHEETS—Price of corrugated sheets (2½-in. corrugations) per pound:

Gage		Mill, Pittsburgh	Cincinnati	Birmingham	St. Louis	Denver
18–20	Black	$0.0845	$18.00*	..	$0.092	..
28	Black	.087	5.75*	...	.094	$0.10
10	Galvanized	.0935	....	....	....	....
18–20	Galvanized	.0995	22.50*	$0.11	....	....
28	Galvanized	.1055	8.75*	.12	.113	.12

*Price per square of 100 sq.ft.

HOLLOW TILE—The price per 1000 in carload lots f.o.b. mine is as follows:

	4 x 12 x 12	8 x 12 x 12
Cincinnati	$68.80	$120.00
St. Louis	60.00	110.00
Denver, per ton	90.00	170.00
Birmingham	52.00	97.50

LUMBER—Price of yellow pine per M in carload lots:

	1 In. Rough 10 In. x 16 Ft.	2-In. T. and G.	8 x 8 In. x 20 Ft.
Denver	$32.00	$12.00	$36.00
St. Louis	31.50	28.00	36.50
Birmingham	21.00	26.00	22.00

Lumber—Price per M in carload lots

	1 In. Rough 10 In. x 16 Ft. and Under			2-In. T. and G. 10 In. x 16 Ft.	
	Y.P.	Fir	Hemlock	Y.P.	Fir
Kansas City	$44.00	$44.50	$43.00	$52.00	
Seattle	18.50	18.50	18.50	18.50	$18.50
New Orleans	26.00			28.00	
St. Paul		51.00	33.50	59.00	37.50

	8 x 8-In. x 20 Ft. and Under				12 x 12 In., 20 Ft. and Under	
	Y.P.	Fir	Hemlock	Spruce	Y.P.	Fir
Kansas City	$39.00	$35.00	$35.00		$45.00	$35.00
Seattle	18.50	18.50	18.50	$18.50	18.50	18.50
New Orleans	24.50				30.00	
St. Paul		40.00	31.50	32.00		45.00

PORTLAND CEMENT—These prices are for barrels in carload lots, including bags

	Aug 4 1917	One Month Ago	One Year Ago
New York	$2.22	$2.22	$1.72
Jersey City	2.18	2.18	1.66
Boston	2.77	2.77	1.92
Chicago	2.31	2.31	1.81
Pittsburgh	2.31	2.31	1.81
Cleveland	2.44	2.44	1.94
Denver	2.39	2.39	.
Los Angeles	2.40	2.40	..

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Ore Reserves of the Rand

BY A. COOPER KEY

The reserve ore supply of the Rand mines, South Africa, is estimated at over 100 million tons. Much of it is now in low-grade material, but capable of being handled at a profit under favorable circumstances. The war has had the usual effect upon costs.

AN INVESTIGATION of the ore-reserve statements of the producing mines of the Rand, South Africa, shows a total of about 102 million tons developed. Of this about 36½ million tons have a content of 6 dwt. and under. The average working cost is now equal to about 4.5 dwt., so when allowance is made for mining and metallurgical losses, it will be seen that the margin is not a very great one. No less than 20 out of the 50 producing mines are included in this category, a fact that makes one wonder what is going to be the effect of increased war costs and the frequent demands for increase in wages. In April the average Rand cost was 19s., as against 17s. 1d. in 1914. A classification of ore reserves is shown in the table.

A GENERAL VIEW OF THE EAST RAND, SOUTH AFRICA

Out of 19 companies with reserves valued above 6½ dwt., nine are mines situated in the Far East Rand tract. Of the four richest mines, three are in that district. The fourth is the remarkably rich Meyer & Charlton of the Central Rand, which is *facile princeps*, in a class of its own, with over half a million tons fully developed—by no means a large aggregate as reserves go today—averaging 14½ dwt. and another 160,000 tons partly developed and assessed at 17 dwt. The City Deep adjoining is also one of the richest of Rand mines, ranking as fifth judged on this scale, with a value of 9 dwt. in respect of a large aggregate of 3,676, 000 tons. The order of the five highest is: Meyer & Charlton, 15 dwt.; Spring Mines, 9.86 dwt.; Brakpan and Modder B, 9.2 dwt. each; City Deep, 9 dwt.

The position of the great amalgamated mines has deteriorated considerably as regards ore reserves in the last few years. Five years ago the Crown Mines had 10,125,000 tons in reserve going 7.25 dwt. In 1912 the value came down to nearly 7 dwt. and in 1914 to 6 dwt. Since then it has kept fairly steady. Of the

CLASSIFICATION OF ORE RESERVES

	Companies	Tonnage
Below 5 dwt	3	4,180,500
Between 5 and 6 dwt	17	32,350,000
Between 6 and 6½ dwt	9	17,350,000
Between 6½ and 7 dwt	2	4,328,000
Between 7 and 7½ dwt	4	8,580,000
Between 7½ and 8 dwt	3	6,200,000
Between 8 and 8½ dwt	3	13,000,000
Between 8½ and 9 dwt	3	6,450,000
Between 9 and 10 dwt	3	8,210,000
Over 10 dwt ...	1	675,000

quantity shown in the table nearly 5,000,000 tons on the South Reef have a value of only 5.3 dwt. over 67 in. stoping width, indicating a very slight margin of payability with costs ranging between 18 and 19s. At the time of the amalgamation the companies had 4½ million tons developed at a shade under 8 dwt. At the East Rand Proprietary Mines, the value dropped 0.1 dwt. for each of the three years to 1914 accompanied by a reduction of 20% in the tonnage aggregate. In 1915 and 1916 the drop was 0.2 dwt. each year. The net result is that the ore reserves are now 4,200,000 tons just over 6 dwt. instead of 6,700,000 tons just under 7 dwt. Not only has the value of payability been low, but development has been seriously handicapped by enormous quantities of water. As regards the Randfontein Central, comparison can scarcely be made, as the ore not payable on present basis of working costs is now shown separately. The profitable ore amounts to 5,000,000 tons worth 7.8 dwt., both good figures.

Great Progress Made on East Rand

A much more pleasing state of affairs is in evidence at the mines of the Far East Rand, some of which have shown remarkable improvement, sometimes gradual, sometimes rapid. For three or four years the Brakpan's reserves stood between 2 and 2½ million tons at 6¾ dwt. But in 1915 the aggregate advanced to 3 million and the value of the whole to nearly 8 dwt., while a year later it was well over 9 dwt. At the Van Ryn Deep, which has also been crushing for the greater part of the period, the experience has been similar, though here there was a sharp improvement in 1913 with maintenance of values since, the mine value being now 8¾ dwt. In two years the Government Gold Mining Areas has doubled its aggregate reserve, the value having increased from 5.8 dwt. over 60 in. to 7.2 dwt. over 75 in., a width only exceeded by the rich Modder Deep and the poor New Goch. Combining value and width gives 540 dwt.-in., as against 517 dwt.-in. at the New Modderfontein, 543 dwt.-in. at the Modder B, with 655 dwt.-in. at Modder Deep, with 570 dwt.-in. at Brakpan and 642 dwt.-in. at Springs Mines. This is, of course, the true criterion of value, but the classification as given, on the pure value basis, is the simpler. It may be noted how close are the aggregates of the Modder B and Moder Deep, both well over 3,300,000 tons. The former shows an increase of over half a million tons and of nearly ½ dwt. in value. Government Areas has close upon 5 millions payable ore in sight and 400,000 tons more than the New Modderfontein had exposed in 1913.

Two Mines with £14,000,000 of Gold Developed

The latter company's aggregate is now 8,000,000 tons worth over 35s. per ton and representing £14,000,000. The aggregate is exceeded only by the Crown Mines, 11,400,000 tons, worth, however, only 25s. per ton, equivalent to £14,250,000. Closer calculation shows the Crown Mines to have a slight superiority. Inasmuch, however, as it is the practice at the New Modderfontein to sort out twice as much as at the Crown Mines, and as the metallurgical loss will be less in proportion, the amount of gold recoverable from existing reserves should prove considerably greater at the Eastern mine.

PROPERTY OF THE SIMMER & JACK GOLD MINING CO. ON THE RAND

City Deep has 3,675,000 tons in reserve valued at 9 dwt. over 60 in., the value having come down from 9.5 dwt. owing to the inclusion of a much greater quantity of poorer Main Reef ore. The stoping width has been gradually increased from the 42 in. of the 1913 assessment to the 60 in. of December last. Bantjes is a mine that has slipped back badly. In 1913 it had nearly a million tons worth 6.3 dwt.; three years later it had little over 400,000 tons at 5.6 dwt. Hitherto this mine worked mainly on the South reef, but lately the policy has been changed in favor of the main-reef leader. South-reef stopes have failed to yield in actual working, the content indicated by assays.

Certain of the older deep levels have suffered material reduction in ore reserves owing to the rise in working costs, largely attributable to the war, causing the elimination of much low-grade tonnage. As examples may be given the Rose Deep, which has shed 700,000 tons in a couple of years with a drop of 0.2 dwt.

in value. Geldenhuis has over the last two years maintained its aggregate, but the value is 0.5 dwt. lower. Nourse mines has altered its mining policy, entailing the writing off of a considerable quantity of ore, but the value is 0.5 dwt. higher. At the Robinson Deep, Wolhuter and Village Deep, the value of reserves shows a slightly improving tendency. In three years the value of the Witwatersrand Deep reserves has dropped from 6.8 to 5.8 dwt., but this is partly neutralized by an increase from 50 to 59 in. in the width. One would like to see a more general adoption of the plan of the consulting engineer giving an interpretation of the ore-reserve data, as has been done by C. R. Knecht in the case of the Brakpan, although not in that of the Springs Mines, which is under the same "control" of the Progressive Consolidated Mines Selection Co. This was also done by Mr. Cameron, formerly consulting engineer of the Goerz group, but it has not been continued by his successors. The exact amount of gold to be recovered from reserves of a certain value varies according to circumstances, especially native labor supply and sorting policy, but could easily be given within limits of a few shillings. If the consulting engineer does not indicate the recovery, this essential figure might well be given by the chairman at the annual meeting. In many cases the recovery will conform to that of the previous year if there has been no marked change in the assessment, but even this may be affected by the incidence of development and the proportion of rock from that source entering into the rock actually sent to the crushers and battery.

TABLE SHOWING ORE RESERVES AT RAND MINES
VALUE OVER ESTIMATED STOPING WIDTH.

		As at December, 1915 *				As at December, 1916 *		
Producing Companies		Tons	Dwt.	In.		Tons	Dwt.	Iu.
Aurora West.........		550,044	5 5	42 5		502,320	5.6	41.7
	partial	88,500	5 7	42.5	partial	68,500	5.2	42
Bantjes Con.........	(b)	648,000	6.1	41	(b)	412,000	5.6	42
Brakpan.............		3,017,000	7.86	62		3,054,000	9.2	62
City Deep...........	(b)	2,976,800	9 5	57	(b)	3,676,087	9 0	60
City & Suburban.....		637,400	9.0	..		602,200	8.8	51
Con. Langlaagte......	(c)	2,248,656	6 5	49 24	(c)	2,174,536	6.2	49
Cons. Main Reef.....		855,600	7.53	48.5		856,740	7.51	48 2
Crown Mines.........	(b)	9,938,000	6.25	63 8	(b)	11,429,000	5.9	66
Durban Rood. Deep..	(b)	1,290,000	6.5	47	(b)	1,259,300	6.3	48
East Rand Prop......		4,800,000	6.3	55		4,200,000	6.1	56
Ferreira Deep........		1,854,100	8.3	70		1,632,609	8.3	..
Geduld Proprietary...		2,100,000	7.7	59.5		2,150,000	7.4	60
Geldenhuis Deep.....		1,826,800	6.1	57	(b)	1,616,000	5.9	55
Ginsberg	(c)	278,118	5.67	68	(c)	270,504	5.6	51
Glencairn...........	(c)	117,430	4 4	56	(c)	76,560	4 6	90
Govt. Areas (Modder)	(c)	3,665,000	6 9	68	(c)	4,930,000	7.2	75
Jupiter..............	(g)	1,217,000	4.6	..		829,500	5.0	..
	partial	161,000	4.25	..	partial	157,800	5.5	..
Knights Central......		406,400	5.8	62.4		296,800	5.35	63
Knights Deep........		2,627,000	4 25	..		2,614,000	4 4	..
	partial	174,000	3.9	..	partial	71,000	4 1	..
Langlaagte Estate....		1,161,119	6.08	50		1,315,813	5.58	·54
Luipaardsvlei Estate..		702,123	5.3	..		826,138	5.67	..
Main Reef West......		416,280	5.87	51		386,960	5.73	50
Meyer & Charlton....		485,246	12.56	53		512,787	14 5	51
	partial	46,566	19.87	47	partial	161,410	17.1	47
Modder B............		2,790,740	8.75	56		3,371,950	9.2	59
Modder Deep........		2,670,000	8.3	73		3,320,000	8.4	78
New Goch...........		668,000	5.51	82		404,185	6.32	77
		....	..	..	partial	48,100	4.76	..
New Heriot..........		536,680	8 2	..		477,767	7 6	..
New Kleinfontein.....	(c)	2,866,941	5.54	59.2	(c)	2,943,994	5.4	61
New Modderfontein...		6,010,800	8 15	62	(b)	8,013,370	8.4	61.5
	(h)	1,656,000	6.6	..		....	..	..
New Primrose........	(c)	265,623	5.5	56	(c)	205,311	5.2	54
New Unified.........	(c)	399,140	5.7	44	(c)	377,264	5 9	46
Nourse Mines	(b)	2,952,400	5.7	..	(b)	2,169,300	6 2	56
Princess Estate..... ..		488,000	6 7	29.7		476,000	7.1	27
Randfontein Central..	(i)	4,449,324	7.4	..	(i)	4,944,302	7.8	..
	(j)	3,285,153	4.2	..	(j)	3,486,917	4.6	..
Robinson, MRL&SR..		565,100	..	..		490,000	..	..
do. Main R.......		418,200	..	..		500,000	..	..
Rose Deep...........	(b)	3,605,390	5.2	62	(b)	3,267,280	5.3	62
Robinson Deep.......		1,513,000	6.0	..		1,814,000	6.16	..
	partial	365,000	6.1	..	partial	178,000	6.7	..
Roodepoort United....		720,309	5.9	44		677,273	6.03	46
	partial	148,414	5.17	48	partial	110,776	6.87	45
Simmer & Jack.......		2,155,000	5.2	..		1,935,000	5.2	..
	partial	273,000	4.3	..	plus reclamation		..	..
Simmer Deep........		1,585,000	4 4	..		1,246,000	4.56	..
	partial	238,000	4.4	..	partial	173,000	4.55	..
Springs Mines........		1,125,000	10.4	57		1,784,000	9.86	56
Van Ryn		1,953,000	6.2	54		1,950,191	6.69	53
Van Ryn Deep.......	(c)	2,044,108	8.4	62	(c)	2,168,851	8.7	68
Village Deep	(b)	2,631,606	6.6	60	(b)	2,378,100†	6.8	60
West Rand Cons		1,838,380	6.1	52		1,600,000	6.1	50
	partial	255,793	6.4	..	partial	404,000	8.3	..
Witwatersrand.......	(c)	1,480,423	6.83	60.4	(c)	1,462,100	6.4	67
Witwatersrand Deep..		1,673,300	6.02	54.5		1,571,300	5.79	59
Wolhuter		1,263,320	5.8	53.2		1,302,160	6.0	53.6
Non-Crushing Company								
Cinderella Cons......	(k)	1,024,800	7	..	(k)	1,024,800	7	..
	suspense	436,000	..	..	suspense	436,000	..	..

* Or latest date in respective years, Cons. Main Reef, Main Reef West, New Modder, Nourse, Simmer and Jack, Knights Deep and Van Ryn Estate, June 30. † Plus 649,000 tons developed but not valued, Springfield area about half expected to be payable. (b) Includes shaft and boundary pillars. (c) Mining tons. (g) Of the total, 303,000 tons at the Catlin shaft not economically available. (h) At circular shaft. (i) Payable. (j) Unpayable at present costs. (k) Mr. Denny's report.

Recent Changes in the Bureau of Mines

WASHINGTON CORRESPONDENCE

With the increasing number of mining experiment stations Director Manning, of the Bureau of Mines, has found it necessary to appoint a superintendent of stations, with headquarters in Washington. Dorsey A. Lyon, who has been in charge of the station at Seattle, has been appointed to the newly created post. Thomas Varley will succeed Mr. Lyon at the Seattle station.

Mr. Lyon has been with the Bureau of Mines since July, 1912. During this time ample opportunity has been afforded to judge of his ability. Since 1914, until the establishment of the Seattle station early this year, he was in charge of the Salt Lake City station. The successful way in which he directed the work there and outlined the work at Seattle caused Mr. Manning and his division chiefs to agree unanimously on his appointment to the important post of superintendent of all stations. Mr. Lyon is a native of Illinois. His technical education was secured at Stanford University, where he was graduated in 1898. He took postgraduate work at Harvard. To study the application of the electric furnace to metallurgical processes, he went abroad to observe the best practices there.

Mr. Varley joined the staff of the Bureau of Mines in March of this year with the title of ore-dressing engineer. He has been stationed at Moscow, Idaho, where he was making a study of ore-dressing in that state. Before joining the Bureau of Mines force, he had been in charge of the ore testing work of the Federal Mining Co. for many years.

Clarence A. Wright, a metallurgical engineer who has been attached to the Salt Lake City station, has been transferred to Moscow, Idaho.

Within the next few days Director Manning expects to be in a position to announce the location of two of the three experiment stations authorized this year. The new stations will specialize in ferro-metallurgy, petroleum research and ceramography respectively. The location of the iron and the ceramic stations will be announced first. The location of the oil station will not be announced before Aug. 15. These stations, together with those already authorized and the coöperative stations, require the entire time of an administrative officer to prevent duplications of work and to direct the experimentation along the most important lines.

Mining Royalties in New Brunswick

The statutes of New Brunswick, says *Commerce Reports*, provide for the payment by operators to the provincial treasury of certain fixed royalties on minerals mined. These royalties are as follows: Coal, 15c. per ton of 2240 lb. (was 10c. until increased by act of legislature in June, 1917); copper, 4c. per unit in 2352 lb.; lead, 2c. per unit in 2240 lb.; iron, 5c. per 2240 lb.; tin and precious stones, 5% of value; tungsten or wolframite, 2½% of the market value of the concentrates.

Tests of Baraboo Quartzite Pebbles

By W. O. Hotchkiss
State Geologist of Wisconsin

Late in 1914 I was impressed with the possibility that the war might result in cutting off the supplies of imported flint pebbles for grinding purposes. It seemed possible that some of the abundant quartzite pebbles in Wisconsin might be of use as a source of supply for grinding pebbles. The tests described in this article were undertaken to see how they compared with the imported flints.

Quartzite pebbles are very abundant in the Baraboo Hills, about 30 miles northwest of Madison, Wis. These quartzite hills project high above the surrounding country and are flanked by Cambrian sandstones, which in numerous places contain considerable masses of conglomerate of well-rounded quartzite pebbles. Some of these pebble deposits are extensive, and the quartzite pebbles composing them make up a large part of the rock.

A considerable number of these pebbles were collected for testing. Samples of imported pebbles were secured through the kindness of the Universal Portland Cement Co., of Chicago, and the John W. Higman Co., of New York City, importers of flint pebbles.

The tests were conducted in a Deval abrasion machine, such as is ordinarily used for the testing of road materials. For the information of those not acquainted with the Deval machine it may be stated that it consists of standard-sized cylinders with removable covers, each 27 cm. in diameter and 34 cm. in length. They are mounted at an angle of 30° on a shaft, so that rotation throws the pebbles from end to end of the cylinder. The standard test for road material is 10,000 revolutions at the rate of about 30 per minute, so that the full 10,000 revolutions takes about five hours. The machine used contained four cylinders.

All the pebbles were carefully scrubbed and dried. Then they were selected so as to give two sets of each kind as nearly comparable in weight and size of pebbles as was practicable. Sample Q1 included 9 even-sized quartzite pebbles, very similar in every way to sample U1, which contained 9 flint pebbles.

Sample U2 was selected to include flint pebbles showing slightly projecting (and therefore harder) white or gray spots. Sample U3 contained the same number of flint pebbles of the same size and was selected to show how the ordinary unspotted dark-colored flint pebbles would compare with those containing the spots.

Sample Q2 contained 17 even-sized, well-rounded, sound quartzite pebbles to compare with sample H1, which included 17 sound, well-rounded, even-sized flint pebbles.

Sample Q3 contained 15 miscellaneous-sized quartzite pebbles, which were the rejects from the selection of sample Q2. Many of these were badly cracked and unsound. They were selected expressly for the purpose of seeing what the behavior of the poorest pebbles would be. To compare with these, sample H2 was selected, which contained 15 miscellaneous-sized flint pebbles. The flint pebbles were sound and of uniform shape.

In the first run of the test samples Q1, Q2, H1 and U1 were put in the four cylinders of the machine. These samples are starred in the table. They were given a first run of exactly 10,000 revolutions, which took 5 hours and 10 minutes. The pebbles were taken out of the cylinders and carefully brushed off so that the fine material was left in the cylinders, weighed, and the loss in weight noted. They were then put back in the machine for a second run, which continued for 10,650 revolutions and took 5 hours and 10 minutes.

The second lot tested included the remaining four samples, and they were given the same treatment. The first run was exactly 10,000 revolutions in 5 hours and 15 minutes. The second run was also exactly 10,000 revolutions, and also took 5 hours and 15 minutes.

The losses in weight in the first run, in the second run, and the total are shown in the table. It is interesting to note that in the two cases where selected quartzite pebbles were compared with selected flint pebbles, the quartzite came out much better. For the large-sized samples, Q1 and U1, the flint pebbles lost over three times as much as the quartzite pebbles. For the small-sized pebbles, Q2 and H1, the quartzite lost only a little over three-quarter as much as the flint pebbles, and the loss in both flint and quartzite was very much less than in the larger sizes.

TABLE OF TESTS ON GRINDING PEBBLES

H = Pebbles from Higman & Co.
U = Pebbles from Universal Portland Cement Co.
Q = Quartzite pebbles.

Sample	No. of Pebbles	Weights in Grams				Losses in Grams			
		Total	Largest Pebble	Smallest Pebble	Average Pebble	First Run	Second Run	Total	Total Loss in %
Q1*	9 even-sized	4,570	726	326	508	16	7	23	0.504
U1*	9 even-sized	4,634	687	428	515	39	33	72	1.55
U2	7 even-sized white-spotted	4,518	792	459	645	6	27	33	0.731
U3	7 even-sized, nicked and black	4,553	801	437	650	30	46	76	1.67
Q2*	17 even-sized	4,554	388	208	268	5	4	9	0.197
H1*	17 even-sized.	4,534	390	159	266	4	7	11	0.243
Q3	15 (miscellaneous sizes rejects)	4,525	443	162	302	22	25	47	1.04
H2	15 miscellaneous sizes	4,530	569	94	302	4	15	19	0.419

Another interesting feature shows up in the table, and that is the comparison between samples U2 and U3. The best selected flint pebbles with white spots lost less than half as much as the ordinary unspotted black flints of the same size.

The only case in which the quartzite lost more than the flints in this test was in the comparison between Q3 and H2, both lots containing 15 pebbles, the quartzite being rejected, odd-shaped and unsound pebbles, while the flints were pebbles in excellent condition.

A further generalization appears from the tests, and that is that the larger pebbles tend to lose more than the smaller.

The sound quartzite pebbles in samples Q1 and Q2 lost less in the second run than in the first. The flint samples all lost notably more in the second run than in the first, except sample U1. The unsound quartzite pebbles in sample Q3 lost slightly more in the second run than in the first. This was probably due to the fact that several of them split into angular fragments during the first run and so had sharp corners to work on all through the second run.

The cause of the superiority of the quartzite in these tests was evident from an inspection of the pebbles. The flints developed "half-moons" of concussion on striking one another, and these fractures were readily chipped out by succeeding concussions. As a consequence the flint pebbles showed a finely hackled surface after the test. The white projecting spots in U2 did not show these in so marked a degree as the uniform-textured black parts and the unspotted flints in U3.

The crystalline texture of the quartzite in the thoroughly cemented rock used for the tests seemed to prevent the development of "half-moons," and so these pebbles came through the test with a surface practically as smooth as they had when they were put in the machine.

Germany's Brass and Copper

The extent to which Germany is increasing its supply of brass, copper and other metals, says *Iron Age*, is illustrated by the testimony of a wounded British soldier on furlough at home. Referring to the large amount of old metal waiting to be gathered up after the war, he said it would be chiefly steel, for the Germans appear to be collecting the brass in thorough fashion for remelting. In several captured German trenches and dugouts he had seen little canvas bags partly filled with broken fuses, nose-caps and other brass scrap, indicating that this method of collecting is being systematically carried out by the enemy.

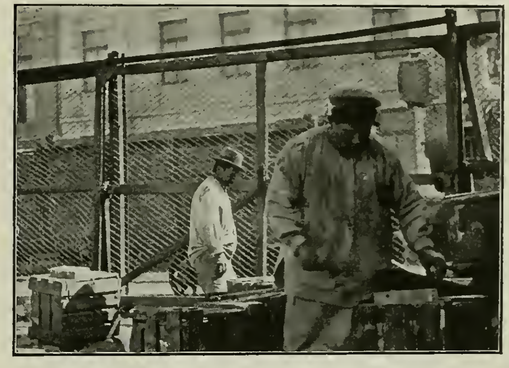
Shipping Silica Brickbats to South America

By Mark R. Lamb

One of the accompanying photographs shows a heap of beautiful silica brick in the condition in which they arrived at a South American port, and the other shows the repacking and boxing necessary before shipment to the interior. There are several lessons to be learned from these photographs. First, so many bricks should not be packed together. Secondly, bricks should not be crated. The third point is that cardboard and not straw should be used to separate the layers of brick in the layers. Finally, each broken brick quadruples the price of one unbroken brick, on account of freight and incidental expenses. In this particular instance the bricks were shipped from the United States, as no thoroughly good silica brick could be obtained locally for reverberatory-furnace work, and the purchasers were wise enough to specify "the best."

THIS VIEW SHOWS THE CONDITION IN WHICH THE BRICKS FINISHED THE OCEAN PASSAGE

Moreover, the manufacturer of this particular brick is not accustomed to making shipments abroad and perhaps had no definite instructions as to the number of bricks in a package, method of packing and character of container. Probably the insurance company will stand for the loss entailed by this poor packing, but only momentarily, as all such losses are ultimately passed on again to the purchaser, so that it is really the purchaser's fault that he did not specify containers sufficiently strong for the job.



REPACKING AND CRATING WERE NECESSITATED BEFORE RESHIPMENT TO THE INTERIOR

The title of this note is perhaps misleading, as probably no brickbats were shipped from the brickyard, but undoubtedly the transformation from bricks to brickbats began shortly after shipment. I should very much like to tell who made these bricks and where they were shipped from, but as I may some time be looking for a position in Butte, it might be held against me, so that I shall say nothing.

Mineral Production of British Guiana

Gold production of Britsh Guiana, as reported by the Lands and Mines Department, for 1916, amounted to 37,129 oz., a considerable decrease from the previous year. As the financial year was altered during 1915 to coincide with the calendar year, the report for 1915 covered only nine months and comparison is not feasible. Of the total, 24,057 oz. came from placer washings, 11,967 oz. from dredging and the remainder from quartz mines.

Dredging was carried on by the Guiana Dredging Co. and the Minnehaha Development Co., with satisfactory results.

The output of diamonds during the same year was 93,782 stones, weighing 16,408 carats. There was a revival in diamond working owing to improvement in the price obtainable and the size of the stones found.

Interest was aroused owing to the discovery of large deposits of bauxite in the Demarara River district, but with the exception of certain leases to the Demerara Bauxite Co., no titles of any description have been issued or are likely to be issued until after the war.

Enlarging the Chief Consolidated Shaft

By J. H. HEDGES
Shaft Superintendent for Walter J. Fitch, Inc., Eureka, Utah

A single compartment and man or pipeway shaft is enlarged from the 1200-ft. level to the surface, making a double compartment and pipe and manway shaft, without interfering with the hoisting operations as usually carried on. Methods of protecting the compartment in continuous use while enlargement was taking place are described.

AN INTERESTING piece of work has just been completed in the shaft of the Chief Consolidated Mining Co., of Eureka, Utah.

From the surface to the 1200-ft. level, this shaft consisted of a hoisting compartment 4 ft. 2 in. square and a pipe and counterbalance compartment 4 ft. 2 in. x 2 ft. From the 1200-ft. level to the bottom, a few feet below the 1800-ft. level, it had previously been widened to three full compartments and retimbered.

The single compartment having proved inadequate to handle the constantly increasing tonnage of ore, it was decided to complete the widening of the shaft from the 1200-ft. level to the surface, provided this could be accomplished without seriously interfering with the regular operation of the mine.

The work was undertaken and brought to a successful conclusion by the contracting firm of Walter Fitch, Jr. Inc.

PRELIMINARY WORK AND CONDITIONS ENCOUNTERED

For a distance of 360 ft. from the surface, the rock penetrated by the shaft is a decomposed rhyolite, locally known as "rotten porphyry." The balance of the shaft is in a hard compact limestone.

Five points of attack were selected. Since the porphyry is so soft as to render raising extremely difficult and hazardous, it was necessary to sink through this formation, and it was decided to raise from the 600, 800, 1000 and 1200 levels.

Considerable preliminary station work was necessary at the various levels before the actual work of raising in the shaft could be begun. Raising was first started from the 600 level on Dec. 29, and work from the 1000, which was the last completed, was finished on June 1, a total elapsed time of 155 days. The total distance from the surface to the 1200 level is 1168 ft. The average daily advance over the total elapsed time was therefore 7.54 feet.

The table gives for each section the date of starting and finishing, the total number of working days, the total distance, and the advance per working day of three 8-hour shifts.

In studying over this table it should be borne in mind that the prime requisite was uninterrupted operation of the hoisting compartment and speed was a secondary consideration entirely subordinate to safety. Furthermore, no blasting was permitted except during the interval between the hoisting of the night shift and the lowering of the day shift—a period of about four hours. Because of this limitation, any interruption in the cycle of operations which prevented the completion of the round in time to blast during the prescribed period resulted in a delay of 24 hours. Viewed in the light of these facts, the average footage attained is much more creditable than would appear at first glance.

TIME LOST AND METHODS EMPLOYED

During the entire period of 155 days consumed in the prosecution of this work, regular mining operations were suspended only 16 shifts, or 5.2%, on account of damage to the old shaft timber or the air line, by the blasting.

Fig. 1 shows the manner in which the work was performed and the old hoisting compartment protected. The old wall plate was cut in the counterbalance compartment and the new one spliced to it as shown at *a*. The length of this butt splice varied somewhat, but was usually from 6 to 8 inches.

A filler post was used with a twofold object. It served to protect the air pipe *c* and to bring the lagging out flush with the projecting end of the wall plate, thus presenting a smooth surface for the shooting sheet *j* to rest against.

The old wall plates were cut three sets ahead of the new timber so that the 18-ft. shooting sheet could be hoisted to a position such that its center was about opposite the center of the shooting.

The sheet was hung on a chain block *d* which was suspended from a timber laid across the wall plates in the counterbalance compartment. The chain block was used only for raising and lowering the sheet and was not depended upon to hold it during the blasting, at which time it rested on a bulkhead *e* of 8 x 8 timbers and was securely blocked in place. An 8-in. bulkhead *f* was laid on the last of the new sets, an opening two feet wide being left over the end compartment. The end compartment of the next set below was bulkheaded over and lagged up along the center post to within about 15 in. of the top. The only opening in this lower bulkhead was the 14-in. sheet-iron chute pipe *g*, which was carried up in one corner. The chute pipe was built in 8-ft. sections, 14 in. in diameter at the upper end and 12 in. at the lower end, so that the lower end of each section fitted into the upper end of the section below. The end compartment was lined for six sets above each station, forming a chute of sufficient capacity to hold all the broken rock from one round. A small air hoist *h* of the portable type was used to handle timber, tools, etc.

TABLE SHOWING TIME REQUIRED AND DISTANCES ADVANCED

Level	Started	Finished	Working Days	Total Distance, Ft	Ft per Working Day
Surface	Feb 6	May 15	79⅓	359	4 52
600	Dec 29	Apr 2	85⅔	226	2 63
800	Mar 1	May 26	77⅔	193	2 48
1000	Feb 22	June 1	92	197	2 14
1200	Jan 28	Apr 30	82⅓	193	2 34
				1168	

In order to minimize the danger of damaging the timber of the old shaft, a very light powder charge was used in blasting, and this necessitated a large number of holes to insure the breaking of the ground. A round consisted of from 25 to 30 six-foot holes and from 12 to 15 three-foot holes, and these were loaded with from one to two sticks each of one-inch 35% gelatin.

With so small a powder charge it was imperative that the holes be fired in the proper order. Had the time allowed for blasting permitted, it would have been highly desirable to blast only a portion of the round at a time, but as this was impossible, the timing of the holes was accomplished by using 10-ft. fuses and trimming them, about three feet being cut from the first one, two inches less from the second, and so on. It was the practice for one man to spit all the fuses to insure correct timing, and it sometimes happened that a new man on the work would get excited and lose his nerve before the job was finished. However, the men soon became accustomed to the work and the fact that 44 fuses were spitting fire and smoke behind them did not deter them from finding and lighting the 45th, so very little trouble was experienced on that score after the first few days.

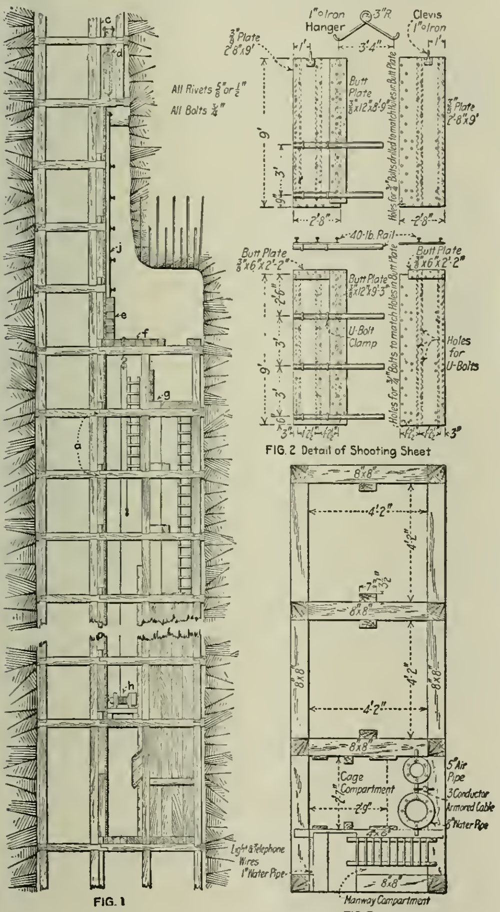


FIG. 1

FIG. 2 Detail of Shooting Sheet

FIG. 3

SECTION OF SHAFT, SHOWING METHOD OF TIMBERING, ETC.

Perhaps the most important link in the chain of devices employed was the "shooting sheet." As first used, this was simply a sheet of 3/8-in. iron, 5 ft. wide by 16 ft. long, which was suspended in front of the lagging against the timber of the old shaft. Its function was to distribute the force of the blow over a large surface and thus prevent the breaking of the lagging and consequent damage to the air pipe and the old shaft timber. Its shortcomings were soon apparent for the first blast put a dent in it which reduced the surface of contact with the lagging from a large area to a point, so that its action was reversed and it served to concentrate rather than distribute the force of the blow. After straightening the sheet, it was then reinforced by standing three timbers, 8 x 8 in. x 16 ft. in front of it and blocking them securely in place. As a later development the timbers were clamped to the sheet for a greater rigidity and greater convenience in handling.

In this form the sheet was still unsatisfacory as the timbers would stand up only three or four rounds, failing by breaking in the center and allowing the sheet to buckle. It would then be necessary to remove the old timbers, reverse the sheet so that the next blast would straighten it and clamp on the new timbers. When the sheet was badly buckled, the clamping on of the new timbers was in itself quite a feat. These frequent changes caused so serious a loss of time that the reinforced sheet shown in Fig. 2 was designed and given a trial and proved to be the solution of the shooting sheet problem.

The only trouble experienced with this type of sheet was when, in a spirit of overconfidence in its excessive strength and rigidity, the powder charge was increased. The heavy rails proved unbending, as anticipated, but several of them broke off short and nearly put both the sheet and the shaft out of commission. After this severe lesson the powder charge was again reduced and no further trouble was experienced on that score.

Arrangement of the Completed Shaft

In the completed shaft the west and center compartments are the hoisting compartments, in which two tripple-deck cages run in balance. The space in the east compartment is utilized in a rather unusual manner, as will be seen by reference to Fig. 3, which is self-explanatory.

The small cage which runs in the east compartment is a three-decker, 24 ft. high, with a removable middle deck which permits of the handling of 16-ft. timber on the bottom deck. The deck area is 2 ft. x 2 ft. 6 in. This cage is used for handling timber, steel, powder, etc., and takes care of all movements of bosses and men from level to level during the shift, thus relieving the main cages of all the petty interruptions to the principal business of hoisting ore.

THE STRENGTH OF TIMBER has been determined through tests carried on by the Mining Department of McGill University and the Forestry Branch at Ottawa. They have shown that the timbers used in the mines of Nova Scotia—yellow birch, white birch, black spruce, red spruce, jack pine, balsam and fir—rank in the order named as to strength.

Abatement of the Dust Menace

WASHINGTON CORRESPONDENCE

The Bureau of Mines and the Public Health Service believe that the siliceous-dust menace in the sheet-ground mines at Joplin, can be reduced substantially by comparatively simple precautions. After extensive and painstaking investigations it is agreed that the requirements and precautions necessary to accomplish this end are as follows:

Improve ventilation, where practicable, by installing fans or by properly locating new shafts. This is an important consideration.

In mines wet enough to produce only thoroughly damp dirt, prohibit squibbing and blasting while the shift is underground. In all other mines the following precautions should be observed:

a. At each working face provide a water-supply of sufficient head to throw a stream at least 20 ft. through a nozzle ¼ in. in diameter. The best arrangement is a main pipe line from the surface or the water column, the water being carried from the main line to the face by 1-in. wire-wrapped rubber hose.

b. The water so provided may be used with any type of water-injection drill. Provision can be made also for spraying the face and broken rock by inserting a tee connection at the machine and attaching a hose and nozzle. The dirt pile should be frequently wetted in order to prevent dust being raised by shovelers.

c. Where drills using solid steel are employed, a pipe long enough to reach the back of the drill hole and having a nozzle formed at one end should be coupled to the rubber hose. The spray thus provided should be used often enough during drilling to keep the drill hole damp; it should also be used for spraying the working place and broken rock at sufficiently short intervals to keep them damp. The dirt pile must be kept damp.

d. Prohibit the blowing of dry holes. When necessary, wash the drill cuttings from the drill holes by means of the spray.

e. Prohibit blasting and squibbing while the shift is underground, or just before the time that the shift goes to work.

f. Where more than one shift is worked, allow at least two hours (preferably more) between blasting at the end of a shift and the beginning of work by another shift.

g. Prohibit the popping of boulders while the shift is underground.

The campaign for the abatement of siliceous dust and the improvement of sanitary conditions in and about the mines was markedly successful. This outcome resulted from the educational work conducted, the coöperation of the miners, operators and those carrying on the campaign, and the passage of state laws regulating the conduct of mining. Similar laws in other mining districts have proved ineffective. In the Joplin district the laws were effective because of the educational work, and because of both operator and miner being penalized in case of noncompliance.

Sulphuric-Acid Statistics

WASHINGTON CORRESPONDENCE

Regarding the sulphuric-acid situation the Bureau of Mines has compiled some interesting statistics. Of the 6,250,000 tons of 50% acid used last year, 2,500,000 tons, or 40%, came from Spanish pyrites; 350,000 tons, or 5.6%, came from Canadian pyrites; 800,000 tons, or 12.8%, came from domestic pyrites; 1,400,000 tons, or 22.3%, came from smelter acid, and 1,200,000 tons, or 19.2%, came from sulphur.

In the effort to make the United States independent of foreign countries as a source of iron pyrites, the Bureau relies greatly upon Georgia. This fact is revealed in a report that has just been made by one of the Bureau's specialists. He believes that the output of Georgia can be increased to 100,000 tons before the first of the year. The Bureau is particularly anxious to stimulate the industry in the South, as this section of the country is a large consumer of fertilizers. By developing pyrite near the Southern acid factories, an important economy in freight cars will result.

Foreign Trade in Lead and Zinc

Imports of lead and zinc during April and May, 1917, are reported by the Department of Commerce as follows:

Articles and Countries	April Contents, Lb.	May Contents, Lb.
Lead Ore:		
Canada	1,029,317	14,080
Salvador		742
Mexico	1,370,087	973,059
Chile	1,142,854	
Peru	86,393	53,794
Italy		46,719
England		81,039
Nicaragua		110
	3,628,651	1,169,543
Lead—Base Bullion and Bullion:		
Dutch East Indies		102,874
Peru		16,805
Canada		582,083
Mexico	6,953,531	9,026,847
	6,953,531	9,728,609
Lead—Pigs, Bars, etc.		
Panama	9,989	4,404
Barbados	567	
Colombia		261
Haiti		
Canada	1,500	131,667
Guatemala	52,400	
England		80,188
Costa Rica		100
Mexico		1,360,761
Peru		10,012
	66,338	1,587,393

The gross weight of lead ore imported was 8139 long tons.

The actual tonnage of zinc ore imported in May amounted to 90,299 tons. The countries of origin and the metal contents were as follows:

Countries:	April Contents, Lb.	May Contents, Lb.
Canada	145,000	606,000
Australia		4,714,236
Mexico	10,487,907	8,918,837
Spain		9,003,280
	10,632,907	23,242 353
Zinc in Blocks, Pigs, etc :		
Costa Rica	250	343
Panama	2,291	2,880
Cuba	16,488	43,979
Mexico		10
Ecuador	7,580	
Canada		15,617
	26,609	62,829

Imports of zinc dust amounted to 134,898 lb. in April, 1917, and to 24,640 lb. in May.

Exports of lead and zinc were as follows (in pounds):

	April	May
Lead		
Pigs, bars, etc , produced from domestic ore	6,907,870	8,391,119
Pigs, bars, etc , produced from foreign ore	4,764,621	2,417,599
Zinc:		
Pigs, etc , produced from domestic ore	22,442,081	14,880,350
Pigs, etc , produced from foreign ore	6,495,601	19,891,529
Sheets, etc	2,907,345	4,175,936

Central Buying and the Embargo

The open world's market has been narrowed by an export embargo, says the *Iron Trade Review*. The National Government has been transformed from a virtually disinterested to the dominant factor, both in the acquirement of tonnage and in the control of prices. The heavy purchasing volume of the Allies, which has been chief among the price stimulants of the last three years, is to be coördinated with that of this country, and probably will be subject to similar price consideration.

Phosphate Deposits of Idaho

BY ROBERT N. BELL
State Inspector of Mines for Idaho

The importance of maintaining the phosphorous content of the soil has not been sufficiently realized. American sources of this element are the phosphate deposits of the Southeast and of the new Western field discovered about 10 years ago. The latter will yield an enormous tonnage of rock phosphate, high in phosphoric acid and low in iron and alumina. It can be extracted as cheaply as coal and, finely ground, can be supplied to the farmer at a reasonable cost.

IN VIEW of the present nation-wide agitation for increased agricultural yields, the subject of phosphorus, one of the most vital element of soil fertility, may be of timely interest to *Journal* readers. It is fitting that attention should be brought at this time to the extensive deposits of phosphate rock in southeastern Idaho and adjoining areas in Utah, Wyoming and Montana. The Yellowstone National Park occupies nearly the geographic center of this phosphate area.

TONNAGE ESTIMATEED IS HUGE

Since the presence of this great mineral field was disclosed to the nation, the United States Geological Survey has taken much interest in it. Following the blanket withdrawal by the Government under its conservation policy of several million acres of these lands as phosphate reserves, a million acres so withdrawn in southeastern Idaho have been extensively mapped.

Less than one-third of this area, aggregating about 16 townships in Bear Lake and Bannock Counties in Idaho, has so far been surveyed in detail. This limited part of the field is described in several well-illustrated bulletins of the Survey, one of the most recent of which, "U. S. Geological Survey Bulletin No. 577," gives an estimated resource of high-grade phosphate rock in this limited part of the field aggregating 2,633,000,000 long tons.

This estimate is based on an assumed minable depth of 2000 ft. from the outcrop of a single bed of phosphate rock at the base of the series. That this assumption is decidedly modest is evidenced by the fact that in the much younger and softer coal-bearing formations at Rock Springs, Wyo., immediately adjoining the phosphate field to the east, successful mining operations have been carried on for years, for the extraction of bituminous coal, to a depth on the dip ranging down to 6000 feet.

In our metal-mining operations of northern Idaho, one of the leading enterprises, the Bunker Hill & Sullivan mine, is successfully removing bodies of lead ore up to 100 ft. thick in heavy crushed ground, by square-set and solid-waste-fill methods, at an operating cost of $1.35 per ton from a depth of 4300 ft. on the vein, which dips at an angle of 40°. It is quite safe to say that the Government estimates of recoverable phosphate mineral in this instance from a practical mining standpoint is very conservative.

The phosphate formations of a total thickness of 120 to 200 ft. also include 10 other superimposed beds of workable size that range in individual thickness from 1 to 12 ft. respectively.

These facts, and the ideal conditions for deep-mining operations present, together with the persistency of the phosphate minerals emphasize the moderation of these estimates.

The bed of phosphate rock, on which the estimate of tonnage is based, is from five to seven feet thick, with a smooth shell-limestone roof and a hard-limestone floor. It is recognized throughout the region as the lowest, and is so far the best developed, of the larger veins in the series. The mineral is brown and shaly at the outcrop, but at the comparatively shallow depth of from 20 to 30 ft. below the surface it assumes a very dark brown or black color. It has a uniform oölitic texture and is slightly heavier than the inclosing formations.

ANALYSIS OF THE PHOSPHATE ROCK

Hundreds of samples taken from this bottom bed of mineral show a uniform average content of 70% tricalcium phosphate with a remarkable and persistent freedom, wherever tested, from the objectionable elements of iron and alumina.

Excessive iron and alumina in phosphate rock cause the finished fertilizer manufactured from it to absorb moisture. It becomes sticky or lumpy and difficult to distribute easily on the land. According to the trade usage in the fertilizer industry of the Southeastern fields the freedom of this rock from iron and alumina, together with its high phosphoric-acid content would enhance its value to the equivalent of about 75% tricalcium phosphate.

It is true that most of the samples taken by the Government geologists were necessarily from shallow surface-pit development and natural outcrops and that a number of results, exceeding 80% tricalcium phosphate, from this and smaller veins, are included. As practical proof of the accuracy of these numerous field tests the Waterloo phosphate mine at Montpelier, Idaho, owned by the San Francisco Chemical Co., has produced and shipped 100,000 tons of this mineral from this particular vein mined from a depth ranging down to 500 ft. at a dip of 30°. This tonnage has contained on an average 70% tricalcium phosphate, when analyzed at the company's chemical plant, on San Francisco Bay, where it was treated for the manufacture of superphosphate.

Samples taken from the 10 other beds of the series showed, upon analysis, a phosphate content ranging from 40 to 82% tricalcium phosphate. The average for all the second-grade beds is 54%. This vast additional asset of second-grade but serviceable phosphate rock is, as far as tested, equally free from the objectionable minerals that reduce the value of the Southeastern deposits for manufacturing purposes.

The phosphate rock is relatively soft, comparable to coal and is mined as cheaply as coal, with the same tools and methods without the serious loss in pillar supports. So far no poisonous effects from handling have developed, nor any of the gaseous disadvantages and dangers attendant on coal-mining operations. Furthermore, the phosphate can be mined clean and does not require sub-equent mechanical concentration or washing for the eparation of waste.

The Waterloo mine, in producing 100,000 tons, had practically no waste-dump residue and probably less han 10% of hand-discarded gob material from stop-ng operations. The phosphate comes to the surface s a clean product at a minimum cost ready for sub-equent fine grinding and direct application to the soil r for chemical or other treatment to make its con-ained phosphoric acid more quickly available for plant growth.

Fertilizer Industry in the South

The present mineral-fertilizer industry of the United States is based largely on the ownership of rock-phos-hate deposits in Florida and Tennessee. The capital nvested in it, according to good authority, reaches a otal of $300,000,000, and the business was largely wned and controlled, prior to 1914, by Europeans. This great Southeastern industry produces a so-called omplete fertilizer with a general formula of 2-8-2, which means 2% nitrogen, 8% phosphoric acid and % potassium. The balance of the substance of this roduct is principally a common soil carrier, with which hese available mineral plant foods are mixed to give hem body and facilitate even distribution for soil fer-ilizer and enrichment purposes.

The phosphoric-acid content is in the form of soluble uperphosphate. This is made by grinding the raw hosphate rock very fine and treating it with an equiva-ent proportion of sulphuric acid. The excessive war emand for sulphuric acid for other industrial purposes as thrown this business out of balance. This has reatly enhanced the cost of this form of phosphate ertilizer, which always was too high, exceeding that f the raw rock several hundred per cent. for the same ltimate results.

This industry produces an amount of complete fer-ilizer valued at $120,000,000 a year. Its market so ar is largely in the Southern and Eastern States. Its roducts have not yet been seriously considered or used n the grain- and meat-producing states of the West nd Middle West, where the serious effects of soil star-ation are already being felt.

The day is fast approaching when the need of phos-hate will be more widely realized in the West and Middle West. Then whether Western phosphate can ompete with that of Florida and Tennessee will be imply a matter of cost of production and transporta-ion.

That the present freight rates are rather against the xtensive use of the raw material from this Western ield by farmers of the Middle West is a stock argument. t is more fancied than real under normal railway-raffic conditions. The low mining costs involved, I be-ieve, would permit the delivery to any point west of the Mississippi and north of St. Louis of finely ground aw phosphate rock at approximately the same rate that t is now delivered and quite extensively used in central llinois from the Tennessee field, which is about $8 per ton. This should still leave a fair profit for the mining, grinding and transportation of the mineral.

It has been proved by the persistent efforts of Dr. Cyril G. Hopkins, of the University of Illinois Agricultural Experiment Station, that very finely ground raw phosphate rock is the cheapest and best method of supplying soil deficiency in phosphorus that is now known.

The finely ground mineral is spread directly on the land at the rate of one ton per acre every four years, in company with stable manures and crop residue, or, better still, with the assistance of green manures provided by plowing under a second or third crop of clover or other legume forage plants, in a four-year rotation method. The phosphoric acid in the finely ground mineral can thus be made available to growing crops and shows decided results after the second year.

Various Methods of Using Raw Phosphate

Recent progress in the matter of making raw rock phosphate assimilable by plants is noteworthy. According to the writers on this subject recognized in a late Government publication, it is believed that the raw phosphate rock mixed with a cheap reagent, sodium sulphate, and with slack coal, and combined and treated in a sintering furnace or equipment similar to that used in portland-cement manufacture, will produce a concentrated product of available phosphoric acid ready for quick and immediate action in soil fertilization, that will have a high value and bear transportation cost anywhere in this country. Both sodium sulphate and slack coal are abundant and cheap in Utah.

Another process also involves the combination of ammonium nitrate producing an ammonium phosphate, which chemical authorities believe may be manufactured at a total cost of about $12 per ton, affording the farmer an ideal combination of mineral fertilizer and readily available plant food at a reasonable cost.

Railroads Tapping Western Field Can Help

By virtue of the double freight-producing potentialities, the several transcontinental railway companies that now tap this big idle traffic resource could well afford to handle the mineral in its raw state on a coal-traffic basis for the sake of the traffic in farm products that would thereby be created. To interest the farmer in the use of this mineral it must be furnished him at a sufficiently low cost to be attractive. The indications are that this can be done by a close unbiased survey of the situation. I believe the Government is warranted in passing legislation facilitating the handling of these withdrawn deposits by private interests, either by direct property transfer or by liberal leasing methods.

Under its present status, with the exception of a very few privately owned groups of claims, this entire Western phosphate field is in the hands of the Federal Government and withdrawn from any form of entry or use. While conservation of this important national asset was warranted when the field was first discovered, its resources are now proven to be of such magnitude as to make its further tight reservation absolutely unnecessary, especially at this time, when every citizen of the country is suffering the penalty of the lack of appreciation and utilization of this asset by our agricultural industry.

American Academy of Engineers

Washington Correspondence

By unanimous consent, the Senate of the United States agreed on Aug. 4 to incorporate the American Academy of Engineers. The incorporators of the academy are as follows:

John W. Alvord, Chicago, consulting civil engineer.

Dr. Edward G. Acheson, Niagara Falls, N. Y., past president American Electrochemical Society.

Thomas E. Brown, New York, consulting engineer Otis Elevator Co.

Dr. Louis Bell, Boston, past president Illuminating Engineering Society.

Dr. L. H. Baekeland, New York, past president American Electrochemical Society; past president American Institute of Chemical Engineers.

Dr. C. F. Chandler, New York, past president American Chemical Society.

John F. Coleman, New Orleans, consulting civil engineer.

Howard E. Coffin, Detroit, vice president and chief engineer Hudson Motor Car Co.; member Naval Consulting Board.

Dr. John J. Carty, New York, chief engineer American Telephone and Telegraph Co.; past president American Institute of Electrical Engineers.

Dr. Mortimer E. Cooley, Ann Arbor, Mich., professor at University of Michigan.

Prof. William F. Durand, Stanford University, Calif., naval architect and marine engineer.

Col. Gustave J. Fiebeger, West Point, professor of engineering at West Point.

Gen. George W. Goethals, New York, consulting engineer.

Dr. W. F. M. Goss, Urbana, Ill., past president American Society of Mechanical Engineers.

Carl E. Grunsky, San Francisco, consulting civil engineer.

Admiral Robert S. Griffin, Washington, D. C., engineer in chief, United States Navy.

Dr. Carl Hering, Philadelphia, past president, American Electrochemical Society; past president American Institute of Electrical Engineers.

Clemens Herschel, New York, past president American Society of Civil Engineers.

Gen. H. F. Hodges, Washington, D. C., brigadier general, United States Army.

Dr. Henry M. Howe, New York, past president American Institute of Mining Engineers; past president American Society for Testing Materials; past president International Association for Testing Materials.

Dr. John Hays Hammond, New York, past president American Institute of Mining Engineers.

Herbert C. Hoover, New York, honorary member American Institute of Mining Engineers; chairman Commission for Relief in Belgium.

Dr. Alexander C. Humphreys, New York, president Stevens Institute of Technology; past president American Society of Mechanical Engineers.

Hennen Jennings, Washington, D. C., consulting mining engineer.

Dr. Julian Kennedy, Pittsburgh, Penn., designer of iron and steel works.

Hunter McDonald, Nashville, Tenn., past president American Society of Civil Engineers.

Dr. C. O. Mailloux, New York, past president American Institute of Electrical Engineers.

Charles T. Main, Boston, consulting mechanical engineer.

Bruno V. Nordberg, Milwaukee, Wis., president and chief engineer Nordberg Manufacturing Co.

Dr. William H. Nichols, New York, president General Chemical Co.; past president American Chemical Society.

Dr. William Barclay Parsons, New York, consulting civil engineer.

Corydon T. Purdy, New York, consulting engineer, expert in steel-building construction.

Dr. M. I. Pupin, New York, member National Academy of Science; professor at Columbia University.

Charles F. Rand, New York, past president American Institute of Mining Engineers.

Dr. Rossiter W. Raymond, New York, founder American Institute of Mining Engineers.

E. W. Rice, jr., Schenectady, president General Electric Co.; president-elect American Institute of Electrical Engineers.

Dr. S. W. Stratton, Washington, D. C., director Bureau of Standards.

Dr. George F. Swain, Cambridge, Mass., consulting civil engineer; professor at Harvard; past president American Society of Civil Engineers.

E. Gybbon Spilsbury, New York, past president American Institute of Mining Engineers.

Dr. Ambrose Swasey, Cleveland, Ohio, past president American Society of Mechanical Engineers.

Frank J. Sprague, New York, past president American Institute of Electrical Engineers.

Prof. A. N. Talbot, Urbana, Ill., past president Society for Promotion of Engineering Education.

Stevenson Taylor, New York, president Society of Naval Architects and Marine Engineers.

Benjamin B. Thayer, New York, past president American Institute of Mining Engineers.

Dr. Elihu Thomson, Lynn, Mass., member National Academy of Science; past president American Institute of Electrical Engineers.

David W. Taylor, Washington, D. C., chief constructor United States Navy.

Prof. F. E. Turneaure, Madison, Wis., professor at University of Wisconsin.

Dr. M. C. Whitaker, New York, consulting chemical engineer.

Dr. J. A. L. Waddell, Kansas City, consulting civil engineer.

Dr. John F. Wallace, New York, past president American Society of Civil Engineers; past president Western Society of Engineers.

Provisions of the Charter

The provisions of the bill include the following:

That the purposes of this corporation are and shall be the furtherance of the interests of engineering, industrial technology, and applied science.

That the American Academy of Engineers shall consist of not more than 200 regular members, and the said corporation hereby constituted shall have power to adopt a constitution, and to make all bylaws, rules and regulations not inconsistent with law that may be necessary or expedient in order to accomplish the purposes of its creation; to fill vacancies created by death, resignation or otherwise; to provide for the election of foreign and domestic members, and the division of such members into classes; to adopt a seal, and to do all other matters needful or usual in such institutions.

That the American Academy of Engineers shall hold an annual meeting at such place in the United States as may be designated, and shall make an annual report to the Congress, to be filed with the Librarian of Congress.

That the American Academy of Engineers shall, whenever called upon by any department or establishment of the Government, investigate, examine, experiment and report upon any subject of engineering science or art, the actual expenses of such investigations, examinations, experiments and reports to be paid from appropriations which may be made for the purpose; but neither the academy as a body nor any of its committees shall receive any compensation whatever for any service to the Government of the United States.

That the American Academy of Engineers be, and the same is hereby, authorized and empowered to receive by devise, bequest, donation or otherwise, either real or personal property, to an amount not exceeding $1,000,000 in the aggregate, and to hold the same absolutely or in trust, and to invest, reinvest, manage, and apply the said property and the income arising therefrom in furtherance of the objects of its creation.

Reasons why the American Academy of Engineers needs a national charter and what it could do for the country, were it properly accredited, are summed up as follows by J. A. L. Waddell:

Without such a charter the academy would not be recognized by people in general as the national association of engineers chosen from every line of technics, nor as the select body of practitioners which it is intended to be, and therefore its capacity for doing good would be most effectually curtailed.

The National Academy of Science exists by reason of a charter from the United States Government, conferred during the period of the Civil War, and as the American Academy of Engineers is to work hand in hand with that organization, it must be on a par with it in every respect.

The great and noted European academies are chartered by the governments of the countries wherein they exist, and it would not be well to have the United States of America drop behind the European countries in respect to such an important matter as academies composed of the most prominent men in the various lines of activity.

If the American Academy of Engineers were given a national charter, all the technical societies of this country would look to it as the leader in matters relating to the general welfare of engineers of all classes and would appeal to it for help in their important difficulties.

If the American Academy of Engineers were to receive a national charter, the United States Government would, as a matter of course, turn to it for expert aid and advice, and such would always be given—often after consultation with some of the other engineering societies from among the prominent members of which the members of the academy have been chosen. In case of such an appeal it would be the bounden duty of the academy, according to the pledge given in the bill asking for a national charter, to supply the information or advice requested, and with the least possible delay. Were the academy not so chartered, it would have the right, like any other of the existing technical societies, to ignore the request if it should see fit.

Unless the academy be granted a national charter the state and municipal governments of the country will not feel that they have the privilege of appealing to it for information and advice, which they would assuredly have according to the proposed bill of incorporation.

Foreign nations sometimes desire to send to America for expert technical aid, and at present they do not know to whom to appeal. Were our academy a national organization, they would invariably apply to it. There exists an excellent example of this at the present moment. There is a French commission now in our country seeking for expert engineers to aid in the reconstruction of France after the war, and they did not know to whom to apply. Fortunately, they fell into the hands of Dr. Mailloux, one of the most enthusiastic members of our new academy and an engineer well known in France, and he has helped them as much as any individual could. Had the academy been duly recognized as a national body, these Frenchmen would certainly have gone to it at the outset and would have benefited by its organized aid.

France is now contemplating the establishment of a national academy of engineers and is looking to our academy for help and guidance; but if the French engineers do not receive such aid on account of our failure to become a national organization, they will soon proceed without us, and then this country will not have the credit of having been the first nation to recognize officially engineering as a great and learned profession, and to France will go the honor of having been the first country in the world to establish an academy of engineers. France has hitherto taken the lead of all nations in matters of this kind; hence this is a unique opportunity for the United States of America to score an important advance in the history of science and technology, because the establishment of a national academy of engineers will be by far the most important step in the direction of progress and general recognition which the engineering profession has ever taken in any land.

Were the academy recognized as a truly national organization, it very properly could take the initiative in many important movements affecting the welfare of the Commonwealth; while, otherwise, its members could not do so with any effect. At the present moment it is a matter of deep regret to many of the members of our nucleus of 50 that we are not properly organized and formally recognized by the American Government; for, if we were, we would at once make officially a stirring appeal through the press to the youths who are about to enter college (and to their parents as their advisers) to the effect that, if at all fitted for technics, they study engineering in some of its numerous branches. We would state that the larger part of the civilized world will have to be reconstructed after the war; that such reconstruction is almost exclusively the work of engineers; that the European engineers are being killed by thousands; that the technical schools of all the warring countries other than ours have practically been out of business for three years, thus cutting down almost to zero the supply of new men for the profession; that the call to arms in this country will have reduced to about one-half the attendance at the technical schools (while instead of being halved it ought to be doubled); that all youths between 16 and 21 who have any special aptitude for mathematics or mechanical work, and who are intending to take a college course, can best serve their country in its hour of need by entering technical schools; that all students of such institutions should remain there, if possible, until graduation; and that engineering for the next 10 years, at least, is going to be the most lucrative of all the professions.

Mineral Production of Norway*

The mineral production of Norway in 1916 showed a heavy decrease due to causes arising from the war. Exports of minerals were diminished by high freight charges, scarcity of vessels and interference with shipments. Prices of products were generally high, but on the other hand, costs were largely increased by high prices of materials and labor. Ocean freights were very high, risks great; one large cargo of iron ore was actually lost, the steamer having been sunk by a submarine.

SILVER

The mines of Kongberg, operated by the state, were worked as usual, the production reaching a total of 12,000 kg. of silver. At Vinorm-Trollerud development was continued and production will begin during the present year.

COPPER AND PYRITES

Production was only about half that of 1915, the total in 1916 being 1400 tons of copper and 300,000 tons of pyrites. The exports of pyrites were 240,000 tons.

At Sulitjelma the production was 65,750 tons of pyrites for export, 3765 tons of smelting ore and 5106 tons of concentrates. The smeltery treated 11,205 tons of ore, yielding 605 tons of copper, in the form of converter bars. The Scheidage mine of this company yielded 122,863 tons of pyrites. The rest of the pyrites came from a number of smaller mines. The largest quantities of metallic copper were 240 tons from Roros and 200 tons from Birtavarre. The Aamdal mine produced 750 tons of ore, averaging 25% copper. Development work was carried on at Grong-Skorovas, where drilling has shown large bodies of pyrites.

NICKEL

The mines and works of Evje, Ringerrike and Christiansand produced a total of 800 tons of nickel, about 725 tons of which was exported.

IRON ORE

The total iron output was 334,000 tons of concentrates and 80,000 tons of hard ore. Exports were 400,000 tons. The Lango and Foehm mines took out 26,600 tons of ore, most of which was used at the electric smelteries of Tinfos and Ulefos,

The Sydvaranger mines showed a largely decreased output. The total raw ore taken out was 842,240 tons, which made 313,500 tons of concentrates, of which 226,650 tons were briquetted. Exports were 328,470 tons, and the ore in stock at the close of the year was 480,000 tons. The number of men employed was 975, against 1600 in the preceding year.

MOLYBDENITE

The demand for molybdenite and the high prices offered resulted in the operation of a number of small mines. At several of these concentrating plants were established, including washers, tables and Elmore plants. Most of the molybdenite, as treated and delivered, ran from 70 to 90% MoS. The total production was equivalent to about 100 tons of molybdenum. It is believed that any considerable fall in price would be followed by the closing of most of these small mines.

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*Abstract of report published in "L'Echo des Mines et de la Metallurgie," Paris

New Tests for Molybdenum

The usual test for molybdenum is to heat a small piece of the mineral (about half the size of a grain of wheat) in a porcelain crucible with a drop of sulphuric acid until the fumes have nearly ceased, and to allow the crucible to cool, when a fugitive deep-blue coating will appear. Molybdenite, however, must be oxidized first by boiling it dry with two or three drops of nitric acid, or by powdering and roasting in the air for a few minutes.

In a recent issue of the *Journal of the Chemical, Metallurgical and Mining Society of South Africa*, Dr. Moir communicates a test which secures a permanent blue color. Hydrazine, N_2H_4, or hydroquinone, forms, in his experience, the best reagent for developing the blue color. A solution containing a trace of alkali molybdate when acidified with acetic acid and treated with a little hydrazine sulphate and boiled, rapidly turns deep blue and retains this color on boiling. An analogous but more remarkable reaction is that obtained when a slightly acid solution of MoO_3 is treated with potassium iodide (in some excess) and boiled for some time; iodine is slowly liberated, and the solution turns blue. The best known sensitive test for molybdenum, however, is that in which the acid solution is treated with sulphocyanide, and a tiny piece of zinc added, when a crimson color is obtained in a few seconds. If iron is also present, the solution becomes blood-red on adding the sulphocyanide, but on adding the zinc this becomes colorless through reduction to the ferrous condition, and after a few seconds becomes crimson if Mo is present. If the solution is strongly acid the color verges to red and is less sensitive; if nearly neutral, it resembles the color of permanganate.

Another modification of the test for Mo in presence of Fe is to add stannous chloride to the acid solution until the yellow color just disappears, and then add sulphocyanide. Another well-known reaction for MoO_3, in the absence of iron consists in adding potassium ferro-cyanide. Mineral acid must be present, and a russet-brown precipitate is obtained which still contains hexavalent molybdenum. In the presence of acetic acid (not mineral acid) tannin (gallic acid) gives a similar reaction, which has been known for some time. Dr. Moir has improved this by substituting pyrogallol or pyrocatechol for tannin. Either of these, when added to a molybdic acid solution previously treated with sodium acetate, gives a very sensitive orange color.

Boring for Potash in Texas

Washington Correspondence

The well being driven at Cliffside, Texas, by the United States Geological Survey, in an effort to discover potash, has reached a depth of 1700 ft. without result. Boring must stop within the next 300 ft., owing to the drilling equipment. The ground still to be penetrated is, of course, more likely to contain potash than the overlying strata.

It is realized that a single well driven in an area of several hundred square miles is not a fair test of a structural basin. Cliffside was selected, it is said, because it is nearly in the center of such a basin, is conveniently situated and is near two wells from which small specimens of potash have been obtained.

The output of the various domestic sources of potash is small, excepting, perhaps, the Searles Lake deposits in California. These, it is said, may possibly produce enough, once their operation is under way, to supply the most urgent needs, such as those of the chemical industries. However, at present no domestic source can yield more than a small percentage of the amount consumed in this country. Interest is said to be keen in the possible recovery of potash as a by-product, but none of the methods, however promising, is far enough devoloped to warrant predictions.

Sulphuric-Acid Situation

Washington Correspondence

In view of the steadily increasing demand for sulphuric acid and the small hope of increasing imports of Spanish pyrites, recourse may be had to the pure sulphur reserve. While it is felt that this should be conserved, it is thought advisable for sulphur-using industries situated near the sulphur wells and at tidewater points on the Atlantic to use sulphur instead of pyrites. This would also help to conserve railway cars. Means must be found, however, of impressing upon all interested the imperativeness of developing domestic sources of pyrites.

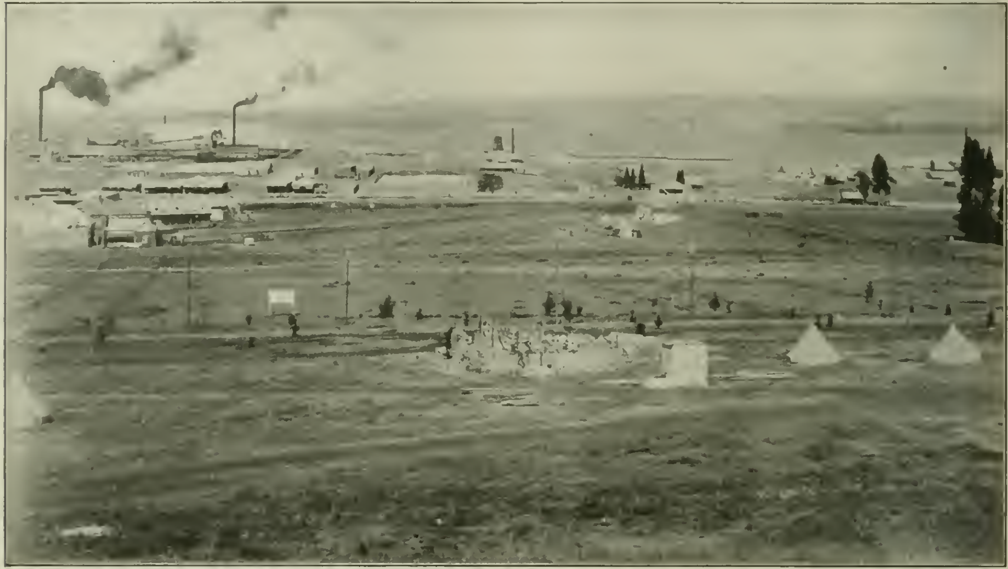
To encourage the production of sulphuric acid, the Bureau of Mines is calling attention to what the demand for acid will be after the war. At present, some of the largest smelters are paying as high as $30 a ton for outside acid when they could greatly increase their own production. Some companies pay the high price rather than risk making expensive additions to their acid plants with no assurance that the present demand will continue long enough to justify the expense. At other smelteries, however, large additions are being made to the acid-making portion of the establishment.

Zirconia as a Refractory

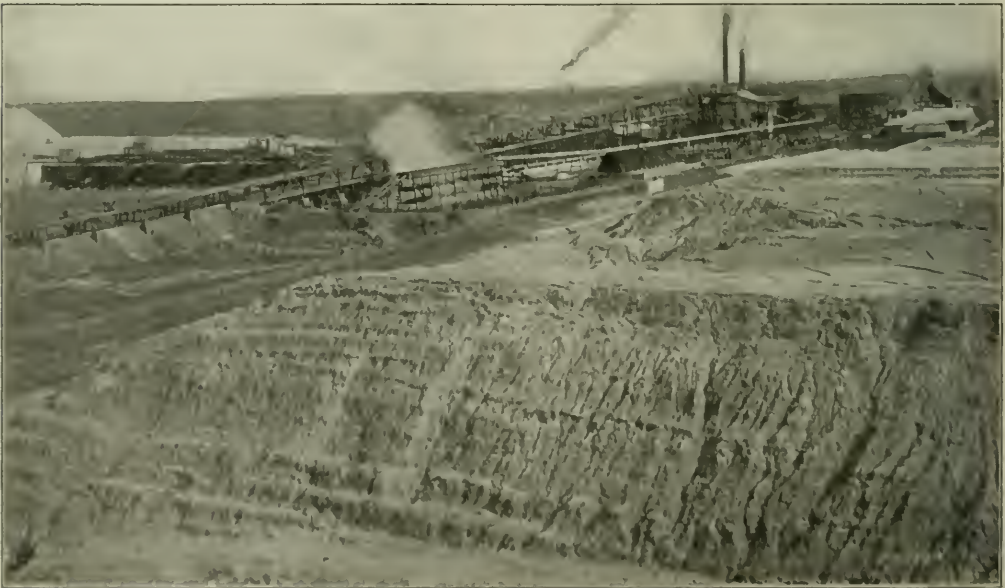
A brief outline of the occurrence, properties and uses of zirconia is given by J. A. Audley in "Transactions Ceramics Society," 1916-17 (abstracted by the *Journal* of the Society of Chemical Industry). Baddeleyite (82-94% ZrO_2) from Brazil is the chief source of zirconia, but zircon ($ZrSiO_4$) from monazite sand, etc., is sometimes used. Zirconia has a hardness of 6.5, specific gravity 4.4-6, gray color, light-yellow streak, very low electrical and thermal conductivity and high melting point (nearly 2000° C.). It can be melted in an electric furnace (360 amp., 70 volts). It is insoluble in acids, except hydrofluoric acid, and resists fused cyanides and alkalies, but is easily attacked by fusion with potassium bisulphate and fluorides.

Bricks made of crude baddeleyite bonded with clay will resist a temperature of 1650° C. if previously burned to a higher temperature; otherwise they crack. Superior bricks are made by extracting the iron oxide from the crude ore with dilute sulphuric or hydrochloric acid. Zirconia has been used for muffles, retorts, tubes and crucibles. More recently, it has been used for lamp filaments and for lining electric furnaces.

Views of Rand Gold Field, South Africa



EAST WITWATERSRAND SECTION IN THE TRANSVAAL, UNION OF SOUTH AFRICA



MINING AND MILLING PLANT OF THE NEW MODDERFONTEIN GOLD MINING CO. ON THE EASTERN WITWATERSRAND, SOUTH AFRICA

HEADFRAME AND PORTION OF CYANIDE PLANT OF THE SIMMER & JACK MINE

EAST RAND'S 200-STAMP MILL AND CYANIDE PLANT, SOUTH AFRICA

Correspondence and Discussion

Sane Oil and Gas Legislation a Necessity

I take the liberty of soliciting your interest in a matter involving two of our most important natural resources, petroleum and natural gas. Just at present these minerals have especial value because gasoline is indispensable in military and naval operations, but even in times of peace their importance can hardly be overestimated. Despite the military and industrial value of oil and gas, however, there is danger that legislation certain to bring about enormous wastes unfair to the oil industry and violating the fundamental principles of Government control will be crowded through under the banner of war-time necessity.

During the Roosevelt and Taft Administrations, when the necessity for new laws governing the disposition of public oil lands was first emphasized, the Geological Survey was called upon to draft a series of bills covering the subject. Unfortunately none of these bills became law.

When the present Administration came in, a new bill was drafted, not this time by the men in the Geological Survey and the Bureau of Mines who had studied oil-field conditions, but chiefly by the lawyers in the office of the Secretary of the Interior—men of long service under the old regime who had never been wholly converted to the belief that a new law was necessary. Their draft was, as might have been expected, an attempt to meet the demand for a new law while retaining as much of the old law as possible. The result was a new garment patched with old cloth, a bill providing for the leasing of oil and gas lands, but giving fee-simple title to one-fourth the area of each prospecting permit. Such a provision would be bad enough if applied to deposits of a stable nature; applied to migratory minerals which a well may draw from hundreds or even thousands of feet distant, it would have all the defects of both the fee-simple and the leasing systems.

This draft went to the Committee on Public Lands of the House of Representatives, which contained some new members not familiar with public-land problems and some Western members who were opposed to leasing in any form. The more progressive members of the committee seemed to have no hope of arriving at good legislation, but only of reaching the best compromise obtainable at the time. The result was the Ferris Bill, embodying the unfortunate features of the departmental draft—a hybrid bill, both fish and fowl, under which the patented tracts might be so chosen that no point on the remaining Government land would be more than 2150 ft. from the possible location of a well on private land, and under which no operator received an acreage, either freehold or leasehold, sufficient to justify exploratory work in fields remote from pipe-line and refinery facilities. This bill passed the House, but failed to reach a vote in the Senate at the last session. It has been reintroduced in the House in the present session, and a somewhat similar bill has been introduced in the Senate by Senator Walsh. Senator Gronna has also introduced a bill, and these three are now before the Senate Committee on Public Lands, which, it is rumored, plans to report one of them favorably, probably the Walsh or the Ferris Bill.

That a public oil-land law is urgently needed no one will attempt to deny. Petroleum and its products are necessary to the carrying on of the war against Germany. The army, the navy and the air service would be helpless without them, and in the industries on which the successful prosecution of the war depends they are indispensable. It is a military necessity not only to maintain America's oil production, but to increase it. Yet while the oil industry, stimulated by abnormal prices, has endeavored by means of an unprecedented drilling campaign to double its production and has succeeded only in holding its own, great areas of promising oil territory in the West lie idle for want of a law under which their development can be undertaken. The interests of the nation demand the prompt passage of a good law. It does not follow, however, that every law proposed will meet the emergency. More important than that we have legislation is that it be wise legislation. Unfortunately, none of the three bills now before Congress would fall in this category without radical amendment.

The Gronna Bill (S. 2012) provides for a two-year prospecting permit covering 640 acres, and for a 10-year lease of 320 acres, renewable for five-year periods. Interest of any sort in leases covering more than 640 acres may be made a ground for forfeiture. No minimum or maximum royalty is specified.

The Walsh Bill (S. 45) also provides for a two-year prospecting permit. If situated within 50 miles of a producing oil or gas well, the permit area may be 640 acres; if more than 50 miles from such a well, the permit area may be 2560 acres. Upon discovery of oil or gas the permittee is given a patent to one-fourth the area of his permit; the remainder is subject to lease in tracts not exceeding 2560 acres for a term of 10 years, no minimum or maximum royalty being specified. No interest in more than one lease may be held, and no one having an interest in a lease can have an interest in an agency for the resale of the products of the lease.

In the Ferris Bill (H. R. 3232) the two-year prospecting permit covers 640 acres within 10 miles of a producing well, and 2560 acres more than 10 miles from such a well. Upon discovery the permittee is given patent to one-fourth the area of his permit; the remainder is subject to lease in tracts not exceeding 640 acres, for a term of 20 years, renewable for 10-year periods, at a royalty not less than one-tenth. No interest may be held in more than one lease.

It is obvious that the limited-acreage and short-term leases proposed by these bills would offer no inducement to develop fields remote from pipe-line and refinery facilities. In fact, the bills could not have been better framed to discourage the operator having sufficient capital and experience to develop Western fields in the most economical and efficient manner. Not only is the individual lease inadequate in area, but it is made impossible for any one person or corporation to be interested directly or indirectly in more than one lease. Thus, so far as the public lands would be concerned, no one could, under the Walsh Bill, own a share of stock in more than one company operating in the West, even if one were in Wyoming and another in California. Each operator would be confined to one miniature short-term lease in the entire public-land area—a provision almost certain to exclude the type of operator most desirable in opening up new territory.

Serious as these defects are from the standpoint of the oil industry, they are even more serious from the standpoint of the public. The industry will perforce adjust itself to any condition imposed upon it, and the enterprising operators who should be developing the West will turn their energies to the foreign fields, already promising to threaten the supremacy of the United States as an oil producer. But the public can never regain oil and gas once allowed to waste, nor reclaim fields ruined by water incursions. Yet waste and ruin would be certain to follow the enactment of either of these three bills.

As is well known to everyone familiar with oil-field conditions, cutting a field into small tracts leads directly to line drilling and the drilling of unnecessary wells, and indirectly to hasty, careless drilling, unnecessarily high cost of production, storage losses and unnecessary storage charges, the loss of oil by evaporation, erratic prices, and even the ruin of entire fields by water infiltration. In other words, dividing an oil field into small holdings results in the waste of large quantities of oil and gas and in increased prices for petroleum and its products. These are results that the public is vitally interested in preventing, yet it is proposed to enact legislation that not only will not prevent them, but will actually bring them about.

It is obvious that Congress needs the advice of men familiar with oil-field conditions and oil-industry economics. It is equally obvious that Congress does not recognize this need and will not recognize it unless forcefully reminded by the oil industry itself. Already, protracted hearings have been held before the Committees on Public Lands of both Senate and House, but these hearings have been devoted almost exclusively to the special provisions for the relief of those who found themselves in conflict with the Government regarding withdrawal orders. Important as these relief provisions may be, they are overshadowed by the importance of the general provisions affecting the great body of the public domain.

If the industry remains silent regarding these general provisions, the committees of Congress will assume that the proposed legislation is satisfactory and will attempt to force it through in its present form at this session. If, on the other hand, the industry raises its voice in protest, Congress will not only heed the protest, but will gladly listen to the opinions of those most competent to advise.

It is the duty, therefore, of every public-spirited man, whether in low position or high, in the oil business or outside of it, to communicate his views regarding this matter to Congress, and especially to the Senate Committee on Public Lands, of which Senator H. L. Myers, is chairman. MAX W. BALL.

Washington, D. C., July 27, 1917.

A New Professional Experience

I am up against a new experience in my professional career and hardly know how to handle it. In 1901 I made an examination of the Liberty Bell M. & M. Co.'s property at Twin Lakes, Colo. Later on, in 1906, I made a supplemental examination and report. I have just ascertained through Howard C. Catlin, of Catlin, Street & Co., 60 Broadway, New York, that a pretended copy of my report is being circulated in New York, ending up with "(signed) Edwin E. Chase M. E."

The M. E. in place of E. M. would put a brother engineer on his guard, but not an ordinary investor. In this bogus report a list of eight assays is changed as follows:

No. 1	0 16 oz. gold	changed to	1 16 oz.
No. 2	0 20 oz. gold	changed to	2 20 oz
No. 3	0 70	same	0 70 oz
No. 4	0 90	same	0. 90 oz.
No. 5	0 70 oz. gold	changed to	1 70 oz.
No. 6	0 10	changed	1 10 oz.
No. 7	0 16	changed	1 16 oz.
No. 8	0 40	changed	2 40 oz.

You will perceive that whoever the rascal was, he grew bolder as he drew near the finish. The "conclusions" of the report are entirely changed and an ordinary fair-looking prospect made into a rattling good mine.

Of course I shall do all I can to run the scoundrel down, but it is hard to do so at this distance from his base. Can you offer any suggestions? I thought perhaps you might care to publish the facts, since it is such an unusual case, to me at least. It might reach some who consider investing and, on the other hand, might also be a lesson to younger mining engineers, leading them to sign every page of important reports with their initials or full signatures, for it is to be presumed that few men would embark on a mining enterprise or even buy stock on a report unless an actual signature was attached to it. I have had parties attempt to salt a mine on me, but never before did I have a report salted. EDWIN E. CHASE.

Denver, Colo., July 20, 1917.

Observations in Copper Smelting

I would like to call the attention of copper metallurgists to the following observations made at some plants. If air is delivered to a blast furnace through bustle pipes parallel to the sides of the furnace, a matte will be produced at the end farthest from the source of the blast that is higher in copper than that produced at the near end. Thus if the matte produced opposite the center tuyeres runs 40% Cu, that at the far end will run over 40% while that made at the end nearest the source of the blast will be under 40% Cu.

Slag from reverberatory furnaces is usually hotter than the matte, while slag from blast furnaces is usually colder than the matte. E. H. HAMILTON.

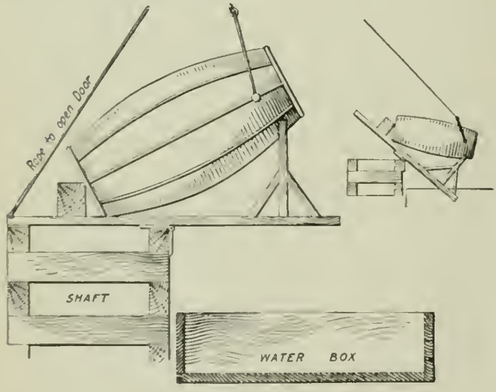
Trail, B. C., July 10, 1917.

Details of Practical Mining

Water-Bucket Dumper for Prospects

The ore-bucket dumping device used in the early days of Cripple Creek—and perhaps used there yet—had nothing on the old Gilpin County method of dumping water buckets, even though they were valve buckets. In Gilpin County, as at Cripple Creek, the engineer ran the whole works on top. The engines were frequently operated by lever rods extending to the collar of the shaft, so that the engineer need not walk back and forth from the engine to the shaft.

The shaft collar (practically all shafts were inclined) was built up about 2½ ft. above the floor level. Back of the shaft—or on the engine side—a water-discharge box was sunk below the floor level. The shaft door may be flat, or a three-quarter box; that is three sides, each about 1 ft. high. This door was built of 2-in. plank and extended back of the shaft about the same distance as the over-all width of the shaft. Just in front of center of shaft, a piece of 8 x 10, about 8 in. long was bolted, and back of this a distance governed by the length of the water bucket, was bolted a bearing block. While the valves filed the bucket, the illustration shows the method of dumping it. This keeps the shaft collar comparatively free from splashing water.

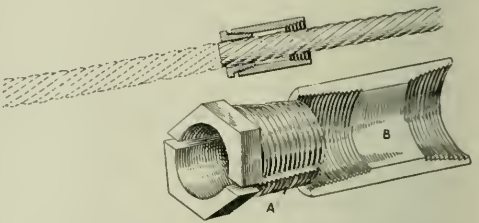


METHOD OF DUMPING WATER BUCKET

Simple Cable-End Protector

By Ernest Schwartz*

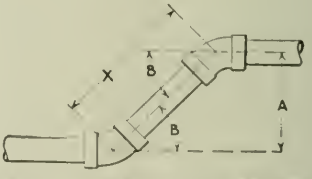
Difficulty is frequently experienced in keeping the end of a newly cut cable from unwinding. To prevent this, I hit upon the device shown in the accompanying illustration. It consists of a suitable reducer split in halves and a coupling. As will be seen by reference to the illustration, *B* will be pushed along the cable until it reaches the point to be cut. The two halves of *A* are now placed on the cable and screwed into the coupling. The tapered thread will force the split reducer to close on the cable and act as a clamp. The device also prevents the hacksaw blade from breaking, caused by the opening of the cable end. The material for this device can be procured at a small expense.



END PROTECTOR FOR STOCK CABLES AND GUYS

Offset Connections for Pipe

In response to a number of inquiries for a formula for offset connections, the *Valve World*, organ of the Crane Co., supplied the accompanying diagram and table, establishing the various offsets used in general practice.



DETAILS OF OFFSETS FOR PIPE CONNECTIONS

B-Angle	Constant	B-Angle	Constant
60 degrees	1.15	22½ degrees	2.61
45 degrees	1.41	11¼ degrees	5.12
30 degrees	2.00	5⅝ degrees	10.20

Air-Lift Calculation

Not long ago a contributor to *Coal Age* requested some information about the use of an air lift to take the water out of a mine. The question came in the following form:

"The shaft at our mine is 115 ft. deep. In order to handle the water that accumulates in the sump at the foot of this shaft, it is proposed to install an air lift that will be capable of handling, say 70 gal. of water per minute under a discharge head of 120 ft., which we estimate will require a 4-in. column. We are informed that it will be necessary to sink a drillhole in the bottom of the shaft to such a depth as will allow a sufficient submergence of the column to enable the lift to work successfully. I would like to ask to what depth this drillhole must be sunk; or, in other words, what submergence is necessary in this case. What volume of air and gage pressure will be required to deliver this quantity of water under the given head, and what size of compressor will it be necessary to employ?"

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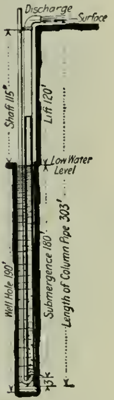
*180 South Eighth St., Brooklyn, N. Y.

The reply included the accompanying figure showing clearly the arrangement of the pipes. Since the depth of this shaft is 115 ft., it will be well to estimate on a lift of 120 ft. The "lift" is the vertical distance from the low-water level in the sump to the point of discharge at the surface. It is assumed, however, in this case, that the mine sump is of such size that the water level will not be materially lowered when the air is turned on, as is usually the case in a wellhole where the low water level will depend on the natural inflow being able to maintain the required discharge. If the required submergence is 60%, the actual lift is the remaining 40%. In other words, the depth of submergence[1] is estimated as 50% greater than the given lift. The latter being 120 ft., the depth of submergence here, is 180 ft., which makes the total length of column pipe 303 ft., allowing 3 ft. of extension below the air nozzle. The top of the column pipe is provided with an elbow for discharging the water into a trench or drain. Estimating on a velocity of about 100 ft. per min. shows that it will require a 4-in. pipe to carry a flow of 70 gal. per minute.



The successful operation of an air lift depends upon several important factors, which must be taken into consideration. Experience has shown that this means of draining water from a depth does not work successfully when the actual lift or head of discharge exceeds 225 ft. Up to this limit the scheme can be made to discharge a good volume of water when the following conditions are fulfilled:

The column pipe should be vertical and have a submergence of at least 60% of its entire length. The air must be conducted to the full depth of submergence and terminate in a nozzle that will spray the air into the water so that it will not tend to form large bubbles that would travel up one side of the pipe. (3) There should be a certain ratio of volume of air to volume of water, dependent on the height of lift.

The volume V (cu.ft. per min.) of free air required should be estimated by multiplying the quantity of water to be handled G (gal. per min.) by the lift h, in feet, and dividing the product by 125, which gives, in this case,

$$V = \frac{Gh}{125} = \frac{70 \times 120}{125} = 67.2 \ cu.ft. \ per \ min.$$

The working air pressure must be sufficient to overcome a head of water equal to the depth of submergence and is, in this case, 0.434 × 180 = 78.12 lb. per sq.in. To make allowance for friction, which is small, we will call the air pressure, here, 80 lb. per square inch.

The size of the compressor must be estimated from the required air volume, assuming the efficiency of the air cylinder is 85 per cent., which gives for the piston displacement, in this case, 67.2 ÷ 0.85 = 79.06 cu.ft. per min. The speed of an air compressor, according to its size, may vary from 90 to 175 r.p.m. Assuming, in this case, that the compressor makes, say 300 strokes per minute, and taking the ratio of length of stroke to diameter of cylinder as $l/d = 1.25$, the diameter of the cylinder is found as follows:

$$d = \sqrt[3]{\frac{1728 \times 79.06}{0.7854 \times 1.25 \times 300}} = say \ 8 \ in.$$

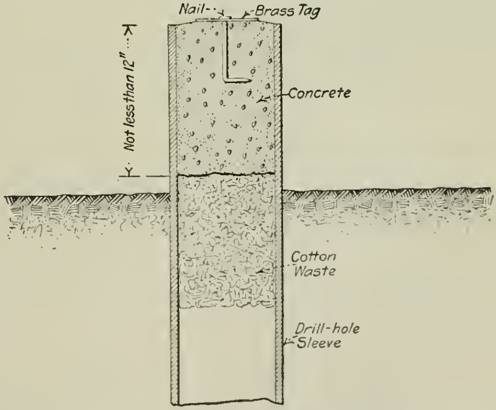
The length of stroke is then 1.25 × 8 = 10 in., and the required size of compressor is therefore, 8 × 10 in.

For a speed of 300 r.p.m., assuming the efficiency of the engine driving the compressor to be 70%, the horsepower required is calculated from the mean effective pressure in the air cylinder, which is found to be 36.12 lb. per sq.in., to produce an air gage pressure of 80 lb. per sq.in. at an elevation of 750 ft. above sea level. The area of the piston of the air cylinder is $0.7854 \times 8^2 = 50.26$ sq.in., and the piston speed 10/12 (300) = 250 ft. per min. The horsepower of the engine required to drive this compressor is, therefore,

$$H = \frac{36.12 \times 50.26 \times 250}{0.70 \times 33{,}000} = say \ 20 \ hp.$$

Plugging Diamond Drill Holes

There are various ways of plugging and marking diamond drill holes, including wooden plugs, pipe caps, etc.; but the method shown in the illustration serves the purpose admirably, with distinct advantages over the two methods mentioned. It consists of the use of a drillhole sleeve, concreted into position as shown in the illustration. The concrete is solid and permanent, nondecaying and resisting the efforts of any curious person, besides providing an excellent base for the nail to anchor the brass number tag. The cotton waste is pushed into the sleeve and acts as a base for the concrete to rest on before it sets. It is an easy matter to saw off the plugged part of the pipe with a hack-saw if it becomes necessary.



PLUG AND TAG IN A DIAMOND-DRILL HOLE

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[1] The expression "depth of submergence" is the vertical distance from the low-water level in the sump or wellhole, to the nozzle of the air pipe or the point where the air enters the column pipe. It is important that the column pipe should extend a few feet below this point, so that there will be no tendency of the air to escape through the bottom of the pipe.

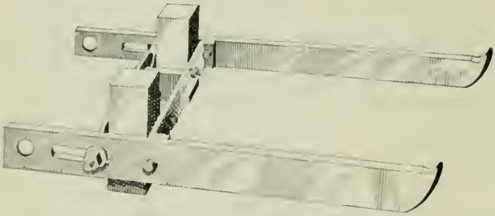
Details of Milling and Smelting

Grinding Roll Shells in Place

By Algernon Del Mar*

Every millman appreciates the difficulty of keeping rolls in condition for effective work. Inasmuch as the center of the rolls wears first, there is usually left along the edges a high ridge that must be ground off while the rolls are at work. Carborundum blocks held tightly against the roll face, as well as laid loosely on the surface, have been tried with varying success. At a mill in Nevada it was the practice to bolt two blocks of carborundum in an iron frame, lay these on the rolls and hold them down with a sack of sand. This answered fairly well, but was liable to become displaced.

The device shown in the illustration is better, I believe, and is being used with success. It consists of three pieces of 1½ x ½-in. iron riveted together as shown. A fourth piece, which is movable as shown, is attached so as to hold the carborundum blocks in a clamp. The ends of the arms are bolted loosely to the feed box so that the frame may be moved vertically but not horizontally. The carborundum, when in place in the position required, rests loosely on the roll shells, but can be made to bear down with more or less pressure by hanging weights on one of the arms according to which side needs the most grinding. I have found this device the most effective means of squaring the roll faces.

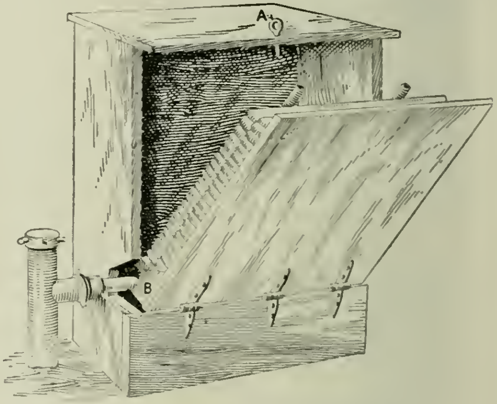


FRAME FOR CARBORUNDUM BLOCKS

Outside Rack for Fire Hose

Fire protection for industrial plants is an important branch of safety engineering. Adequate fire protection cannot be had without proper care and easy accessibility of fire-fighting apparatus. The illustration shows a serviceable and convenient hose rack for mills, smelteries and mine plants. It consists of a wooden frame about 4 ft. high, 5 ft. long and 12 in. wide inside, covered with corrugated iron, preferably galvanized, with top hinged in the rear and front hinged at the bottom, the two doors, or lids, being held together by the pin *A*. At the bottom of the front door is a shelf so fastened to it that the two move together. The rack is placed with one end about a foot from the fire plug, and at the bottom of that end a piece is cut out, as shown; the triangular portion *B* of this piece is fastened to the front door.

The hose is piled upon the shelf and the plug end is brought out through the rectangular opening at the bottom of the rack. In case of fire it is only a few seconds' work to pull out the pin *A*, allowing the front door to fall forward, and drag the nozzle end of the hose to the fire. The triangular opening in the end of the housing gives plenty of clearance for the hose, which, carefully piled upon the shelf, pays out readily. As the hose is always fastened to the plug, there is no time lost in making connections and water can be on the fire as soon as the nozzle men are ready. The short piece of hose exposed between housing and plug can be protected by an extra box placed over it. This rack is inexpensive, takes up little room and answers every purpose. The device is obviously simple to construct and furnishes a means of protecting the hose from dust and weather conditions, while providing immediate readiness when necessary.



OUTSIDE RACK FOR FIRE HOSE

Cutting Paper for Blueprints

Laying off the cutting table for blueprint paper in regular intervals of 6 or 12 inches and marking by driving brass-headed upholsterer's nails at those points facilitates the cutting of the paper for the prints and eliminates the possibility of accidentally cutting a tracing, sometimes caused by placing the tracing upon the blueprint paper for a guide to cut by.

Large-sized desk blotters in the plueprint room save time when used for quickly drying blueprints that must be had on short notice.

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*Sandon, B. C.

Power Transmitted by Belts*

Belt charts and formulas generally apply to leather belts only, and users of substitute belts have been at sea in applying such charts to their conditions. There is a demand, therefore, for a chart that will include in a clear simple way all commonly used belts. The rapid advance of the substitute belting makes the demand for such a chart all the more urgent.

The chart herewith was designed to meet present-day demands. It is simple, clear and based on formulas that are most in use. Lay a straight-edge across the chart twice, and the problem is solved.

For example, what horsepower may be transmitted by a "light-double" solid-woven treated belt whose width is 5 in. and whose speed is 2000 ft. per minute?

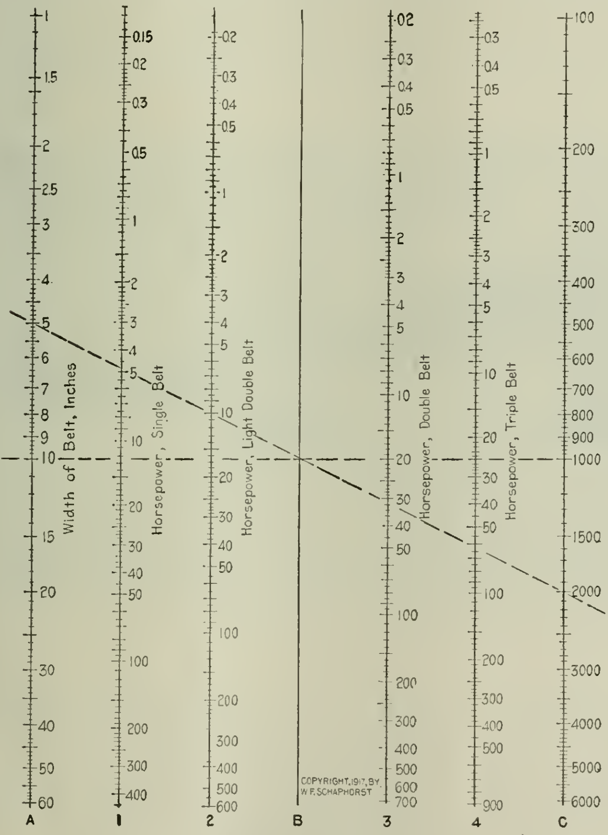

CHART FOR DETERMINING POWER AND SIZE OF BELTS

Connect the 5 (column *A*) with the 2000 (column *C*), as shown by the dotted line and find the intersection with column *B*. Then run a horizontal line through the intersection point, and where the horizontal cuts column 2 we find the answer to be about 16.7 hp. It is easy to run a horizontal line across because the divisions in columns *A* and *C* are identical. The figures in Column *C* are simply 100 times greater than in *A*.

By following this same method any ordinary problem may be solved, no matter what the make of belt.

If it is desired to determine the belt width necessary to transmit a given power, the process is reversed. That is, first decide on the kind of belt and the thickness. Find the column through which the horizontal line must pass. Run the horizontal line and find the intersection with column *B*. **Then run a** line through that intersection and through the belt speed (column *C*), and the intersection with column *A* gives the belt width. The accompanying tables will be found useful for determining the columns to be used with the various thicknesses of belt. To show how the tables are used, let us suppose that it is desired to transmit 100 hp. with a 16-in. balata belt of 8-ply. At what speed must the belt be operated? The table says "Use column 3." Run a horizontal line through the 100, column 3, and find the intersection with column *B*. A line through that intersection point and the 16 (column *A*) shows that the speed should be 3200 ft. per min. (column *C*). The range of the chart is great enough to take care of any ordinary transmission problem, the horsepower values varying all the way from 0.142 hp. to 900. A fine black thread is an excellent instrument to use on this chart in place of a straight-edge, if such a thread happens to be available. Anything straight, of course, will do the work.

SOLID-WOVEN COTTON TREATED BELT

Single	Column 1	Regular double	Column 3
Light double	Column 2	Triple	Column 4

LEATHER BELT

Single	Column 1	Double	Column 3
Extra heavy single or light double	Column 2	Triple	Column 4

RUBBER, BALATA OR STITCHED BELT

4-ply	Column 1	8-ply	Column 3
6-ply	Column 2	10-ply	Column 4

Crown on Pulleys

Many times it is desired to build up, or reduce the size of a pulley by the fraction of an inch. It is astonishing, but true, that many mill men and mechanics figure that if a little crown on a pulley is good, a lot is better and in the building up or decreasing the size of a pulley so alter the crown as to really injure the driving belt by the decrease in strain on the center. Anything which tends to bend or strain a belt at right angles to its length, tends also to shorten its life, therefore attention should be paid to lacings and pulley crowns and if a belt commences to show signs of wear in the center, it is a fair presumption that an excessively crowned pulley is the cause of it. Frequently dust is allowed to accumulate on the pulley side of the belt, which is equivalent to or worse than an excessively high crown. Keep pulleys and pulley side of belt clean.

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*Copyright, 1917, by W. F. Schaphorst, Woolworth Building, New York.

Those Who Drill for Gold

BY W. H. GARDNER[*]

Some incidents and stories of a party of drillers en route to the Klondike. The leisure of the steamer voyage and delays in the prospecting operation induce the drillers to relate experiences they had in other parts of the world.

DRILLING FOR GOLD IN THE KLONDIKE

I FIRST met Dan on the steamer "Jefferson" en route from Seattle to Skagway. Barred by sheer youth and unsophistication from cards and drink, nevertheless I sought out the smoking room as the center of social activity. It was early in the afternoon, yet the five poker players at the center table were playing rather a stiff game. Their very quietness showed this even to me. I had drawn my chair close behind Dan. He was the only player at the table that minded my presence not at all. Through suspicion or superstition, the others—two old-time sour-doughs, a steel-pipe salesman and a Dawson storekeeper—shielded their cards from my eyes if I drew too near.

My ignorance of the game was abysmal. Whist I had played, poker never. Dan picked up his cards as they were dealt; held them loosely, even carelessly. Apparently he played in the same spirit, yet in front of him was the bulk of the chips on the table.

The technical details of the affair I probably never understood, but it must have happened something in this manner: Dan opened the jackpot, pushing forward a generous pile of chips. One of the miners at once dropped out. The other sour-dough raised, and the Dawsonite, with an ill-concealed gleam in his eye, raised in turn. The salesman hesitated, then threw down his cards. Dan had a pair of kings—plain for me to see—not another thing. He called the last raise without hesitation, however, and the miner, after a look at Dan out of the corner of his eye, failed to raise again.

"Cards," said the salesman, who was dealing. "Three—off the top," said Dan. The miner nodded his head negatively, and the Dawsonite said quietly, "I'll play these."

A MERE REMARK CONCERNING "FOUR OF A KIND"

Dan, smiling whimsically, picked up his three cards. I slid forward to the edge of my chair, my eager eyes close to his shoulder. "Gee whiz!" I exclaimed. "That sure is funny!" "What is funny?" the Dawson storekeeper said to me sharply. And before Dan could even turn I blurted out, "Why, that out of the whole deck he should get two more like he had!" The salesman laughed nervously. Dan turned and looked at me as a man does over a pair of glasses—although Dan never wore them. The Dawson storekeeper threw down a ten-full, face up. The miner followed with his pat straight. "The pot's yours," he said to Dan.

With all eyes on him Dan stood up. "Guess I'll cash in while I'm ahead, if you fellows don't mind." The little matter of bookkeeping was attended to, a few gold coins jingled, and he turned to me, abashed, awkwardly trying to figure out my fault.

"Come on, sonny," he said kindly. "I see where you need a few lessons in the national pastime, and you'll never learn a minute younger." He led the way to a corner table and then and there gave me the essentials of poker, explaining the different hands from a "bobtailed flush" to a "dead-man's full." Nor did he give me a word of recrimination, except to say as we parted for dinner: "Lad, a poker player is satisfied with one well-played hand at a session, and you sure put the jinks on the one I'd been waiting for."

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[*] With Yuba Manufacturing Co., 1204 Oakland Ave., Piedmont, Calif.

The next few days offered many chances for improving my acquaintance with the drillmen. Fred, the panner, and Howard, another drill runner, were of the party which Dan headed. Dan was a big-framed man, not only tanned from outdoor work, but with the wrinkles around his eyes that come from life in the bright sun. The three of them were conspicuous for their whimsical humor. Off duty as they were, they were nothing but care-free boys. En route to the Klondike, they were drawing salary and expenses. They enjoyed the leisure, yet deplored the inactivity, for they often talked shop in my presence. Perhaps their polish was not of the highest, but they were very congenial indeed. And if they dissipated in those idle days, it was in the mildest way.

The drill is a machine for sampling gold-bearing gravels. There is nothing very complicated about its operation. Mechanics, capable of running it, might be picked up almost anywhere. Care and accuracy are essential, however. Initiative and courage are required to transport the machine to the inaccessible spots where it is called on to work. The men must be loyal and close-mouthed. For these reasons the big mining companies keep the same drill crew together year after year. They send them to Alaska, to the Tropics, then to Siberia or back to Alaska—sometimes within the same year.

Such men were Dan, Howard and Fred. They planned to pick up two firemen and to operate their machine both day and night, Fred doing the panning for both shifts. They were noncommittal about the site of their work, but I judged it was not far from Dawson. I was looking for work, and Dan half promised to take me as one of the firemen.

Hotel Equipped With "Modern Conveniences"

We were forced to take up our quarters for several days in the Golden North Hotel at Skagway. We had failed to get reservations on the first boat for Whitehorse and decided to wait at the larger town. The Golden North Hotel was principally famous for its intercommunicating system. It was a three-story frame building with a discouraged list to port. Fortunately, the building at the left had sunk toward it, and the two tottering edifices virtually supported each other. The partitions were paper thin. The dropped shoe of a retiring lodger would shake the crazy building to its foundations.

Ingenious patrons soon learned how to make practical use of the acoustics. Two stamps on the floor were a call for hot water. Three stamps meant ice water. Four stamps called the porter. These telegraphic signals were always promptly and accurately answered, even to the third floor back. To be sure, I once inadvertently called the porter in killing a spider, but in the main the system was reasonably efficient.

Time hung a bit heavy on our hands. We chafed at the unexpected delay, even though it postponed the day of going to work. The second night I was watching Dan and Fred trying their skill on an English pocket-billiard table. It was a bit late. Fred shot across the big table and missed his ball completely. "Darn it!" he exclaimed. "I'm not a'going to play any more on this acre lot without they put telescope sights on the cues."

"It isn't the cue," rejoined Dan, "it's your eyes. We have all been smoking too much, sitting around passing the time."

"Maybe there's something in that," said Fred. "My tongue does taste like a fiber mat in a Chinese bird store. It might be a good idea to swear off."

How He Stopped Smoking

"I'll swear off if you will," replied Dan.

"I'm with you," said Fred; and they solemnly shook hands. "Only no cheating," he continued, "Maybe we'd better put up a forfeit."

"It's a go," Dan agreed. "The first one who smokes—and gets caught—pays the other ten bucks. The kid here is witness." And when I left them they were trying to dispose of a miscellaneous collection of cigars, tobacco and papers at half-price to the protesting little Frenchman in charge of the poolroom.

Things went smoothly enough until noon. After lunch Dan and Fred showed a disposition to mope. Howard, alive to the situation, made a great deal of fuss over a long black cigar. He was careful to sit to windward.

Finally Dan yawned lazily. "Guess I'll go take a snooze," he remarked. He rose and ambled out of the room.

Fred, thus deserted, amused himself with solitaire. It was but half an hour later, however, that Dan reappeared, ostentatiously rubbing his eyes. "One thing about sleeping in this dump," he remarked; "the wind sure rocks you to sleep."

Fred eyed him suspiciously. "Sleeping or smoking?" he asked directly.

"Smoking—at ten dollars a throw?" exclaimed Dan. "Not on your life. You can buy off for seven fifty though," he added.

Fred grunted, and the matter was dropped. A gentle game of freeze-out was started, which continued through a drowsy afternoon until someone discovered that the hotel deck was short an ace.

Again Dan rose. "Beats all what a sleepy country this is," he yawned, stretching languorously. Without another word he strolled stairward.

Fred watched him out of sight and then stared at the spot where he had disappeared. Suddenly he rose. "Come on, son," he said. "I'll stage some fun for you."

A Perfectly "Legitimate" Business Deal

I followed him on tiptoe over the creaky boards. Dan's room was on the second floor, in front. But Dan had locked the door, hung his hat on the knob to cover up the keyhole and stuffed a towel in the crack at the bottom of the door. Suspicion became a certainty. Dan was smoking. How to prove it?

Fred was equal to the emergency. I followed him to the hardware store where he bought twenty feet of stout manila line. Then we cautiously proceeded to Fred's room, which, as he had in mind, was on the third, directly over Dan's. Inspection from the street had showed that Dan's curtains were up, and hence Fred's plan.

Fred tied the rope to the iron bed, after bracing it crossways of the window, and with a prodigious wink at me slowly vanished over the edge. I looked out cautiously and suddenly felt a commotion beneath me. A heavy step, a slamming door, hurrying feet on the stairs, and into the room burst Dan, a half-burnt cigar still in his mouth. Brushing me aside, he leaned out of the window.

Fred, already aware of the harm his waving foot had done, had begun to scramble up. He stopped when he saw Dan.

Dan took from his pocket the long crescent-bladed pocket knife he carried, and opened it. Bending over the sill he held the knife against the taut rope.

"Say, Fred," he observed, "I got a mighty good knife here, I'll sell cheap." Fred looked down, and then up again.

He grinned. "How much you want for it?"

"Well," replied Dan slowly, "a new one will cost me five bones. You can get six cigars in this man's country for a dollar, and I guess maybe I owe you ten. Suppose I let it go at sixteen dollars?"

Fred's grin was a bit forced, but his eyes twinkled. "Seems like I just got to have that knife" he observed, "and I'll take your word for its being sharp."

So passed the idle days in Skagway.

On arrival in Dawson I obtained the job as fireman on the night shift. This gave me an excellent opportunity to become better acquainted with the drillmen. I was impressed with their loyalty and willingness for hard work. I enjoyed their whimsical humor. All outdoor men are fond of grotesque exaggerations.

THE MANUFACTURE OF ALCOHOL AND DREAMS

Tilting back in his chair, one night, Fred began: "Down in Alamogordo, New Mexico, a town so dry that even the drug store is closed Sunday afternoon, there was an old fellow with a reputation for knowing more ways to make booze, private like, than any camp cook in the state. Give him a quarter—and all he did was beg 'em—and he was independent of the dry laws. Old Al (his name was Al Hall, but they sometimes called him 'Alcohol' for short), I say old Al would go down to the grocery store and buy 15 cents' worth of sugar and a dime's worth of dried prunes. Then he would go to his cabin, and about the second evening after he would stroll up town, a trifle unsteady, with as much alcohol in him as 50 cents would buy in a drug store.

"This was amusing for a while, but quarters got kind of scarce when we saw Al was a plumb dead beat and never did any work. He had been without even a bottle of lemon extract for a week, when Nightmare Jenkins, from Silver Cloud, blew into town. Nightmare was a rich old codger who believed in dreams. He spent all night dreaming and all day following the hunches the dreams gave him.

"Al, soberer than usual, came to Nightmare all serious like and told him he had dreamed a dream. Nightmare listened very earnestly to this alleged dream. It was to the effect that six hundred feet into the hill back of Nightmare's cabin was a fabulously rich vein of gold ore. Al told it all with fixings, which, while delirious enough to me, seemed meat and drink to old Nightmare. He gave Al over a dollar in small change. Al withdrew to prepare some more of the stuff of which dreams are made, and Nightmare hurried off home.

"Three months later he came to town again and announced that he was three hundred feet into the hill and had some fine stringers. We asked him about the outcroppings, but found he hadn't worried about these. He trusted Al, asleep, when he wouldn't have paid any attention to him awake. In spite of the fact that there were two good mines not far from Nightmare's place, we see where he was sure playin' the fool.

CONSTRUCTING A TUNNEL IN AIR

"A month later to a day in blows Nightmare. 'How's the mine?' we asked. 'Well,' says Nightmare, 'if I can get timbers long enough, I'll be in pay in another month.' 'Timbers! what do you mean?' asked Doc Wright, 'Well, you see,' says Nightmare, a mite shame-faced, 'the tunnel come plumb through the hill at 380 feet and I've got to continue it on a trestle.'

"Yes sir," continued Fred, "that darn fool had put a hole through the hill and was figuring on continuing the hole through the air for another 220 feet just because poor old dead-beat Al had lied about a dream for the price of the makings—fruit, sugar and yeast."

"How far did he carry it?" asked Dan, opening a can of peaches.

"At six hundred feet," said Fred, "he ran into an outcropping on the next hill that ran seventy dollars a ton."

There were several moments of silence.

"What became of 'Alcohol'?" I asked.

"Well, sir, would you believe it," continued Fred, "Old Nightmare gave him a pension of one dollar a day and he bought some clothes, spruced up a bit and, as I said before, come to life. He died not long ago though after he came on evil days again. It seems like some mining engineer showed him how to make alcohol out of sulphuric acid, lime, yeast and the San Francisco Sunday paper, and his last words were to the effect that he oughter have left out the comic section."

A GOLD PROPOSITION

"Times up," said Dan. "Let's go back to work." Absence of sarcastic comment told me that Fred's story had passed muster—in fact, was either fairly new or well told.

An hour or two later we started to pull casing. We were well down in bedrock, and the bottom length of pipe came slowly, an inch a minute. Slack had to be taken up only occasionally, and we all gathered around the boiler to leeward from the cool morning breeze.

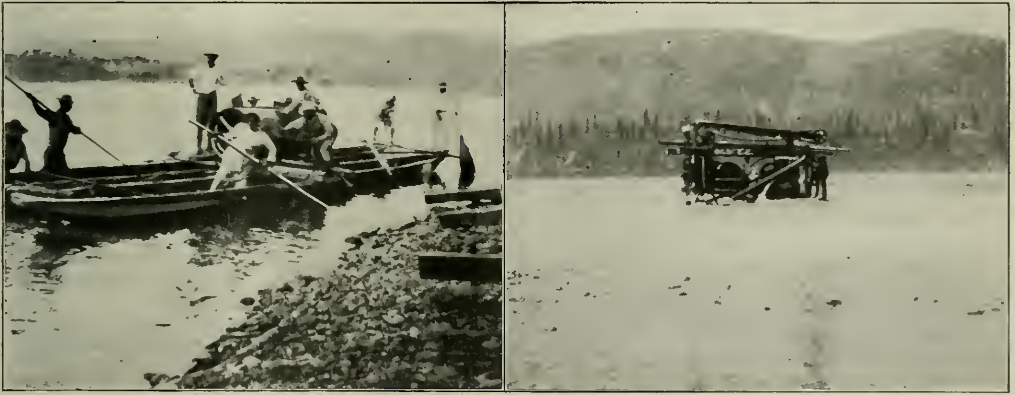
"If some of these dead beats would use their brains like an honest man," observed Dan, "they could make big money. But it seems as if they prefer to catch a nickel rolling up hill to a dollar rolling down. I was in Montana last year," he continued, "just getting ready to come back to San Francisco, when a real-estater put up a proposition to me that sounded sort of interesting. He got me into a corner of the bar one night and told me a wonderful thing. It seems like he'd been out from town in his wheezy old automobile and had got lost. Finally, on an abandoned road his radiator run dry. An old farmhouse showed over the crest of the hill, so he walked over there with his canteen. The place was abandoned, but after some searching he found the well. The creaky windlass was noisy but working, and he pulled up the chain and bucket. What do you suppose he found? Why, the iron bucket and as much of the chain as had been in water was plated a quarter of an inch thick in gold! Excited? He was so breathless when he got through he had me a bit nervous. Nothing impossible about it in a highly mineralized country like that part of Montana—so he said. Could he find the well again? Of course he could. How much did he want to show it to me? One-tenth of all I made out of the proposition, me to pay expenses and a fair rate for his auto while we drove out on the two-day trip to the old well. Sounded reasonable enough, so I took him up." Dan paused, ostensibly to light his pipe.

"What did you find?" I asked.

"Well, I found his bill for auto hire was 75 dollars, besides gasoline and grub, after five days' search. And when I stepped on the Pullman I found him buttonholing a newcomer, telling him just as breathlessly about the wonderful well."

"Dan," said Howard, "slack needs taking up."

Another night on the same trip brought forth a typical example of Dan's Munchausen-like humor.



TRANSPORTING A DRILLING MACHINE IN COLUMBIA—THE SAME MACHINE A YEAR LATER, FORDING THE CHISTOCHINA RIVER IN ALASKA

"I hear the Natoma dredges are having trouble with clay," I remarked. "They say that the water thickens up almost to a mud and the dredge pumps wear out in a few weeks."

"Yes," observed Howard, "all the Philippine dredges have the same trouble. Once I saw a nigger drop a bolt overboard, jump over and grab it before it sank and then jump back on deck again."

Sprinkling Dredge Ponds in Columbia

There was a moment's silence. We looked at Dan. "Those dredge ponds in the Philippines are muddy, all right enough," said Dan, slowly puffing at the plug cut in his pipe, "but the pond at the Pato dredge in Colombia was just a bit thicker than I have ever seen— if you can call it a pond. In fact, when I first arrived it was so thick that they could not row the boat from the bank to the dredge—they had to pole it. Before I'd been there a week they put wheels on the bottom of the old scow, so that they could make better time. Yes," he went on, "they almost lost their pond before the rainy season set in."

"What do you mean?" I asked.

"Well, it got so blamed thick, so much clay and so little water, that it used to get dusty, and if they had not sprinkled it every noon 'twould have blown away in the afternoon breeze. That thicker'n them Philippine ponds?" said he, turning to Howard.

Howard chuckled. "I've got to admit it," he replied.

Some Methods of Salting Placer Properties

Outdoors, on their own resources, spending the summer in Colombia and the winter in Alaska—or vice versa—the drillman develops inevitable characteristics. He is self-reliant and, though often uneducated, a good mixer. He knows how to meet people. He makes a friend of the locally hired water-boy or of the mining engineer who employs him. His loyalty is unquestioned. He has been tempted, but the lore of the profession cites no example of dishonesty. On the contrary, the keen watchfulness of a drill crew has more than once foiled a skillful attempt at salting.

It is a far more difficult matter to salt a placer property than to give fictitious values to a quartz mine, in spite of the fact that two cents' worth of gold per hole would usually be ample. The pumpings from the drill must receive the added gold at once. There is usually no long journeys to the assayer, with its attendant perils. The panner tests the pumping at once. The salting must be done in the presence of the drill crew. The gold must be of the same color and quality as is being found in the ground. The salting must be done at the right depth, and the drill man is never communicative about such a matter. The driller, if at all suspicious, takes the precaution to put a shovelful of barren dirt down the casing when he quits work. The next morning he pumps that out and pans it.

In spite of these difficulties two clever schemes to salt dredging properties have nearly worked, and in both cases the sharp-eyed drillman foiled the dishonest promoter.

Up in Idaho some years ago a prospecting party put down six barren holes. The seventh hole was a wonder—gold from the grass roots to bedrock. So was the eighth. The engineer in charge was puzzled. Such even distribution of gold through the gravel was without precedent. The ninth hole—running something like a dollar a yard—decided him. He was being salted, but he couldn't imagine how. The loyalty of his crew was beyond question, so one evening he took them into his confidence, telling his suspicions and frankly confessing his inability to guess any possible way for an outsider to achieve such results.

Gold Dust in the Drill Rope

The drillman, an old-timer from Oroville, spoke up. "I've often figured," said he, "how a crooked owner could salt a hole on me. I believe there's only one way to do it—to get the gold even-like through the dirt. If some galoot drove dust into the drill rope, the pounding would loosen it gradually, and every jolt would drop a flake down the hole."

The idea appealed to them so much that they took a lantern, walked over a mile to the drill, and by a careful scrutiny verified their suspicions. The property was turned down next day.

But there is another way to salt a drill hole—even a cleverer one. A California property was once drilled. The results ran a trifle under 10c. per yd.—just enough to put it in the doubtful class in those days. The owner tried his best to get the option taken up, but the company which did the drilling was undecided. They determined to drill more closely to banish their doubt.

From the very start the new holes were better. A heavy concentration on bedrock was reported by the panner. Check holes were put down six feet from some of the former holes. The same unusual values on bedrock appeared. Another mining engineer was sent to the property in consultation. The owner of the property was there also—in evident anxiety as to the results. He kept away from the casing, only peering into the pan at times. He was unobtrusive, and while salting was thought of, no one really suspected the man.

One day a hole was just being completed. The panner was at work on next to the last pumping. The owner stood idly by smoking a cigarette, looking into the pan. Suddenly the drillman leaped over the sand pump and grabbed the cigarette out of his hand. The owner turned white, then without a word turned and walked quickly away. Examination proved what the driller had shrewdly guessed at—the cigarette was rich with gold dust. The ashes, innocent enough in appearance, falling into the pan, had doubled the real results.

That ground is now being dredged, but the values are under ten cents.

A Dynamite Story

My last job with Dan was in a little Oregon town. The story of our parting will bear telling. I was to leave first; the others were to drive the drill to the railroad. The stage was to leave at 6 o'clock in the evening, and I had packed and gone downstairs in the hotel to the room that was office, bar, cardroom and parlor all in one. It was a bitterly cold night outside. The entire male populace of the village was close to the red-hot airtight stove. Henry Adams, the teamster, whose uncanny marksmanship with tobacco juice fascinated me in spite of myself; Bill Edwards, whose wife supported him by working in the hotel kitchen; Swen Matsen, whose beautifully stained whiskers set the standard even in this bewhiskered community; Gus Leiber, who did odd jobs at blacksmithing back of his little bakeshop—all formed a charmed circle around the stove and sawdust box.

I leaned against the bar, waiting for Dan to return. But it was Howard who blew in with a gust of chilly wind. He joined me and, with a mysterious twinkle in his eye, started to speak. Just then Dan came in, a lunch pail in his hand. We three chatted together, the group around the fire paying us no attention.

"What you got there in my lunch pail, Dan?" asked Howard.

"Some dynamite that I'm returning to the store," said Dan. "One stick was enough to loosen the drillstem." Then he added, "Where do you get the idea that's your bucket?"

"Guess I know it by the dent in the top," said Howard. "I'll have to ask you for it."

Dan's voice grew a bit louder. "Look here, once and for all! this is my pail, full of *my* dynamite, and no freckle-faced mud grubber is going to get it away from me!"

The mossbacks around the stove were listening now. It looked like things might take an interesting turn. I was aghast—never before had the men exchanged unfriendly words.

The Pail of Dynamite Goes Into the Stove

Howard stepped forward, his fist clenched. "Keep your powder sticks," he said slowly, "but to save trouble, *give me my pail.*"

Dan was white. "Howard," he said grimly, "you're plumb mistaken. You can't have that pail."

The room was quiet, except for the heavy breathing of the excited spectators.

Howard, silent and tense, stared grimly at Dan. Suddenly he stepped forward and spoke sharply. "Dan," he said, "nobody but me is going to have that pail"—and he grabbed for it.

Dan thrust out his arm. "*Then nobody'll* have it!" he roared, and stepping back, he opened the stove and threw in the pail.

Crash! The chairs of the charmed circle went over backward in unison, and every head hit the floor at the same instant. Men began to run before they got to their feet. Some took no time to rise, but scuttled for the door on their hands and feet. Bill Edwards took three steps in the same spot on the sawdust-covered floor before he got traction enough to begin to gain any momentum. Nobody said a word—there wasn't time. Adams went through the window—or would have if his foot hadn't caught. I was too scared to run—until I looked at Howard.

Howard was laughing, more than laughing. He was hysterical. He pointed a wabbly finger at Henry Adams' shoe, hanging to the window sill and, bent double with merriment, laughed himself breathless. Dan sank into a chair, and his big bluff roar of laughter brought the scrambling mob at the door to their senses. And it was the contagion of his laughter, together with the presence of mind of the barkeeper in "setting them up," that prevented the massacre of the practical jokers.

When I meet Dan again, we'll sure squeeze a lot of joy out of the recollection of that night.

Events and Economics of the War

The Food Bill is signed, and Hoover is ready to buy the new wheat crop for the Government. The $2,000,000,000 tax bill is now chief among the measures before Congress. A $6,000,000,000 bond issue is sought by McAdoo. The Trade Commission expects shortly to complete its work of determining costs. Selection of conscripts proceeds with little disorder, and the first contingent is to mobilize on Sept. 1. The regular army, recast on the Allies' model, is now at war strength.

On the battlefronts the Canadians have pushed closer to Lens. The Russian defense has stiffened but the Rumanians have been defeated by Mackensen. In England, an Admiralty shake-up and Henderson's resignation from the Cabinet are the only occurrences of note. In Russia, Kerensky has formed a new cabinet. The new foreign secretary in Germany is said to oppose the submarine policy but liberals are ignored in the Prussian cabinet. Peace proposal was sent Aug. 14 by Pope Benedict to belligerent and neutral governments.

Hoover Plans Control of Harvest

Food Administrator Herbert C. Hoover recently announced his plan for control of the 1917 wheat harvest in a lengthy statement the salient points of which are grouped by the New York *Times* as follows:

"With a view to determining a fair price, the President has approved the appointment of a committee to be selected from representatives of the producing sections and consuming elements in the community. The committee will be assembled under the chairmanship of President Garfield of Williams College, and it will be the duty of this committee to determine a fair price for the 1917 harvest.

"Upon the determination of this fair basis, it is the intention of the Food Administration to use every authority given it under the bill and the control of exports to effect the universality of this fair basis throughout the whole of the 1917 harvest year, without change or fluctuation. It should thus be clear that it will not be to the advantage of any producer to hold back his grain in anticipation of further advance, for he will do so only at his own cost of storage and interest, and if it is necessary for the Government to buy the entire wheat harvest in order to maintain this fair price in protection of the producer, we intend to do so.

"Furthermore, the holding of wheat or flour contracts by persons not engaged in the trade, and even when in trade, in larger quantities than is necessary for the ordinary course of their business, is unlawful under the Food act, and such cases will be prosecuted with vigor. We would advise such holders to liquidate their contracts at once."

The plan provides that "in order to eliminate speculation in wheat and flour, all elevators and mills over 100 bbl. daily capacity will be required to take out a Government license, the conditions of this license to be: That only reasonable and customary charges shall be made for warehouse service; that no wheat shall be stored for more than 30 days without the approval of the food administrator; that certain information as to receipts and shipments shall be supplied regularly.

"The grain exchanges are being asked to suspend all dealings and quotations in future wheat. These regulations will come into force Sept. 1, and the licenses will be prepared this week.

"While farmers' coöperative elevators are excepted by the food bill, this, however, only applies to mutual concerns, and not to stock companies, and in any event, under the advantage of joining the plan, none are likely to stand out.

"In substitution for the broken-down marketing machinery, the Food Administration proposes to open agencies for the purchase of all wheat at the principal terminals, carrying on its transactions with the usual dealers, and is prepared to take the whole harvest if necessary, in order to maintain a fair price; and will resell wheat for export in such quantities as we can afford to part with in protection of our own people, on the one hand, and to sell, on the other, to the millers for domestic consumption.

"The Administration will make no charge, except a nominal percentage to cover costs of the operation, and arrangements will be made which will assure the Government against loss.

"In order that nothing shall be left to mischance, we are setting up a properly constituted and independent auditing committee, which will check all transactions at every point."

Adjustment of Labor Disputes

A labor-adjustment commission will be created by the Council of National Defense. The council's decision was made after consultation with Samuel Gompers and other labor leaders and has been approved by the President. The important details of the council's statement are summarized here:

There shall be created a Labor Adjustment Commission of nine members, three representatives of the Government, three representatives of employers and three representatives of labor. The commission shall have jurisdiction over all disputes concerning wages or conditions of employment in all establishments having contracts with the Government, and shall hear and determine all labor disputes in which more than 1000 workers are directly affected, and may in its discretion hear and determine labor disputes in which less than 1000 workers are directly affected. It shall also have authority to appoint committees to hear and determine such labor disputes as may be assigned to them by the commission, where less than 1000 workers are directly affected, such committees to be representative of the same elements as the commission. The awards of the commission or committees appointed by it shall be made in each case not more than 30 days after the case has been submitted and shall be binding upon the employer and employees in the plant affected for period expressed in the award, but not longer than 60 days after the close of the war. In all hearings employers and employees affected shall have the right to be represented by such persons as they may select under rules the commission may prescribe.

Whenever a labor dispute arises in any establishment under contract with the Government and a strike or lockout seems imminent, the Department of Labor may on its own initiative or at the request of the employers, employees, or department whose contract is affected appoint a mediator to bring about a mutually satisfactory adjustment of the dispute. If the mediator thus appointed is unable to bring the employers and employees to a mutual agreement, the question in dispute shall be submitted for adjudication to the adjustment commission, work to be continued pending its decisions. Every contractor and subcontractor shall agree to accept and abide by the decision of the commission or committee, and every worker accepting employment in any plant within the jurisdiction of the adjustment commission shall accept and abide by the decision of the committee.

Saving of Manganese Alloy Urged

Ferromanganese receipts from Great Britain are rapidly declining, and the situation confronting the steel industry of the United States is not so assuring as it was, says *Iron Age*. With submarine sinkings of 2000 to 3000 tons (of alloy) in the last two months and with an evidently more acute situation in England regarding supplies of manganese ore and metal to meet the increased demands of the steel industry there, future imports from that source are not likely soon to resume the rate needed to meet our total needs of 28,000 tons per month. The May and June available supplies were less than 23,000 and 24,000 tons respectively. The indications are that the July supplies will not be any larger than those of May and June.

In view of these facts the Alloy Committee of the Council of National Defense has notified the steel industry that all possible conservation of the alloy must be practiced and urges a more liberal use of spiegeleisen where at all feasible.

This unexpected development again brings up the question of a way to met the situation. It is generally accepted that metallurgically there is no complete substitute for manganese in the important rôle it plays in steel. In practice it is found that only the high-percentage alloy is efficient. Both ferromanganese and spiegeleisen are high in carbon. Were lower manganese alloys available, having a low-carbon content, they would probably be nearly as satisfactory and find a wide use.

A solution of the problem which holds out some hope is the conversion of our plentiful manganiferous iron ores into a low-carbon manganese-iron alloy. Blast-furnace reduction does not meet the problem. The electric furnace may perhaps solve it. The suggestion of intensive and prompt research with a view to ascertaining whether such ores cannot be electrically converted into low-carbon manganese alloys might well be acted on. Such a metallurgical process, successfully carried out on a commercial scale, would be of incalculable value to the steel industry of the United States and perhaps render us independent of foreign sources for manganese. It at least deserves investigation.

Limited Power of War Industries Board

What the new War Industries Board may accomplish is outlined in a bulletin issued by the United States Chamber of Commerce. It is explained, however, that this bulletin is written and issued solely on the responsibility of the National Chamber Committee.

The War Industries Board not being an official department of the Government engaged in procuring war supplies, says the bulletin, the Board will not have problems presented as they arise, but only as they are referred or may be known after they have developed. When it reaches decisions, it will have only indirect means of putting them into effect.

Nevertheless, it will undoubtedly accomplish a great deal. The problem of a general basis of prices on war materials and supplies for the Government and the Allies is already under consideration, and a satisfactory conclusion may be anticipated. Also, regarding priorities on Government contracts, improvement in conditions may be expected. It is difficult, however, to see how the board, with its present function, can bring about such concentration of effort in buying as exists in the English Ministry of Munitions, or how, without delay and lost motion, the industries of the country can be brought to an output of materials and supplies to meet the war needs of our Government and the Allies.

More and more it becomes evident that here, as in other countries at war, the normal business life is so disrupted that concerted action is necessary to prevent a breakdown in the distribution of the country's output. Continued reliance upon uncontrolled prices as the basis of distribution in war is producing harmful results. As a step toward concerted action that will avoid such results, the War Industries Board must receive a hearty welcome. It will accomplish much and will develop the need for a board with power—not power which comes from friendly coöperation, but real power which compels action and can be judged by results.

Those who have in mind that the only legal function of the Council of National Defense is to investigate, report and make recommendations, will readily appreciate that a War Industries Board created by it can have no direct powers.

War-Time Substitutes May Remain

An important matter that concerns many is the changes that will result from the economies practiced as a result of the war, says *Iron Age*. There is no reason to suppose that the old ways will be returned to after the war. If the use of a farm tractor (for example) is commenced on account of scarcity of men and horses, it will not be abandoned when men and horses become more plentiful.

In the automobile field, the necessity for economizing gasoline will produce a trend toward vehicles whose specialty is economy in gasoline and to those that use kerosene. (And now we read of busses being run in London with real "gas.") Necessity is the mother of invention and many of these inventions, once introduced, will remain in use. It is clear that economies forced by war will have important after effects. Those who look forward to the end of the war with the idea that they will then resume "business at the old stand" are in danger of experiencing a rude shock. It is impossible to predict what will occur, but it is safe to assert that few things will be the same after the war, and the trends should be studied carefully from day to day.

Priority of Shipment and Manufacture

The Priority Shipment Bill is ready for the President's signature. Under its terms, says the New York *Times*, the President is empowered to order, through the Interstate Commerce Commission or such persons as he may designate, that preference be given by common carriers in the transportation of such commodities as he may deem essential to the national defense. Provision is made for the maintenance by the railroads of a central board at Washington, such as the existing Railroads' War Board, to carry out the President's priority orders. Obstruction or interference with the orderly movement of interstate or foreign commerce is forbidden under penalty of fine and imprisonment, but there is a provision that nothing in the bill shall be construed to repeal or modify that section of the Clayton anti-trust law which allows labor to strike peacefully to secure its demands.

The broader subject of priority in manufacture is dealt with in a bulletin issued by the Railroads' War Board. While the War Industries Board is determining what should be done in this country regarding priority, says the bulletin, it may be well to present to business men what has been done in England toward solving the problem as it exists there.

The priority branch in England has for its function the bringing about of harmonious action between the different departments of government, the railroads, mines and other quasi-public service and approved industry. These public interests were prior to the creation of the committee, in competition among themselves for their share of raw materials, manufacturing capacity, and labor of the country.

The committee meets every day, and no priority can be granted unless all present agree. One objection rejects an application, but this decision is not final. The manufacturer is not compelled to accept work from the government. When a manufacturer accompanies an order to another manufacturer with a certificate which would entitle the order, if accepted, to priority, the manufacturer to whom the order is tendered need not accept it unless he desires to sell. There is, however, strong indirect pressure to accept priority orders because they give assurance that steel and other scarce raw materials may be secured, that transportation will be afforded, and also that a plant engaged upon priority work will have an adequate supply of labor.

The priority committee orders from time to time that no scarce materials shall be used except on war work or other work of national importance. The steel controller receives weekly reports from rolling mills giving the schedule of rollings, actual rollings, shipments, and of great importance, a statement of reasons for retarded output. The reports require the name of each customer and the priority class in which the order is entered. The committee thus has actual control over all work done in the steel business.

Reports are required of all stocks in Great Britain of certain listed scarce material, and from time to time the Minister of Munitions takes possession of all stocks of certain character. This has been done with regard to brass, brass scrap, copper and copper ore.

War Census of Geologists

WASHINGTON CORRESPONDENCE

A census of the geologists of the country is now being made by the United States Geological Survey in coöperation with the geology committee of the National Research Council and the Association of American State Geologists. Blanks are being mailed to geologists to be filled in with such data of their careers as will enable the Government to know what resources it has at its disposal in this particular field.

The first inquiries are being mailed to members of the Geological Society of America, to Section E of the American Association for the Advancement of Science and to the Association of American Geographers. It is asked that individual geologists and geographers send in the names of those who may not be members of societies. In this way it is believed that a list including practically all the geologists in the country can be compiled. The experience of the Bureau of Mines in compiling a list of the mining engineers brought forth the fact that many additional names will be submitted by those answering the inquiry. The Bureau of Mines sent out 5000 blanks, but received 7500 names of engineers.

Redistribution of Freight Cars

Reports from the Car Service Commission, says a bulletin of the Railroads' War Board, show that orders have been given to 36 separate railroads to ship immediately 68,814 freight cars to 54 other railroads. These cars are being moved without load and in the quickest possible time.

The reports show further that 46,682 cars have actually been received by the roads for whose benefit this arbitrary movement is ordered, and that 51,795 cars have already been delivered by the initial roads to intermediate lines in the direction of ultimate destination. To move freight cars from one road to another regardless of ownership is something new to American usage.

Among the immediate and important results of this redistribution of cars are the following:

Within 30 days from the date that the Government placed its first orders for cantonment materials, the railroads have delivered more than 12,000 car-loads of lumber and other building supplies to the 16 cantonments under construction. Additional trains, loaded to capacity with lumber, bricks, piping and all other materials needed to construct cities capable of accommodating 40,000 inhabitants, are arriving daily.

To the MINER

To the miner let me say that he stands where the farmer does; the work of the world waits on him. If he slacks or fails armies and statesmen are helpless. He also is enlisted in the great service army.

Woodrow Wilson

DEPARTMENT OF THE INTERIOR
Franklin K Lane, Secretary

Drilling Contest at Tonopah

In the old days, what mining camp did not have its drilling contests, where the "boys" pounded steel, single-handed or double-handed, not only for the prizes offered and for the glory of winning, but for the downright fun of it, and what a transfer of wages took place after it was all over! Even the faro bank and the roulette wheel were neglected while a contest was on.

Tonopah celebrated the Fourth and fifth of July with a drilling contest, brawn giving way to the more modern method—the machine.

Prizes, $400 to the winner, $300 second, $200 third and $100 fourth, were offered to the man who could drill the deepest hole in 8 min., including time required for coupling air and water hose; 95-lb. air and about 70-lb. water pressure were furnished, and the contest was open to all who had resided in Esmeralda or Nye County for a period of 90 days prior to the contest.

MACHINE-DRILL CONTEST AT TONOPAH, NEV.
July 4 AND 5, 1917

Name	Machine	Inches Drilled	Bit Used
Thomas Bacho	Ingersoll-Rand	41⅛	Carr
George Lynch	Denver Rock Drill	44 13/16	Carr
W. R. Marshall	Ingersoll-Rand	52¼	Carr
Harold Hanson	Ingersoll Rand	46¼	Carr
James E. Martin	Ingersoll-Rand	44½	Butler
Charles Dahlin	Ingersoll-Rand	48¼	Carr
J. D. Perovitch	Denver Rock Drill	44⅛	Carr
James Burke	Sullivan	58⅞	6-point starter, Carr finisher
Bert Conley	Ingersoll-Rand	27 15/16	Carr 1st and 2nd, 6 point finisher
Charles Lefevre	Sullivan	42⅝	6-point starter, others Carr
J. W. Stevens	Ingersoll-Rand	54 11/16	Carr
W. E Johns	Cochise	26½	Carr
Oscar Ryden	Ingersoll-Rand	53⅛	4-point Carr
Samuel Hodge	Ingersoll-Rand	52½	Ordinary 4-point
Albert A. Clute	Ingersoll-Rand	52⅝	Ordinary 4-point
Benjamin Richardson	Denver Rock Drill	51¾	Carr
Isaac Hill	Cochise	36½	Carr
Mike Chorovich	Cochise	28⅜	6-point starter, others Carr
Victor Mandich	Ingersoll-Rand	48¼	Carr
E. Carlson	Ingersoll-Rand	49¾	4-point starter, others Carr
Mark Leetich	Ingersoll-Rand	57¾	Ordinary 4-point
(Drilling off third place)	Ingersoll-Rand	60⅜	Ordinary 4-point
Bernard Barry	Ingersoll-Rand	53 15/16	Ordinary 4-point
Andrew Loukkula	Ingersoll-Rand	48⅜	Ordinary 4-point
H. Harper	Ingersoll-Rand	55¼	Ordinary 4-point
Adam Ogi	Ingersoll-Rand	57¾	Ordinary 4-point
(Drilling of third place)	Ingersoll-Rand	56⅜	Ordinary 4-point
Oscar Rivi	Ingersoll-Rand	61 7/16	Carr
T. M. Spencer	Ingersoll-Rand	37¾	Carr
Bert Wilder	Sullivan	48½	Carr
J. S. Williams	Ingersoll-Rand	45 13/16	Carr
John Zeuker	Denver Rock Drill	41 11/16	Carr, 4-point
J. E. Dunlap	Denver Rock Drill	43 7/16	Carr
Jalmar Maki	Ingersoll-Rand	54	Carr
Abe Farrow	Denver Rock Drill	26¼	Carr
William Johns	Denver Rock Drill	43¾	Carr
Harry Koocher	Ingersoll-Rand	53 15/16	Carr

Winners		Prize	Distance Drilled, In.
First place	Oscar Rivi	$400	61 7/16
Second place	James Burke	300	58⅞
Third place	Mark Leetich	200	57¾
Fourth place	Adam Ogi	100	57¾

There were 42 entries, and 35 finished; machines up to 2½-in. cylinders were allowed. It was not a machine test, but a go-in-and-win-with-whatever-machine-you-may-have contest.

A coach was allowed each contestant (but not to assist with anything but advice) and Rocklin granite from California was provided for the contestants to work on.

The accompanying table gives the results, which being reduced show:

Deepest hole drilled by winner, 61 7/16 inches.

Shallowest hole, 26¼ inches.

Average of 37 holes, including two drilled for tie for third place, 47⅓ inches.

Mean, between deepest and shallowest hole, 43 31/32 inches.

Number of holes drilled, which exceeded the general average, 21.

It is interesting to note that the distances drilled are greater than those made by hand-work in double the time, the connecting of the air and water hose requiring about ½ min. In other words, the one-man machine does twice the drilling of the best pair of the old-time hand drillers. It is hoped that other districts will follow the example of Tonopah.

Research Work of the Experimental Stations of the Bureau of Mines

WASHINGTON CORRESPONDENCE

Experiments with low-grade and complex ores at the Salt Lake City station of the United States Bureau of Mines have reached the stage where work on a commercial scale is taking the place of the laboratory work which has been in progress.

At the Seattle station every effort is being made to push forward as rapidly as possible the ambitious program that has been mapped out. The University of Washington is coöperating with the Bureau of Mines in the study being made of electrometallurgical problems. One of the interesting subjects receiving attention at present is the waste tin-can problem. This work involves the study of the volatilization of tin, lead and zinc and the bringing of residual steel to "pitch." It also involves the treatment of flue dust. The work is being done with an oil reverberatory furnace. As a result of the existing need, special efforts are under way in the hope of devising means to make available the low-grade chalcopyrite-pyrrhotite ores of the Northwest.

Thomas Varley, recently made superintendent of the Seattle station, is devoting a considerable portion of his personal attention to the study of gravitation processes of ore treatment, while Will H. Coghill is specializing on flotation processes.

The scope of the work being conducted at Moscow in coöperation with the University of Idaho will be limited at present to a study of ore-dressing problems and the prevention of mineral waste. C. A. Wright, until recently connected with the Salt Lake station, has been placed in direct charge of the work at Moscow. A preliminary survey of the Idaho mining districts is being made by E. K. Soper, the bureau's consulting metallurgist. Messrs. Varley and Wright are accompanying him on many of these trips.

The coöperative work with the Oregon Bureau of Mines and Geology includes ore dressing, hydrometallurgical and coal-mining problems. R. R. Hornor, one of the bureau's mining engineers, now is in Washington, where he just has completed an inspection of the Springdale, Loon Lake, Chewelah and Northport districts to collect definite information regarding their low-grade ores. Mr. Hornor also has been inspecting black-sand deposits.

Arrangements have been completed whereby the station at Tucson will coöperate actively with the station at Golden, Colo., in a special study of the rare metals in the Southwest. C. E. Van Barneveld, the superintendent of the Tucson station, is at present engaged in the observation of copper-mining methods in the mines of Ray, Arizona.

Editorials

Through a Perspective Glass

THE course of prices, if left to themselves, is not difficult to forecast. There need not be all the present fuss about the subject and all the threats to tamper with the machinery, which is so disturbing business. If the perspective glass be turned on the several industries, we can obtain excellent pictures of situations that are perfectly normal. Let us regard the metal industries.

Turning first to zinc, we observe a metal in which the fire has burned out. It was the first to run through the gamut of extravagance and was the first to return to normal conditions. We do not mean normal as compared with before the war, but normal according to present standards. It will be remembered that long ago we forecasted the time when prices would settle upon a relatively high plane, upon which there would be no more profit in production than with ante-bellum conditions. In zinc that plane appears to be about 8@9c. per lb., compared with about 5c. before the war; that is, the present plane is about 60 to 80% higher, with producers making the same complaints of narrow margins that they used to at 5 cents.

This is the fixing of the price for spelter by the composite of opinion of all the people who are interested, which is expressed in the market according to the law of supply and demand, and it is a truer verdict than the Federal Trade Commission, or any other commission, ever will make. Unsold stocks of spelter have accumulated, the market has its normal balance wheel, and the Government has reverted to its old policy of asking for bids and awarding to the lowest bidder. Many producers have already closed their works. If the world needs more spelter than is being produced at present, it can get it only by raising the price so that idle plants may be operated profitably again. Yet it is scarcely 18 months ago that spelter was quoted around 20c. per lb. That high price destroyed itself. Such is the law.

What is true of spelter is also true, in the main, of several of the minor metals; namely, antimony, quicksilver and tungsten. It was true also of sulphuric acid until the interruption of ocean traffic checked the supply of raw material. In none of these things is there any need of price fixing. The market is taking care of itself. As compared with ante-bellum conditions the price for sulphuric acid is very high, but would it not be preposterous for anyone to talk about reducing that price just because it is high? On the contrary, the Government itself is moving heaven and earth to interest capital in the exploitation of new deposits, because it wants the raw material, and the high price is pointed out as the inducement.

Turning the perspective glass upon copper, we do not find that in the market for this metal there was any extravagant rise. In 1916 there was a quotational average of 27.2c., but the producers realized for the sale of their entire output not more than 25.7c. Looking back, we find, in 1906, a quotational average of about 20.5c. and an average of about 19c. actually realized. Considering the increased cost of production, the price of copper was, perhaps, no higher relatively in 1916 than it was 10 years previously with purely industrial conditions, but the profits of the producers were enormously enhanced by their ability to sell a great deal more copper. However, at the end of 1916 the copper position seemed to be tottering on the verge of a gradual decline that would be attributed to increased production. The expected increase did not happen, however, owing in the first place to labor troubles at the refineries; in the next place to increasing inefficiency of labor; and then to additional delays in the providing of new capacity. Finally, the general strikes at the mines, reducing the supply of crude copper and compelling refineries to be closed, produced an actual shortage of copper and consequently strengthened the statistical position of this metal. Manifestly, the most important thing at present is to encourage production in all possible ways, not to discourage it. The serious curtailment of production, however, already experienced is directly attributable to the fear that a low price for copper named arbitrarily by the Government would necessitate a reduction in wages at a time when cost of living continues high and is even advancing.

Lead exhibits conditions peculiar to itself. A large part of the production of this metal goes into consumption on average price contracts. The Government seems to be requiring about 8000 tons per month, or about one-sixth of the domestic production of lead, which must be taken out of the small quota that the producers have free from contracts. The producers and the Government having fixed a price of 8c. by agreement, the price that demand and supply determines for the remainder of the output is at present about 3c. a lb. higher. This is a case where the subtraction of a large supply by the Government causes the public to pay an enhanced price for what is available to it. The situation is aggravated by the average-price contracts, which results in the market being made really on the sale of a very small proportion of lead. The large producers have for a long time been disinclined to strangle their customers and have endeavored to restrain the advance in the market, but it could not be done, and the price determining the settlement of the average-price contracts had to move up in conformity with the price made for the free lead.

Manifestly, that which the producers themselves have failed in doing—namely, the fixing of a lower price for lead and maintaining it—cannot be done by the Government, unless the Government decrees that lead shall no longer be used for certain purposes of consumption. That would work great hardship on many people, some of whom would be crippled in business, while others would be ruined. Left to itself the market is saying who shall have lead and who shall not by determining a price that can be paid only by those who need it most. Clearly, what is needed in the lead industry is more production, not interference. There are two eminently practical things that can be done by the Government in this industry at this juncture: (1) It can make a statistical survey of consumption and urge economy in use of the metal for purposes where not indispensable; can urge people to postpone repainting their houses, for example, and thus can reduce consumption in the same way that Mr. Hoover is reducing the consumption of wheat. (2) Remove the duty on imports and admit the output of Mexico, which will immediately become a factor in our market. That would be a distinctly ameliorative measure.

The most embarrassing situation has been, and is, with iron and steel. For these products there has been a steady advance ever since the middle of 1915, which has but lately reached its maximum. In 1914 prices for iron products fell to low ebb. In 1915 there was a slow and steady improvement, but it was not until December that the price for steel billets rose above figures prevailing in 1913, an ante-bellum year. The great advance occurred in 1916, due to the enormous demand for shell steel, for ship plates, railway material, etc. Mills were utterly unable to take all the business that was offered. During the first part of 1916 this situation became worse, and we found bessemer pig iron in July at an average of \$57.45, against prices of \$15@\$18 prevailing before the war. Steel billets were at \$100, against \$20 before the war and even as late as the middle of 1915. Plates were 10c. per lb., against 4¾c. at the end of 1916 and ante-bellum prices ranging from 1 to 1½c. At the middle of 1915 plates were 1.16c., and at the end of 1915 they were about 2c. No other major industry, not even zinc, experienced any such inflation as this, which was manifestly due to the excessive demand on manufacturing capacity, for raw material rose in no such proportion.

With the United States entering the war at the very apex of this inflation in steel, and needing enormous quantities of the material for shipbuilding, shells, etc., it was but natural that objections should be raised to paying the extravagant prices prevailing in the market. In fact, the crest of the upward movement in prices had passed, or was passing. The natural law was operating in this industry just as in all others. On the one hand, the fabulously high prices were extinguishing consumption for domestic peaceful purposes. On the other hand, production was increasing, stimulated by the high prices. The production of steel ingots in 1916 was about 41,500,000 tons. The present capacity is estimated at about 50,000,000 tons, with about 3,800,000 tons building additional. No doubt, the President, or Mr. Daniels, or Mr. Baker will eventually be credited with having broken the steel market, but for weeks back it has been patent that prices had started downward and there would be no renewal of large buying until the market had descended to a lower level. While that was inevitable, however, the Government had already started upon an elaborate program, could not wait for what was going to happen and was bound to do something drastic. The rational thing to do will be for the Government and the steel makers to come together in some reasonable agreement and adopt some policy for the restriction of consumption that is not immediately necessary.

The enormous demands for steel and many other products have naturally been reflected in the coal industry. Although the supply of coal existing in the earth is abundant, although operators have endeavored to produce more of it, even to the extent of opening upward of 1200 new mines during the last year, the production has not increased very materially. In this industry the shortage of labor appears to be the governing condition. Not long ago, coal operators, under the leadership of Mr. Peabody, discussed conditions with representatives of the Government led by Secretary Lane, and both parties reached an agreement and fixed the price of bituminous coal at \$3 per ton, which is to be compared with about \$1.50 per ton in normal times. Considering the increased cost of production and the scale of inflation in all other industries, that does not look like an unreasonable price. However, the agreement on the part of the Government was repudiated by Secretaries Daniels and Baker, and the price of coal is now awaiting the arbitrary adjudication of the supreme powers. In any other country this repudiation of Secretary Lane would have been the occasion of a split in the ministry, but Washington does not apparently mind such things, although it is to be noticed that lately Secretary Lane has been less in evidence, which in itself is a cause for alarm, inasmuch as he is one of the few members of the Cabinet who has the confidence of all the intelligent people.

Just now, the country is confronted by a shortage of manganese ore and of sulphur ore. The prices for those raw materials have been bid up to high figures and those prices are stimulating domestic production in the desired way. In these cases Washington looks with distinct favor upon the operation of the law of supply and demand.

The Matter of Prices

WITH respect to the matter of prices, confusion in Washington seems to become worse confused. The President has been taking an active part in the discussions, but evidently he is as much confused as anybody and perceives that the matter is not so simple as it looked to him when he made his sentimental address to the people about a month ago. On Aug. 8 Judge Lovett in behalf of the purchasing committee of the War Inıstries Board, isued a statement to the public which mprised the following declarations:

> It is the purpose of the War Industries Board to carry t the policy recently announced by the President, and with ıich the members of the board are in complete accord, that the purchase of war materials in this country our allies all be charged no more than our own Government has to y.
>
> Guns and ammunition employed against our enemy are r our benefit as much when used by our allies as when ed by our own men, and it is obviously unjust to require r allies when fighting our battle to pay our own people ɔre than our own Government pays for the materials cessary to carry on the war.

With the above everybody will concur. Never in all e controversy heretofore has there been any dissent om this principle. However, Mr. Lovett proceeds to y:

> But this policy has two important limitations. First, it to be reciprocal. The allies must henceforth apply the me principle in dealing with their own producers and in lling to us and in selling to each other.
>
> Second, the arrangement must be limited to war materials, order to protect our own industry. We must not allow w materials sold by our producers at prices patriotically nceded to our Government and its allies for war purposes be diverted to industry and trade abroad which may me in competition with our own manufacturers and procers. Measures will be taken by the board for the best ssible assurance that materials sold at a concession in ices for war purposes shall be applied only to war purses.

To this also will everybody subscribe. It recognizes ıat producers have been saying all along; namely, that is unfair to expect them to supply the foreign governɔnts with material at special prices, not only for muniɔns but also for industrial purposes that may include mpetition with American manufacturers subject to gher prices.

After Mr. Lovett has displayed this excellent sense, is paralyzing and mystifying to find him saying:

> The War Industries Board has not yet had and may not ve occasion to deal with the question of prices to be arged the public, but it seems proper in this connection direct attention again to the following from the stateɔnt of the President on that subject: "We must make the ices to the public the same as the prices to the Governɔnt. Prices mean the same thing everywhere now. They ɛan the efficiency of the Nation whether it is the Governɔnt that pays them or not. They mean victory or defeat."

This is nonsensical. Commodities are being consumed r purposes that are not immediately necessary. Owg to such demand, the prices for many things are ɔrdinately high. Their highness will sooner or later minate certain demands. Coincidentally, production ll be increased. Then prices will come down to the int that reflects cost of production. This is automatic d axiomatic.

This subject has been discussed at such length that is scarcely necessary to enlarge upon it. The Govnment can say that certain persons shall not have mmodities, and prices will then be reduced summarily. will also be the business of many manufacturers. the Government may take over and operate all mines, ills and works and distribute their products. Either these expedients is too gigantic for consideration.

The uselessness of all this discussion and controversy ıen the Government has the power to offset high prices d adjust all inequalities in cost of production by taxion, which power it proposes to exercise, is evident. It may be said, indeed, that the exercise of such means does not help the case of the munitions supplies of our European allies. Very well then, let the American Government pay to them in cash, not lend, such sums of money out of its own taxes as will equalize things to them.

The plan of an arbitrary general reduction in prices is so preposterous, so dangerous and so contrary to economic law that we have not looked for such an experiment by Washington—do not look for it even now. Yet there is the possibility that Washington will try it and will pursue it until it has been broken down and its impracticability has been demonstrated. In the meanwhile there will be damage done that it will be difficult to repair.

The Colorado School of Mines

THE Colorado School of Mines, which has acquired an unenviable reputation for student disorders and unscholarly atmosphere, has been figuring recently with a trouble which may be considered to cap the climax. We have been slow to express any opinion about it, having taken the pains to hear both sides. After all, the case seems to be simple.

The striking students behaved in a disgraceful way. No less disgraceful was the behavior of the trustees. Indeed, theirs was the more disgraceful for they were older men and should have known better how to act. The president of the institution should have been supported even if he had been an incompetent. In this case he was not only a highly competent and professionally esteemed gentleman and engineer, but also his position in the school controversy was correct in all respects.

The fundamental trouble with the Colorado School of Mines is a poor board of trustees, for which the governors of the state have been responsible. The present governor is singularly responsible, for the truth of the matter has been bluntly revealed to him in a way to which he should have paid attention. But having chosen to shut his eyes to the truth, he must continue to shoulder the responsibility.

This is a pity, for the reputations of his state and one of its leading institutions of learning suffer, and especially is this a mortification to the serious part of the alumni of the Golden school, comprising many useful and well-known engineers, who deserve better treatment. They do not like to see their alma mater made the subject of joke and jibe. Nor do we, who have at heart the interest of all the mining schools, which constitute the struts of our beloved industry.

Ex-President Parmelee knows that his unhappy experience at Golden did not cause him to depreciate a whit in the esteem of his professional colleagues. The persons who lost were the incompetent majority of the board of trustees and the unscholarly, striking students, who will, like the mutinous soldiers of Russia, individually wear a black band of disgrace until they have redeemed themselves by some signal exhibition of correct conduct. But for redemption of the Golden school it will be necessary for the governor of the state to appoint a new board of trustees, and the new board must use strong disinfectants to remove all odors of politics and petty interests. And some authority must abolish the system of annual election of president and faculty and abate its pernicious influence. Until those things are done the Colorado School of Mines cannot be expected to regain rank among the principal mining schools of the country.

BY THE WAY

The following is from a bulletin of the United States Geological Survey. Honor to whom honor is due, but who made the discovery mentioned, the geologist or the prospectors? The bulletin says: "Alaska lode tin was discovered, curiously enough, by a geologist of the Geological Survey, Department of the Interior, as he was helping two prospectors by crudely smelting in a camp cup a piece of peculiar-looking ore which the prospectors rightly suspected to be tin." Curiously enough, potash was discovered by the Survey, or was it by its we-never-sleep-detective-like press agent?

Herbert C. Hoover is responsible for the following story: "Germany's claim that she imports nothing, buys only of herself, and so is growing rich from the war, is a dreadful fallacy. Germany is like the young man, who wisely thought he'd grow his own garden stuff. This young man had been digging for about an hour, when his spade turned up a quarter. Ten minutes later he found another quarter. Then he found a dime. Then he found a quarter again. 'By gosh,' he said, 'I've struck a silver mine,' and, straightening up, he felt something cold slide down his leg. Another quarter lay at his feet. He grasped the truth: There was a hole in his pocket."

A new crushing mill is being offered for sale which contains in its "innards" balls weighing 400 lb. each. The circulars describing this apparatus state that it is "so constructed as to be transportable into the most inaccessible places." We have all heard of the Mexican "mule skinner" method of balancing a load on a jack by using a counterbalance of rocks, but we are anxious to know how he is going to transport crushing balls 16 in. in diameter weighing 400 lb. each, "into the most inaccessible places." We have never seen any mules in the mountain country who would like to undertake the contract of carrying 400-lb. balls over a bad mountain trail, and old man Sisyphus is probably busy or an I. W. W. by this time. The man who receives this equipment for his mine "back in the mountains" is likely to give this mill one look and pass the equipment over to the gentleman on the little round tag and cotton bag of the well-known "makin's."

Charles Reginald was efficiency personified, and although the ink on his diploma was scarcely dry, he was already assistant to the consulting engineer of a chrome-buying company in—let us say, Gwendolyn County, Oregon. As in all cases where competition between ore purchasers is keen, precise information on certain points was at a premium. One night, the boss glanced over the carbon copies in his assistant's record book. "What's this? Sample No. 265, C. M. & St. P. Ry. Co., car number, the time, the place and the man that did it." "Why, Mr. Eastman, I'm sure I copied it exactly as the tag is marked." "Great Siwash, that sample was taken sur-rep-titously and you've sent the whole dope to the very assayer that runs the controls. Good night!" And with a slam of the door, the boss registered departure. Turning to the stenographer, a crestfallen Charlie hoarsely whispered: "Have I resigned?"

A mixture of humor and diplomacy sometimes outcrops near the summits of financial eminence. A well-known engineer-capitalist required a man to perform a delicate mission in a foreign country, in connection with possible future mining work. It was necessary to have a man who would know a mine when he saw it in the making, a man who could speak the language of the country and who could deal politically with the inhabitants. A candidate for the mission was sent to the mining engineer. After briefly outlining the situation, the big man told a "Dooley" story of a consulting golf expert in the Windy City, who conducted his inquisition of ambitious golfers as follows: "Do ye wear a red coat?" If the candidate answered this question favorably, he would be confronted by the other crucial question: "Do ye know Mrs. Potter Palmer?" The consulting mining engineer, turning to his more youthful confrère, said: "Do ye wear a red coat? Shure, an' I know ye do, fer now that I think on it, I saw ye git yer diplomy up at Jimmie Kemp's University. But, do you know Mrs. Potter Palmer?" "I don't, but I can meet her," said the young engineer. He got the job.

In the July *American Magazine* John Hays Hammond in writing of Cecil Rhodes gives this account of the formation of the De Beers Consolidated: "South Africa had its Sherman Law, which prevented anyone from owning more than one claim, but the moment it was repealed Rhodes, although then only 27 years old, organized the De Beers Mining Co., raised a million dollars of capital and purchased almost half the diamond area at Kimberley. His chief rival was the famous Barney Barnato. The output of diamonds greatly increased, prices became demoralized, and the unsettlement which followed the Majuba disaster to British arms caused widespread depression. The whole diamond business was sliding towards ruin. Rhodes, though losing money, stuck to his guns. He saw that the evil rose from overproduction, competitive price cutting. He realized that the industry could be saved only by regulating output. He tried to buy out Barnato, but that shrewd operator, with his own mighty ambitions, would not consent to be swallowed up. In the end Rhodes won out—as he almost always did. In 1888 he formed the great De Beers Consolidated Mines, then the largest industrial corporation in the world and even since that time the controlling factor in the world's diamond business. The De Beers claim was named after a Dutchman interested in the company. Rhodes would not have dreamed of giving his own name to it, but Rhodesia, an empire as large as all of France, Austria and Prussia combined, took its name from him.

Personals

B. Tyrrell, of Toronto, has gone to ish Columbia.

. A. Wheeler has been examining oil erties in western Illinois.

ensselaer Toll, of San Francisco, is Kingman, Ariz., on professional work.

rthur Thacher is in Leadville, Colo., re he has been at work on the strike ation.

. H. Wright, of the Malm-Wolf Co. of ver, recently examined placer properties daho.

. L. Sheldon, of Ely, Nev., recently le a trip through Madison County, Mont., examination work.

. W. Turner has been appointed general nager of the Oroville Dredging, Ltd. American company).

ohn D. Ryan, president of the Anaconda pany, is visiting relatives at his old e in northern Michigan.

. C. Perkins, William W. Mein and **Kane Davies** are investigating mining spects in northern Manitoba

. E. Ring, of Flat River, Mo., is in hospital in St. Louis as the result an accident in the Federal mill.

Villiam M. Brewer has been appointed trict mining engineer of the Western eral Survey district of British Columbia.

Theodore Dengler has been elected higan director of the Wolverine Copper , succeeding the late Samuel L. Smith.

Prof. W. E. McCourt, of Washington iversity, has been spending the past nth at Boulder, Colo., on geological work.

Donald M. Liddell, New York, has been sen assistant secretary and assistant asurer of the Superior Steel Corporation.

. B. Meuche, until recently superindent of the Cass mine in Michigan, is king a trip to the Cobalt and Porcupine tricts.

John A. Rice, consulting mining engineer l geologist, has established permanent ce headquarters at 525 Market St., San ancisco.

R M. Edwards, president of the South ke, North Lake, Indiana, Algomah, and anklin mines, is at Houghton, Mich., for summer

B. H. Bennetts, of Tacoma, Wash., has en appointed consulting engineer for the dysmith Smelting Corporation, at Ladyith, British Columbia.

Bradley Stoughton was in St. Louis, Mo., ently, arranging for the meeting of the nerican Institute of Mining Engineers at is to be held there in October

Major Glenn S. Smith, formerly of the ited States Geological Survey, is in arge of the topographic work being done the American engineer corps in France.

John R. Stanton, president of the Wolrine, Mohawk, Michigan and White Pine tension companies, in Northern Michigan, making his regular visit to those propties

D. C. Jackling spent a few hours at tte on Aug 7, with local officials of the tte & Superior Mining Co., while on way from Utah to Glacier National rk.

John F. Cregan, formerly with the New rsey Zinc Co., has been appointed supertendent of the zinc oxide plant of the merican Zinc and Chemical Co. at Lanloth, Pennsylvania

William B. McKinlay has returned to w York from Cuba, where he has been gaged for several months in the exoration of copper prospects in the rovince of Pinar del Rio.

Philip N. Moore, president of the Amern Institute of Mining Engineers, is king a vacation in Colorado, following trip to Washington in reference to the inerals conservation movement

Bancroft Gore, of Butte, Mont., sailed om New York on Aug 10, for El Monte, rovince of Santiago, Chile to take the osition of metallurgist for Société des lines de Cuivre de Naltagua

Dr. G. B. North has resigned as professor f chemistry at Rutgers College, New runswick N J., and is now director of he research laboratories of the York etal Alloy Co at York Pennsylvania

H. G. Hodgkinson has resigned as assistant superintendent of the United Verde xtension Mining Co at Jerome, Ariz., o become superintendent of one of the iron nines of the Wharton Steel Co., Wharton, New Jersey

Major Alfred H. Brooks, formerly in charge of Alaskan mineral resources for the United States Geological Survey, is directing the geologic engineering being done in France in connection with the American expedition.

William L. Wolfe, general superintendent of the Donaghmore plant of the Bethlehem Steel Co., has resigned his position with the latter company to become vice president and general manager of the Central Iron and Coal Co., Holt, Alabama.

Ford Corll is superintendent of the openhearth department of the Cambria Steel Co. at Johnstown, Penn., having resigned a similar position in the Farrell, Penn., plant of the Carnegie Steel Co. Norman S. Powell, superintendent of the North Sharon openhearth department will succeed Mr. Corll at Farrell.

Dr. L. A. Dessar, secretary of the Louisiana Consolidated Mining Co., together with Pres. Walter Trent, is now at the company's Tybo mine in Nevada. **Julius Siegbert**, vice-president and director, and **Leslie McCurdy** and **Thomas Roberts**, stockholders, will inspect the Tybo and Zenda mines during August.

Obituary

Henry M. Holbert died in July at St. Clair, Mich. He was a graduate of Michigan College of Mines of the class of 1895 and had been engaged in mining work at Gallup, New Mexico.

Walter Unzicker died on July 27, at Readers, Ala., where he had been manager for the Tennessee Coal, Iron and Railway Co. He was a graduate of the Michigan College of Mines, class of 1900. He was buried at Macon, Georgia.

George B. Kirkpatrick died at Toronto on Aug. 3, at the age of 82 years. He was appointed Director of Surveys for Ontario in 1878, and held that position until last year when he retired on account of ill-health. He was born in Ireland and educated at Trinity College, Dublin, and in 1857 came to Canada. He practiced for some years as a surveyor in which capacity he was engaged by the Department of Crown Lands. In 1890 he devised a system of exploration for northern Ontario which resulted in opening large areas, the value of which was previously unrecognized, for agricultural settlement and mining development. Owing to his work, several important mineral fields were made available for exploitation He leaves a family of five sons and one daughter.

Societies

American Iron and Steel Association will hold its fall meeting at Cincinnati, Ohio, Oct. 26 and 27 Headquarters will be at the Hotel Sinton.

American Institute of Mining Engineers, New York Section, will hold the second of the series of war meetings on Thursday evening, Aug 23, at the Machinery Club, New York. The subject for discussion will be sulphur and pyrite William Young Westervelt, chairman of the Committee on War Minerals, and A G White, mining economist of the Bureau of Mines, will be among the speakers of the evening.

Industrial News

Mark R. Lamb has recently placed orders for ball mills, Butchart tables and Isbell vanners for clients in Bolivia

H. Kramer & Co., smelters, refiners and metal dealers of Chicago, have arranged to move into their new foundry and warehouse at 1324-44 West 21st Place

Thwing Interests, of Kansas City, have purchased a 40-acre tract in East St Louis, where a large plant is to be erected for the extraction of potash from Western alunite

Hazard Manufacturing Co., of Wilkes-Barre, Penn., announces the appointment of George B North as general sales manager with offices at 533 Canal St., New York City

Pilling & Crane, of Philadelphia, have dissolved partnership This firm, which for 25 years has been composed of William S Pilling and Theron J Crane, controlled the Northern Iron Co., with furnaces at Port Henry and Standish, N Y and has also been identified with the Warwick Iron and Steel Co., the Eastern Steel Co., the Benson Mines Co., and the Northern Zinc Co. It has acted as sales agent for a number of eastern Pennsylvania blast furnaces. Mr. Pilling for years has been the secretary of the Eastern Pig Iron Association. Mr. Crane is retiring from business.

Trade Catalogs

Wire Rope. Macomber & Whyte Rope Co., Kenosha, Wis. Catalog M. Pp. 128; 7 x 10 in.; illustrated.

Oronite Paints for Protecting Surfaces. Standard Oil Co., California. Bulletin No. 10. Pp. 6; 6 x 9 in.

Motor-Generator Sets. Crocker-Wheeler Co., Ampere, N. J. Bulletin No. 181. Pp. 8; 8½ x 11 in.; illustrated.

Smelting Blowers. P. H. & F. M. Roots Co., Connersville, Ind. Catalog No. 60. Pp. 32; 8½ x 12 in.; illustrated.

Oxy-Acetylene Welding and Cutting Apparatus. The Prest-O-Lite Co., Inc., Indianapolis, Ind. Bulletin. Pp. 8; 8½ x 11 in.; illustrated.

Rails, Locomotives, Cars, Cranes, Tanks, etc. Walter A. Zelnicker Supply Co., 325 Locust St., St Louis, Mo Bulletin No. 221. Pp. 4; 3½ x 8½ in.; illustrated.

New Patents

Bore Holes—A Tool for Enlarging Bore Holes. W. Weber, Hylngen, Germany. (Brit. No. 105,281).

Charging-Lorry. Silas B. Russell, St. Louis, Mo., assignor to Parker-Russell Mining & Manufacturing Company, St. Louis, Mo. (U. S. No. 1,234,221; July 24, 1917.)

Concentration—Improvements in or Relating to the Concentration of Ores. Henry Livingstone Sulman, London, Eng. (Brit. No. 105,627.)

Drills—Improvements in Percussion Rock Drills and Coal Cutters Operated by Fluid Pressure. James Fletcher, Newnes, N. S. W. (Brit. No. 105,528.)

Excavator and Loader. Hugh F. Dolan, Pottsville, Penn. (U. S. No. 1,234,304; July 24, 1917.)

Feed-Regulator. James Howard Dickerson, Fairmont, W. Va., assignor to Fairmont Mining Machinery Company. (U. S No. 1,234,532; July 24, 1917.)

Furnace—Fluid-Fuel Furnace for Heating Castings. Robert W. Wiederwax, Atlantic City, N. J., assignor of one-half to Carlton Geist, Atlantic City, N. J. (U. S. No. 1,234,240; July 24, 1917.)

Furnaces—Improvements in, and Relating to, Tilting Furnaces. Samuel W. Price, London, Eng. (Brit. No. 105,381.)

Furnaces—Method of Controlling the Stoking of Furnaces. Edwin A. Emery, St. Louis, Mo. (U. S. No. 1,234,317; July 24, 1917.)

Hoist. Robert Burns, Jr., Brooklyn, N. Y. (U. S. No. 1,234,622; July 24, 1917.)

Hydraulic Machines — Improvements in Hydraulic Appliances for Breaking Down Coal and Other Material in Mines. D. V. Sickman, Denver, Colo. (Brit. No. 105,680.)

Ingots—Improvements in Casting Steel Ingots. W. G Armstrong, Whitworth & Co., Newcastle-on-Tyne, Eng. (Brit. No. 105,617.)

Ingots—Improvements in Machinery or Apparatus for Charging and Withdrawing Ingots into and from Furnaces, and, or, for Stripping Ingots James Smith, London, Eng (Brit No 105,644)

Liquid Measure—Meter for Measuring the Flow of Liquids. Eugene Roberts, Salt Lake City, Utah. (U S. No. 1,234,392; July 24, 1917.)

Pump. Edward Benson, Miami, Ariz. (U S No. 1,234,119; July 24, 1917.)

Rotary Pump. Thomas A. Bateman, Portland, Ore. (U. S No 1,234,262; July 24, 1917.)

Shoveling-Machine. Frank H Armstrong, Vulcan, Mich. (U. S. No. 1,234,113; July 24, 1917.)

Surveying—Combination Level and Transit Adolph Wissler, St. Louis, Mo. (U. S No 1,234,520; July 24, 1917.)

Tuyere—George D Golden, Clarkdale, Ariz. (U. S. No 1,229,988; July 24, 1917)

Washing and Classifying — Improved Washing and Classifying Apparatus for Ores. Claude Rene Pinette, Saone-et-Loire, France (Brit No. 105,690.)

Editorial Correspondence

SAN FRANCISCO—Aug. 8

Darwin Mining District has no idle men. This does not mean that there is a demand for more men. There is no prospecting boom on. The camp of Darwin is alive because the Darwin Development Co. has kept it alive from the initial development a few years ago right up to the present time. Since development and operation of the properties taken over in the beginning of its campaign, the company has constantly and consistently added other properties in the immediate territory until it has in hand enough to make a large property. The successful operation of the Murex oil-concentration plant on the Lane mine, treating ores from the several properties owned by the company, has been of great encouragement to the owners of properties adjoining or in the district apart from the immediate camp of Darwin. Besides the ore treated at this mill, shipments are going out to the smelteries, not only from this company's mines but from other mines and leases. In fact there are not enough motor trucks in commission to carry all the ores promptly to the railroad at Keeler. The properties owned or leased by the company include the Lucky Jim, Lane, Promontory, Columbia, Independence, Defiance, Thompson. Other mines in the neighborhood worked direct by the owners or by leasers are the Custer, owned by the Tom Reed interests of Oatman, Ariz., and managed by John Thorndyke; the Minnietta, situated on the east side of the Argus range, operated by Teagle Bros. of Johannesburg. Old dumps in the district are being sorted and the product milled at the Darwin mill. With the acquisition of the Defiance mine the company has acquired water rights that have enabled the construction of reservoir tanks and the town is now provided with an abundance of fresh water. It is reported that the company contemplates the installation of a pumping system at the Lane mine, which would encourage the cultivation of vegetables by residents of the camp, who have sufficient arable soil but lack means of conservation of water for irrigation.

Spreading of Tailings from the Keystone, Original Amador and Treasure mines in vicinity of Ione along Amador Creek is causing farmers to complain. These properties are no doubt doing their best to remedy the evil and for some time have been repairing their dams. None of the mines on the Mother Lode are desirous of paying damages and none of them unmindful of the necessity for restraining tailings. There has been a great deal of fuss made by the farmers during several years past about the damage the mill tailings have done to their land and the mine owners have paid large aggregate sums of money to the farmers. There is no doubt that the tailings choke the irrigating ditches if allowed to run in, but this is in a measure the fault of the farmer who does not attend to his ditch. There is no damage to the soil. And when the mines hold back the water from the creeks that flow to the west from the Lode there is likely to be a shortage of irrigating water.

BUTTE—Aug. 14

(By Telegraph)

Strike Situation is improving slightly. Guards about the mines in Butte have been Federalized, and soldiers are now patrolling all the streets and roads in the eastern part of town leading to the mines, the Government having determined to protect from assault men who want to work. The I. W. W. leaders of the strikers protested to Washington against their locally recognized privilege of waylaying and beating miners who want to work. Many more miners are returning to work, but there are still thousands who remain out on strike and declare they will not return to work until they are granted increase in wages in proportion to high cost of living. This increase to be regardless of price of copper, better safety conditions in mines, and the absolute abolition of the rustling-card system. Gradually the unions, which have been in sympathy with the strikers, are becoming cool in their sympathy because the strikers refuse to affiliate with any recognized labor organization, and continue their abuse of, and fight against, the American Federation of Labor, while soliciting financial and moral support from them. Smeltery employees at Anaconda voted on a strike question Monday night, a slight majority favoring a strike, but two-thirds vote is required to declare a strike. When the vote was announced the strike advocates started a disturbance and tore the American Federation charter from the walls and destroyed it. Representative Jeannette Rankin arrived in Butte, Tuesday night, from Washington to get some first-hand information on the local labor situation. Miners and unions and some women have been urging her to come to Butte and use her influence in bringing about a settlement of the troubles. She offered her services to the Anaconda company but they were declined with thanks. A parade and public demonstration was planned to be pulled off on Miss Rankin's arrival but the authorities prevented it, although 5000 people met her at station. She was not permitted to address the crowd, but was escorted to her hotel by the police.

BUTTE—Aug. 9

Labor Situation, while by no means permanently settled, labor conditions in Butte are gradually drifting back into normal channels. The lynching of Frank H. Little, the I. W. W. agitator on the morning of Aug. 2, has created a bitter resentment among the more radical labor element and has without doubt arrested to a certain extent an amiable settlement of all troubles. Little's funeral was held Sunday afternoon. Silently and orderly over 3000 sympathizers, four abreast, marched in the procession that was headed by 200 women and was watched by an immense throng of spectators, estimated at fully 10,000. A motion picture was made of the procession. Extensive investigations carried on by Federal, county and city officials have so far not revealed any clews concerning the identity of the lynchers, indicating that the latter have taken well-planned precautions to cover up their tracks. Since the lynching the Governor of Montana and other officials and private citizens have received letters from I. W. W. organizations and from individuals, threatening bitter revenge if the persons responsible for Little's lynching are not apprehended and punished. A short-lived strike of the streetcar men that started Aug. 4 and ended Aug. 9, temporarily interfered with mining operations in that it prevented many miners to reach the mines from their distant homes. The situation was somewhat relieved by the quick appearance of jitney service established by enterprising auto-owners. It is estimated that fully 70% of the miners and allied trades have returned to work. A complete and final settlement of the labor situation will depend on the ultimate attitude of the electricians and the members of the mill and smeltermen's union of Anaconda. Of the 70 electricians employed around the mines, 40 are working in spite of Dunn's efforts to have them walk out.

DENVER—Aug. 10

Colorado Fuel & Iron Co.'s recent labor disturbance is smoothed out, at least temporarily. President Welborn is confident that, if a strike be called, only a small number of the men will go out for such an order would be in defiance of the advice of Secretary of Labor Wilson. Welborn has posted bulletins in all of his company's camps announcing that, hereafter, all miners' grievances must be taken up with the committee as agreed upon in the "Rockefeller Plan"; that the meetings last week between the company officials and representatives of the United Mine Workers was granted simply because of the grave national situation; and recognition of the union would not be granted nor submitted to arbitration.

SALT LAKE CITY—Aug. 10

Utah Coal Route built primarily with a view to carrying the output of the Emery and Carbon County mines of the United States Fuel Co., of which it is a subsidiary, but operating separately, is rapidly completing its terminal at Provo, so as to have it in readiness as soon as possible after Sept. 1, during the early part of which month the operation of the railroad wil probably be started. The road will star running with nine engines—six Santa F type locomotives and three Mallet engines

Deep Creek Railroad is operating smoothly; and, as well as transporting an increasing tonnage from the Deep Creek and Ferber districts, is maintaining satisfactory passenger service. The night train leaving Salt Lake City at 11 p.m. arrive in Gold Hill, the camp of the section, a six o'clock the following morning, and a train for the return trip leaves Gold Hill at eight o'clock the same morning The largest shipper continues to be th Western Utah Copper which is stated t be in position to bring its output up t 500 tons a day, running about 3% copper This company is developing lead-silver or of good grade in the Gold Hill section o the property. It also owns the Yellowhammer mine, which is shipping tungsten ore. Other properties shipping are th Western Utah Copper Extension, southwest of Gold Hill and which has a spu to the railroad, the Pole Star, the Spotte Fawn at Dutch Mountain, etc. The Woodman Gold is accumulating ore of good grade. The Ferber district, with a 12 mile haul to the railroad at Gold Hill i being rapidly developed. The Ferber Copper here is preparing to begin shipment from a new strike as soon as teams ar available. Silver-lead ore of good grad is being developed by the Western Mine Development.

SPOKANE, WASH.—Aug. 11

Granby Smeltery at Anyox, B. C., with a capacity of 2500 tons a day, is to b increased to 3000 or 3600 tons daily, according to Jay P. Graves, former head o the corporation, who has just returned from the property. A furnace, two large converters and appurtenant apparatus ar included in the equipment. About $6,000,000 has been spent by the Granby compan since it extended activities to the Coast si years ago. This includes the purchase and development of the Hidden Creek mine and the smeltery at Anyox; a steamship line t transport ore and supplies; the purchase and development of the Midas mine from which 125 tons daily has been shipped fo a year, and the Mamie and the It mine on Prince of Wales Island, from which 15 tons daily is being shipped, mostly from the It. The site of Anyox was a wilderness six years ago. It is occupied now b 2500 persons, of whom half are employee of the company.

HOUGHTON, MICH.—Aug. 11

Failure of Strike Attempt, made here July 13, has not been followed by any success in winning the men to the I. W. W cause. The midnight distribution of yellow anonymous circulars did not prove effective in impressing the miners. The circulars stated that the "Strike is now on" and called upon all to join it to secure the usual I. W. W. demands of six hours, $6 a day, two men at a machine, etc., but was met among the miners and trammers only with apathy. The business men of the district, knowing that there were here and there a few I. W. W. leaders, but believing in the patriotism of our miners and trammers, reorganized the Citizens' Alliance, held a mass meeting at Calumet, Sunday, July 15, with an attendance of about 8000 and a parade of 2900, and published three numbers of "Truth," their paper, which made it plain to the underground men that the circular was an endeavor to use them to hold back the Government in its war with Germany. "Truth" also stated that an agitator, in a secret joint meeting of the I. W. W. and Red Socialists in the basement of the Red Socialist headquarters at Hancock, the last week in July, declared how much better the German Government would be than the American and how the former could be hampered in carrying on the war by crippling the industries upon which it depends for supplies. Beyond an occasional scattering of the circulars in the darkness of the night, nothing has been done. On the other hand, the underground men have contributed handsomely wherever the Red Cross subscription lists have been passed around.

JOPLIN, MO.—Aug. 11

Zinc-Ore Output Is Increasing despite the act that a number of the sheet-ground ines have closed. The new plants being laced in the production column in the klahoma and Kansas sections of the field nore than offsets the loss from the sheet-round properties. In a number of cases he mills from the sheet-ground mines are eing moved to Oklahoma leases, so there s no real loss to the district. The output f the Miami camp is now not less than 700 tons per week, and is increasing rapily. Several of the largest operators in he older fields, including R. Y. Ramage, F. . Wallower, Charles T. Orr, and numerous thers, are getting leases and starting mines n the new field. It is persistently rumored hat the American Zinc, Lead and Smelting o. is about to acquire large interests in his field and may move the greater part of heir extensive above-ground holdings near arterville to Oklahoma.

WASHINGTON—Aug. 11

Examination of Tin Deposits near Linolnton, N. C., has been made by George S. Rice, chief mining engineer of the Bureau f Mines and Thomas H. Leggett a mining ngineer of New York. This is one of the irst examinations to be conducted under he volunteer plan being suggested by the ommittee on war minerals.

Potash Leasing Bill introduced by Senator Pittman to provide prompt exploitation f the country's potash and other chemical resources through lease of Government lands at Searles Lake, San Bernardino County, Calif., and other government lands in the West, was passed by the Senate on Aug. 10. The general leasing bill met with determined opposition, which, however, does not apply to potash. For this reason a separate bill has been prepared. The potash bill provides conditions under which lands may be leased and in case no one will take a lease on a condition satisfactory to the Government, it provides that the Government will operate the potash deposits. The measure will go to the House for action and is expected to pass. The bill authorizes the Government to permit prospecting for chlorides, sulphates, borates, salicylates, and nitrates of potash for a period of not exceeding two years, the area to be embraced not over 2560 acres of land "in reasonably compact form." Period of leases may run up to 50 years and subject to adjustment after that for longer term by Secretary of Interior. Lessees must pay royalty to Government of 2% gross value of output at point of shipment. Rental will be not less than 25c. per acre for first year, 50c. for the second, third, fourth and fifth years, and $1 for every succeeding year up to expiration of the lease. Opening up of hundreds of thousands of acres of oil lands, including No. 2 naval reserve, also seems assured by agreement between opposing groups in Senate and Pittman expects the oil-land leasing bill to pass the Senate in a few days. This action is expected to increase nation's oil supply by about 15 per cent.

Producing Marketable Iron Product from the siliceous red-hematite ores of the Birmingham district, which are now valueless and are being lost permanently, was the subject of experiments of Joseph T. Singewald for the U. S. Bureau of Mines. The need of devising some practicable method of concentrating these ores is spoken of by Mr. Singewald as follows: "Where these ores are worked they usually are associated intimately with lower grade material that in mining is left behind. The difficulty and expense of going into broken ground by old workings make the later recovery of this lower grade material practically impossible. Success in concentrating the red ores, therefore, will save material now being irretrievably lost, and the large scale concentration of low-grade ore in Lake Superior region should encourage a similar attempt in the Birmingham district."

THETFORD MINES, QUE.—Aug 10

Mining Conditions in Asbestos Field continue favorable. Labor leaders have been sizing up the ground for the last month, but the workmen are so deeply interested in the question of conscription that local strife is forgotten. The low-grade mines of Robertson and East Broughton are again receiving considerable attention. The first of these to resume operation is the Quebec Asbestos Co.—formerly the Ling. It is maintaining its former high percentage of fiber in the ore, yielding up to 15% fiber. Mr. Jacobs, of Montreal, is using a shot drill in testing the ground at the Berlin mine with a view to taking it up if results are encouraging. The Regent Asbestos Co.—formerly the Robertson Asbestos Co.—is pumping out the pit with the hope of disposing of its interests; the company may operate in case the deal does not go through. The Martin Bennett interests are operating for crude ore on Lot 26, R3 in Township of Ireland, about three miles from Black Lake station; small operations have been carried on here for many years with indifferent success, but the larger system of mining now being carried on is meeting with excellent success, and indications point to another important asbestos area as an extension of the Thetford and Black Lake areas; a milling plant is proposed for this property but it is more probable that under the high prices now ruling for crude that the extraction of this grade of ore will be pushed as much as possible. J. A. Voorhees, a mining engineer from San Francisco and E. E. Miller, of Denver were in Thetford Mines recently studying methods of asbestos mining and milling that might be adapted to their operations in California and Arizona.

The Chrome Industry in the Black Lake district has had a severe slump this season; thus far, production has not been more than a third of what it was last year at the same date. The Mutual Chemical Co. mines, which were not showing up well early in the season, have just struck a lode the full size of the drift and is 20 ft. wide at the 65-ft. level. The company's St. Francis mill, which has been idle since last fall, will resume operation in August. J. A. Baker, engineer in charge at these mines, has recently joined the colors and has been succeeded by L. K. Fletcher, formerly in Mexico. The important event of the year in the chrome industry is the discovery of a body of high-grade chrome ore on Lot 8, R. 10, Cleveland. The property was sold last fall by the Canadian Bank of Commerce to a Washington syndicate. Douglas B. Sterrett is in charge of operations. The lode is from 2 to 5 ft. in width and the outcrop has been followed for distance of half a mile. Three pits are working at present and two cars of run-of-mine ore have averaged 35% Cr_2O_3. This is the first chrome find of importance in this locality. The distance is 45 miles southwest from the Black Lake-Lake St. Francis chrome district and three miles from the Danville asbestos area. The ore is all being shipped to the United States through Frank Samuel of Philadelphia.

The Mining News

ALASKA

ALASKA TREADWELL (Treadwell)—P. R. Bradley, consulting engineer, reports option taken on Red Diamond group near Bullion Creek on Douglas Island, owned by Winn interests of Juneau. Option also taken on Auke Bay group, 16 miles north of Juneau.

ALASKA GASTINEAU (Juneau)—Company's second quarterly report for 1917 shows 642,683 tons milled, compared with 541,093 in first quarter; gross value per ton, $1.112 compared with $1.207 in first quarter; yield, $0.8988 per ton, compared with $0.997 in first quarter; tails, $0.2127 per ton, compared with $0.2102 in first quarter. Extraction, 80.85%, comparing with 81.06%, in previous quarter; operating expenses less miscellaneous income, $0.7210 per ton, compared with $0.788 in previous quarter.

ALASKA UNITED (Treadwell)—Ready Bullion mine produced, in June, 20,559 tons ore, yielding concentrates realizing a value of $12,880; operating expenses, $13,086; operating loss, $631. Construction expenses amounted to $19,971, including $16,151 charged for compressor removed from 700 claim, giving net loss, $20,605. Yield per ton ore milled, $2.09. The 700 claim saved 27.69 tons concentrate realizing $2727; operating expenses, $9600; operating loss, $6873; construction expenses, $663; net loss, $7536. Ready Bullion reports 17,315 tons decrease in stock of broken ore. Drifted 221 ft. on 2400-ft. level, averaging $3.13 per ton, and 230 ft. in waste on 450 level.

ARKANSAS

NORTH ARKANSAS SHIPMENTS for July amounted to 60 carloads of lead and zinc ore totaling 4,209,950 lb., all was zinc except 31,700 lb. of lead. J. C. Sheperd was largest producer, shipments totaling 2,240,000 lb. Heavy stocks of ore accumulating in mine bins, as producers reluctant to sell on present market.

Marion County

NORTH STAR (Yellville)—Installing battery of tables in mill to catch fine values.

OKLAHOMA (Buffalo)—A. G. Blaumer succeeded A. F. S. Cooper in management. Driving new tunnel showing good face of crystallized carbonate in heading.

GEORGIA MINING CO. (Buffalo)—Formerly operating in Zinc camp, Boone County, have purchased interest in Monte Vista mine near this place and will start driving tunnel.

GROUNDHOG AND MINE 16 (Buffalo)—Interest in these mines belonging to Walburt Bros., and Sam Deener of Batesville sold to A. Christiansen of Chicago, and Mr. Renander of Omaha, Neb. W. T. Barr who developed properties retains interests. Mills planned for both properties.

ARIZONA

Cochise County

CALUMET & ARIZONA (Bisbee)—July production was 3,548,000 lb. fine copper.

SHATTUCK ARIZONA (Bisbee)—Company's statement for July shows production amounted to 205,081 lb. copper; 101,044 lb. lead, 3214 oz. silver, and 29.61 oz. gold, for the month. For seven months, ended July 31, production was 8,365,970 lb. copper, 1,756,436 lb. lead, 112,570 oz. silver, and 1124.44 oz. gold. Decrease of 85% in monthly production for July, due to unsettled labor conditions in district.

Gila County

STRIKE GATHERING in Miami of about 400 miners broken up and strikers dispersed by Federal troops on Aug. 14.

Pinal County

ARIZONA HERCULES (Kelvin)—Steel structure for power plant completed and concrete being poured for mill foundations.

PINAL DEVELOPMENT (Kelvin)—On Aug. 1, secured title to Renfro group of claims, 43 in number. Held under option for some time. Will install compressor.

RAY CONSOLIDATED (Ray)—June output was 7,611,114 lb. copper, comparing with 7,902,724 lb. in May, and 6,598,594 lb. in June, last year.

TROY ARIZONA (Kelvin)—Station being cut at 200-ft. level in Climax shaft. No development will be done at this level until shaft is sunk to 500 ft. Sinking will be resumed by end of month.

MAGMA CHIEF (Superior)—Watson tunnel passed 1000-ft. mark; expected to intercept L. S. & A. lateral vein this month. Last 300 ft. of tunnel has been in porphyry. Work resumed in Baltimore tunnel on north end with view to determining extent of manganese deposit.

Yavapai County

CACTUS QUEEN (Congress)—Operations increased following recent inspection by Pres. H. H. Barbee, of Colorado Springs.

VERDE COMBINATION (Jerome)—Verde Combination shaft passed 500-ft. mark. Several bands of Pre-Cambrian schist cut in shaft which show chalcopyrite. Intend to do some lateral development at 700 level.

CALIFORNIA

Amador County

HAYWARD COPPER (Ione)—Recently developed by Allen Estate Co. and ready for extensive stoping. Situated on west belt of the Mother Lode, three miles from Ione near old Rantlett copper mine and in early days was owned and operated by Alvinza Hayward. Contemplate building tramway from mine to Ione & Eastern Ry. tracks, provided operation of mine warrants. At present ore will be hauled by team or motor to railroad and shipped to Selby.

SOUTH KEYSTONE (Amador City)—Shaft unwatered to 600 level and north crosscut advanced toward vein. Contemplate driving also from 1000-ft. level as soon as water taken out.

CENTRAL EUREKA (Sutter Creek)—Mine in better physical condition than for several years. On 3850-ft. level orebody followed in north and south drifts in good grade of ore. Mill running steadily.

Butte County

BLOOMER HILL (Chico)—Reported optioned by Philadelphia men. Will develop with tunnel and if results warrant will install milling plant. Mine, formerly a producer. F. M. Meyers of Seattle, in charge.

SURCEASE (Oroville)—Reported Goldfield Consolidated optioned or purchased this property in Big Bend district. Recently purchased by Phebe Bros. of Oakland, and formerly owned by Congressman Kinkaid of Nebraska. Developing with crew of 15 men under management of Robert J. Burgess, mining engineer.

Calaveras County

VALLECITO (Angels Camp)—Being developed and showing fine condition. Owned by Frank Bishop and associates of San Francisco. T D. Mitchell, superintendent.

TANNER (Murphys)—Contract reported let to drive 1000-ft. tunnel and men set to work. J. A. Canfield, Oakland, resident manager.

GOLD BAR MINING CO. (Angels Camp)—Authorized to sell 35,000 shares of capital stock for development of claims known as the I. X. L., Sunnyside, Gold Bar Placer, Esperanza and others.

Inyo County

REVENUE COPPER CO. (Randsburg)—Will develop copper property in Argus Range on west side of Panamint Valley.

TUNGSTEN DEVELOPMENT near Bishop is extending area of scheelite ores and reported another milling plant to be installed, making three in this camp.

Kern County

FERRIS (Amalie)—Reported new plant consisting of 2 Herman ball mills of 70 tons each, 2 gas engines, air compressor and other equipment installed and about ready for operation.

YELLOW ASTER (Randsburg) — M. Carillo, killed on July 22, by fall of rock which sloughed off side of Grizzly drift. No details at present available Another man injured by same fall, but reported to be not fatally hurt. Large screening plant being installed for separating fine rock from coarse and saving what otherwise would go into waste.

COLORADO

Chaffee County

PAT MURPHY (St. Elmo)—Will be reopened; buildings being repaired. Adjoins Mary Murphy mine, a producer of gold and mixed sulphide ores for 35 years.

MOLYBDENUM MINE on Brown's Creek, developed recently, to produce medium tonnage, good-grade molybdenite ore. Stated U. S. Geological Survey will make inspection of district.

Clear Creek County

WEST ARGENTINE (Georgetown)—Regular shipments being made.

SEVEN-THIRTY (Georgetown) — Being worked by lessees.

WALFORD (Georgetown)—Regular shipments being made. Extensive mine repairs under way. Flotation will be installed in mill to treat low-grade ores.

COLORADO CENTRAL (Georgetown)—Mill will be built to treat at least one-half million tons in dumps and old stopes that can now be worked at profit.

SILVER PLUME MINES now shipping are: Smuggler, operated by Hollingsworth Co., Mendota, Phœnix, Josephine, Ashby and Mammoth.

Gilpin County

BARNES (Central City)—Regular shipments, good-grade copper ore being made.

OLD TOWN (Central City)—Hot Time lateral being cleaned out preparatory to work by lessees.

Gunnison County

ANACONDA (Iola)—Shaft sunk to 200-ft. level and development work done on 150- and 200-ft. levels. Stoping in good-grade copper ore underway on 150-ft. level.

EUREKA (White Pine)—Old mine recently drained without apparent cause, but probably through Akron tunnel, will now be worked by lessees. Mine a large producer of argentiferous galena in eighties.

AKRON (White Pine)—Taken bond and lease on Victor mine. Now owns May & Mazeppa, North Star, Erie, Spar Copper mines and many individual claims. Mines drained through Akron tunnel, 3800 ft. in length, which also serves as haulage way to milling plant. Crude ores, both iron-copper and lead-silver, and concentrates being shipped: haulage to railroad at Sargent done by three Jeffrey trucks and teams.

Ouray County

DUNMORE NO. 2 (Ouray)—Shipment of good ore made recently from this Mt. Hayden property.

CAMP BIRD (Ouray)—New vein, 30 ft. wide and assaying well in gold, cut in tunnel at point 650 ft south of Yellow Rose side line. Little water now encountered and tunnel driving progressing. Equipment of electric hoists and pumps will be disposed of; also 2-mile Bleichert tramway from mine to mill, as these will not be required when tunnel completed. Bunk house will be torn down and moved to mill, where grading is under way.

Pitkin County

HOPE (Aspen)—Driving tunnel to cut Annie vein.

SMUGGLER (Aspen) — Pumps lifting 3500 to 4000 gal. per min. against head of 1500 ft., keeping mine workings drained.

San Miguel County

TOMBOY (Telluride) — Flotation tests prove process well adapted and mill will be equipped, one unit at a time.

FARRELL & KING (Telluride)—Leasing and operating in Bear Creek canyon and ready to begin shipments. Good-grade ore shipped last autumn.

CARRIBEAU (Ophir) — Flotation machines and new ball mill installed; other machinery not yet received. Remodeled mill will start operations this month.

Summit County

FOX LAKE (Breckenridge) — Lessees shipping good-grade gold ore.

IDA BELLE (Montezuma)—Lessees will ship high-grade lead-silver ore via burro-back, which was mined last winter.

BALD MOUNTAIN MINING CO. (Breckenridge)—New corporation has taken over Carbonate and Bald Eagle groups on Mt. Baldy; work started.

ARCTIC (Breckenridge)—Mill run to be made on ore from development work. Ore is gold-bearing telluride of bismuth. Mine in upper Blue River district.

MOLLIE B (Breckenridge)—Ore assaying 1.5 oz. gold, 30 oz. silver and 10% bismuth opened by lessees recently; shipping.

MEKKA PLACER (Breckenridge) — Operations ceased recently when French Gulch dredge cut ditch supplying hydraulic water. This placer worked for 25 years, and most of high bars hydraulicked; low bars now being dredged.

MONTE CRISTO (Breckenridge)—Preparations for reopening mine under way. Milling plant to be remodeled and flotation process installed. Ore, containing lead and zinc sulphides, occurs in blanket vein of porphyry dipping about 25°, large area of which is exposed, allowing open-cut mining. Property owned by Big Reserve Mining Company.

Teller County

CRESSON (Cripple Creek)—Shipments of high-grade ore made recently.

BLUE BELL (Cripple Creek)—Stated shoot of galena carrying silver opened in this tunnel on Gold Hill.

SHERIFF (Cripple Creek)—On Raven Hill, to be reopened after years of inactivity. Shaft being retimbered and workings repaired.

BERTHA B (Cripple Creek)—Shipping-grade ore opened on 300-ft. level. Ore bins built; shipments will begin as soon as construction finished.

DANTE (Cripple Creek)—Mine leased to Denver company headed by Frank Goudy. Reid mill on property sold, and being dismantled.

LAST DOLLAR (Cripple Creek)—New brick shaft house being built; compressor and electric hoist overhauled. Old shaft house destroyed by fire recently. Mine operated by Catherine Gold Mining Co.

IDAHO

Shoshone County

COEUR D'ALENE ANTIMONY MINING (Kellogg)—Operating near mouth of Pine Creek; experiments on flotation process not yet completed. Recently encountered orebody carrying gold; shipping crude ore and concentrates.

CALEDONIA MINING CO. (Kellogg)—Company's report for first half of 1917 shows production of 331,742 lb. copper and 575,575 oz. silver of net value of $737,241 from 8657 dry tons. Mining cost was $2.89 per ton; milling cost, $0.63 per ton, and shipping $0.22 per ton. Total operating cost was $75,462; profit, $661,779. Development failed to show any new vein or additional ore. Charles McKinnis, manager.

MICHIGAN

Copper

SENECA (Calumet)—Started building warehouse, and will begin shortly on carpenter, machine, and blacksmith shops.

VICTORIA (Victoria)—This mine won its litigation with G. A. Berglund regarding raising of water in Lake Gogehic.

QUINCY (Hancock)—Daily production is 3600 to 4000 tons comparing with 4500 tons before labor shortage.

MICHIGAN (Rockland) — Drifting on Ogimah lode both ways with good copper ore; east on Butte lode; shaft 15 ft. to go to reach seventh level.

CHEROKEE (Houghton)—Working in 220- and 320-ft. levels in rich copper ore Shaft down 350 ft. obtaining some good showings.

WHITE PINE (Ontonagon)—Recovery from experimental flotation plant about 11 lb. with loss in final tailings of 4 lb. Making yield of refined copper about 34 lb., as compared with 22.27 lb. for 1916.

ISLE ROYALE (Houghton)—Daily production is 2800 tons, as compared with 3200 in winter. Shaft No. 5 in quality has equalled No. 4; ore from No. 7 is next, then No. 6, No. 2, and No. 1.

WOLVERINE (Houghton) — Footwal backing continues to furnish considerabl portion of medium-grade tonnage coppe ore. Continuance of ore in footwall o Kearsarge lode means larger tonnage than considered possible.

AMEEK (Houghton)—No labor difficulty since war started three years ago. Cu Kearsarge conglomerate lode indicating possible commercial ore some months ago opened laterally for 200 ft., but showing did not warrant further developmen Producing largest rock tonnage of high grade copper ore in history of property.

MINNESOTA

Cuyuna Range

RECORD PRODUCTION will be mad this year if marine tonnage is available Shipments to July 1, 998,000 tons; Armou and Kennedy mines lead with 140,000 an 115,000 tons respectively.

STRIKE OF MINERS on Cuyuna Rang began Aug. 6, instituted by I. W. W. ag tators. Mines affected: Cuyuna-Duluth Cuyuna Mille Lacs, Mangan, Armou Croft, Meachem, Merritt and Feigh mine idle. No disorder or destruction.

HILL CREST MINE (Ironton)—Stri ping work active to uncover additional or by steam shovel and hydraulic method Ore mining at low capacity due to lac of marine tonnage.

MacKENZIE MINE (Manganese)—Id due to water trouble. Water from su rounding mines raised level of near-by lak which has no outlet. One diamond dri active on property.

NORTH THOMPSON (Crosby)—Ove burden removal well advanced and iron o exposed. Will ship before close of seaso Operated by Inland Steel Co. under sta lease.

CUYUNA MILLE LACS (Ironton)—N 2 shaft sunk to ledge at 55 ft. Will electrically operated with steam for emer ency, capacity 1500 tons. Will operate high-grade manganiferous orebody.

MISSOURI

Joplin District

BILLIKEN (St. Louis, Okla.)—Has contract for 300-ton mill on lease adjoi ing that of St. Louis M. & S. Co. pro erties.

GOLDEN ROD (Picher, Okla.)—Negoti tion for purchase of this mine under wa with F. C. Wallower and P. E. Tabor Joplin; consideration asked, $300,000.

GREEN ZINC (Miami, Okla.)—New co centrating plant south of Commerce, Okl completed but unable to operate on accou of insufficient water. Deep well bei drilled.

LUCKY STRIKE (Miami, Okla.)—So lease of 20 acres to Southwestern Royal Co., which will develop. Lucky Strike r tains 60 acres upon which it plans erecti of two mills soon.

COAHUILA (Webb City)—Building ne 150-ton mill at Carthage on lease whe it has been operating old Hermosa mill f some time. Both mills will be used future, according to C. A. Smith, Webb Cit manager.

CARL PLUMB (Joplin)—With assoc ates, sold 40-acre lease just east of Luck

Extension tract to Frank M. Woods, of Denver, and associates. Woods formerly interested in some of largest Cripple Creek Mines. Will push development on lease. A. M. Gaines, formerly with Chicago Mining Co., superintendent.

WINGFIELD (Webb City)—Charles T. Orr, head of the Athletic Smelting Co., will move Wingfield mill at Webb City to site just south of Picher, Okla., where drilling disclosed good ore. One of the largest producers of Webb City camp; is in the sheet-ground area, where most of the ore is not rich enough to justify operations under present conditions.

VELIE & WEEKS (Joplin)—Planning early construction of third concentrating plant near Picher. Lion mill, completed some weeks ago, obtaining yield of almost 8% blende from ore in which drill records showed only 2.9%. Second mill, the Panther, now nearing completion. S. H. Velie, Kansas City implement man, head of company. Frank Weeks, Joplin, district manager.

MONTANA

Beaverhead County

NEW DEPARTURE (Argenta)—Leasers working and shipping high-grade ore.

UNITED STATES SMELTING CO. (Argenta)—Hauling from old slag dump and shipping to Midvale, Utah, for flux.

BOSTON & MONTANA DEVELOPMENT CO. (Wise River)—Montana Southern Railway Co. grading for narrow-gage railroad from Divide up Big Hole River to Wise River and then to company's mines in Elkhorn district. Will enable company to mine and ship high-grade copper and silver ore now blocked out and awaiting shipment by rail to smeltery.

Madison County

MANGANESE PROSPECTS being opened near Ennis and Sappington on branch railroad of Northern Pacific. Few shipments of 60% ore made. Old Revenue and Clipper mines being worked. Expect considerable activity in district developing old mines, due to difficulty in finding new ones. No great depth obtained in working, but considerable production obtained in first few hundred feet in past operations. Formation is gneiss with local bodies of granite, cut by porphyry and quartz porphyry dikes mostly in east and west direction.

Silver Bow County

ANACONDA (Butte) July output estimated at 12,400,000 lb. of copper, compared with June output of 20,400,000 lb., decrease due to strike which will also affect August production.

BUTTE & SUPERIOR (Butte)—Seriously affected by strike, earnings show estimated loss of nearly half a million. Many employees left for other camps at beginning of strike and will require time to replace them.

BARNES KING (Butte)—Company's statement for quarter ended June 30 shows following earnings: North Moccasin, $17,132; Piegan-Gloster, $18,664; Shannon, $49,024; Kendall, $938. Deficit was recorded on Boyer Group option and development, $1831; miscellaneous expense, $1103. Net profit on operations, $82,825. Exploration work in deeper levels of North Moccasin has not found any ore and outlook is not good for mine. Production from upper levels much less than previous quarter. Produced 5021 tons yielding $53,151. Piegan-Gloster is not developing new orebodies of importance. The 400 and 00 west drifts of Gloster have been advanced about 200 ft. since April 1. Produced 4896 tons ore, yielding $57,846 bullion. Shannon strike of high-grade ore reported previous issue. Produced 7670 tons yielding $87,637. Gave up option on Boyer property about June 1; showings discouraged further work.

NEVADA

Nye County

YANKEE BOY (Manhattan)—Formerly Chipmunk Mining Co.; now reorganized. Had some rich veins in past and will be worked shortly. H. W. McMillan, president.

DEXTER UNION (Manhattan)—From waste dump on No. 4 claim, 60 ton of ore recently sorted by B. J. Yurich and milled at War Eagle mill. Demonstrates wastefulness of old lessees work, as ore averaged $10 per ton in mill.

UNION AMALGAMATED (Manhattan) Since Earl contact was struck, flow of water increased steadily and advancing of east drift discontinued until adequate pump installed. In addition to main Earl orebody, two others developed from upper levels and will be exploited shortly after one now in sight has been explored.

WHITE CAPS (Manhattan)—East drift extended 28 ft. recently and hanging-wall crosscut from west drift driven 35 ft. No work done in raises from third level, as ore has blocked up everything; no relief until mill starts. Pump pocket completed and pump will be installed immediately. Assay office completed. Expect to start mill in few days after roll shells are received. Wedge furnace in mill being fired with full oil blast.

White Pine County

NEVADA CONSOLIDATED (McGill)—Production for three months ended June 30, was 20,817,356 lb. copper comparing with 18,852,321 lb. in previous quarter. Cost of production given as 10.19c. per lb., a slight increase over first quarter's record.

NEW MEXICO

HELEN RAE (Nogal)—Group of claims, situated in Dry Gulch and Nogal Canyon being developed by two tunnels, one 450 ft. in length and other 190 ft. Vein about 5 ft. in width. J. H. Robertson, in charge.

OREGON

Josephine County

PLACER MINES in Waldo district are shut down during the rainy season.

NEILS SUCCESS (Kerby)—This gold mine is in operation under management of R. J. Firth of Seattle.

CHROME DEPOSITS located near Kerby by Fred Hart, J. W. Bigelow, T. P. Johnson and Dave Bauer.

WALDO (Takilma)—This copper mine shut down on Aug. 6. Reported sale pending and changes to be made. A. H. Gunnell, Grant's Pass, manager.

SOUTH DAKOTA

Custer County

CRAWFORD MICA (Custer)—Old Mike mine reopened and production being made. Operations at Pringle, which have produced a large tonnage during last year, have been suspended.

SPOKANE LEAD AND SILVER (Custer)—Car of high-grade, lead-silver ore ready for shipment to smeltery. Shaft down 180 ft. in ore and will be continued. Ore taken from 100-ft. level transported four miles to railroad by Jeffrey Quad truck with trailer.

UTAH

Iron County

CALUMET (Lund)—Newly developed property of 19 claims, 30 miles northwest of Lund; made 19 shipments, 30 to 50 tons, each.

Juab County

IRON KING (Eureka)—Capitalization increased from 1,000,000 shares, par value $1 to twice this amount. Shaft sinking to be started. Col. C. E. Loose, president.

TINTIC STANDARD (Eureka) — July shipments amounted to 21 cars. New shaft has cut ore for 86 ft. Station will be completed at 1260-ft. level, and will drift to make connections with main orebody. New 150-hp. motor installed at shaft.

Salt Lake County

SILVER SHIELD (Bingham) — Shaft sunk to 60 ft. in quartzite showing mineralization. Well equipped.

ALTA TUNNEL AND TRANSPORTATION (Alta)—Tunnel in 2700 ft., face being in hard limestone showing iron staining.

COLUMBUS-REXALL (Salt Lake)—First car ore (63 tons) from new strike brought to market. Seventy tons more ready. Ore carries copper, silver, and lead.

BOSTON DEVELOPMENT (Salt Lake)—Old Maxfield mine being developed under lease and bond. Drifting from tunnel level in white limestone Fairview fissure, showing ore on surface. Work in new ground.

UTAH COPPER (Bingham)—Production for quarter ended June 30 was 56,403,465 lb. copper comparing with 42,866,316 lb. in March quarter. June production, 19,909,097 lb. copper as compared to 19,262,856 in May.

MONTANA BINGHAM (Bingham Canyon)—First 100-ton unit of new mill to treat ores from Fortuna property started and working satisfactory. Expect second 100-ton unit in operation immediately. Oil flotation used, on 2% copper ore. About 3000 ft. piping completed to furnish additional water other units require. Pumps installed.

Summit County

PARK CITY SHIPMENTS during July amounted to 8149 tons, showing an increase of 1553 tons over June. There were 11 shippers.

CALIFORNIA COMSTOCK (Park City)—Fifth car shipped within 10 days, present output being about 30 tons daily. Air connections to be completed with California workings. Expected to increase production as soon as compressor is ready. Lead-silver ore; also copper showings. Developing in upper levels.

CANADA

British Columbia

MINNESOTA GOLD AND SILVER MINING AND MANUFACTURING CO. (Ferguson)—Operating in Trout Lake district two properties, the Triune and Florence on south fork of the Lardeau. Have small quantities of shipping lead-silver ore from Triune. R. H. Battey, general manager.

FERGUSON DISTRICT is developing considerable activity in promising silver-lead properties. Towser mine is producing, situated 4 miles from Ferguson, up South Fork. Silver Cup and Nettie L being worked under bond. Circle City, 7 miles up North Fork from Ferguson being exploited by new company.

Ontario

BOSTON HOLLINGER (Boston Creek)—Expect to install mining plant, when shaft is sunk to 200-ft. level, and lateral work undertaken.

SLADE-FORBES (Porcupine)—This asbestos property being reopened and shipments of high-grade asbestos will be resumed. A small mill will be erected.

MINAKER-KIRKLAND (Kirkland Lake) Main shaft down 30 ft. on new vein recently encountered on north claim, which runs in from Lake Shore mine. Vein continues strong and highly mineralized.

CROESUS (Monroe Township) — New pumping equipment installed to prevent flooding, and flow of water expected to be shut off by placing of cement bulkhead in seam, enabling underground work to be resumed.

MILLER LAKE-O'BRIEN (Elk Lake)—Vein now being developed is 10 ft. wide in one place with five stringers running through it, about 5 in. wide, of high-grade ore. Rest of vein being good milling ore. Further on stringers unite in one orebody 28 in. wide with high silver.

McINTYRE (Schumacher)—Diamond drilling on Plenaurum property optioned some months ago. Situated northeast of Jupiter and management believes Jupiter orebodies continue into Plenaurum. Active drilling on Jupiter to locate other orebodies carried on. Mill operating at 525 tons per day treating largely ore from south of lake ahd development work on No. 5 vein. Not likely to show any increase in production for July over June. Expect to have banner month in August because 800- and 1000-ft. levels on No. 5 vein completed and allow extraction high-grade ore in this section.

CHILE

BRADEN (Rancagua)—July production of copper amounted to 6,250,000 lb., compared with 5,002,000 lb. in June.

SOUTH AFRICA

RHODESIAN GOLD PRODUCTION in June was $1,470,692, an increase of 1% over May, but a decrease of 9.8% from June, 1916. For the six months ended June 30, output was $9,538,014 in 1916, and $8,684,495 in 1917, a decrease of $853,619 this year. Other production in June included 19,986 oz. silver, 347 tons copper, 859 tons asbestos, 3805 tons chrome ore and 41,837 tons coal; also 66 carats diamonds.

TRANSVAAL GOLD PRODUCTION in June was 759,724 oz., being 19,661 oz. less than in May and 2040 oz. less than in June, 1916. For the six months ended June 30, the total production was $95,816,856 in 1916, and $94,597,788 in 1917; a decrease of $1,219,068 this year. The number of negro laborers employed in June was: Gold mines, 175,727; coal mines, 11,258; diamond mines, 5369; total, 192,354, being a decrease of 6057 from May.

CHOSEN

ORIENTAL CONSOLIDATED MINING (Unsan)—Cable report, July cleanup, $95,000; value below average owing to rainy season. June bullion amounted to $106,324 divided as follows: Tabowie mill, $22,669; Taracol mill, $21,589; Maibong, $12,311; Taracol cyanide plant, $46,067; Maibong tube mill, $3686. Tonnage milled aggregated 25,970. Taracol cyanide plant and Maibong tube mill shipped slag and furnace ashes to Chinnamampo smeltery receiving $1818 returns. Bullion output below average because of low grade of ore going to Tabowie and Maibong mill. Expect to bring Tabowie feed up to normal soon, but do not hope for much better results from Maibong as Charabowie mine has only eight to 10 months' low-grade ore supply left. Native labor plentiful.

The Market Report

Metal Markets

SILVER AND STERLING EXCHANGE

Aug.	Sterling Exchange	Silver New York, Cents	Silver London, Pence	Aug.	Sterling Exchange	Silver New York, Cents	Silver London, Pence
9	4 7556	82⅞	42 1/16	13	4 7556	82⅞	42 1/16
10	4 7556	82⅞	42 1/16	14	4 7556	83¾	42½
11	4 7556	82⅞	42 1/16	15	4 7556	86¾	44

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

DAILY PRICES OF METALS IN NEW YORK

Aug.	Copper Electrolytic	Tin Spot.	Lead N. Y.	Lead St. L.	Zinc St. L.
9	25¾ @26¼	63¾	10½ @11	10 50 @10.90	8.45 @8 55
10	25½ @26	63¼	10½ @11	10.50 @10 90	8 40 @8 50
11	25½ @26	63⅛	10¼ @11	10⅝ @10¾	8 40 @8 50
13	25 @25½	62¾	10 30 @11	10 30 @10 80	8 40 @8 50
14	24¾ @25¼	62⅝	10 30 @11	10 30 @10 80	8 35 @8.40
15	24½ @25	62⅝	10½ @11	10½ @10 90	8.35 @8 40

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

The quotations for electrolytic copper are for cakes; ingots and wirebars. Electrolytic copper is commonly sold on "regular terms" (r.t.), including freight to the buyer's works and is subject to a discount for cash. The difference between the price delivered and the New York cash equivalent is at present about 0.25c. on domestic business. The price of electrolytic cathodes is 0.05 to 0.10c. below that of electrolytic. Quotations for spelter are for ordinary Prime Western brands. We quote New York price at 17c. per 100 lb. above St. Louis.

Some current freight rates on metals per 100 lb. are: St. Louis-New York 17c.; St. Louis-Chicago, 6.3c.; St. Louis-Pittsburgh, 13.1 cents.

LONDON

Aug.	Copper Standard Spot	Copper Standard 3 Mos.	Copper Electrolytic	Tin Spot	Tin 3 Mos.	Lead Spot	Zinc Spot
9	125	124½	137	247¼	244	30½	54
10	125	124½	137	244¼	241	30½	54
11							
13	125	124½	137	242½	239	30½	54
14	125	124½	137	242¼	238¾	30½	54
15	125	124½	137	244	240½	30½	54

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2,240 lb. For convenience in comparison of London prices, in pounds sterling per 2,240 lb., with American prices in cents per pound the following approximate ratios are given, reckoning exchange at 4.80. £15 = 3.21c.; £20 = 4.29c.; £30 = 6.43c.; £40 = 8.57c.; £60 = 12.85c. Variations, £1 = 0.21⅜c.

NEW YORK—Aug. 15

The same unsatisfactory condition continued in all of the metal markets, which are under the obsession of the uncertainty over what the Government is going to do. Negotiations are going on in Washington, but neither their progress nor their nature may be revealed.

Copper, Tin, Lead and Zinc

Copper—There were a few especially noteworthy transactions this week in lots of considerable size, including at least one of importance for export. All of the business of major character was for October-December or September-December delivery. There was increasing pressure to sell from several quarters, and on Aug. 15, business was done for September-December delivery on the basis of 24⅝c., net cash, New York, while September copper alone was to be had at 25c.

Soon after noon, Aug. 15, it was reported (but not officially) that the War Industries Board had agreed to advance to the copper producers 22½c. per lb., leaving the difference between that price and 25c. to be settled after receipt of the report of the Federal Trade Commission.

It was a matter of gossip that the Federal Trade Commission has obtained from copper producers all the figures that it wants and has made up its mind respecting cost of production, except in the case of one important company, whose business is complicated.

The Great Falls refinery is closed. The Raritan refinery is operating at reduced capacity.

The Baltimore Copper Rolling and Smelting Co., subsidiary of the American Smelting and Refining Co., has established a warehouse in New York to take care of the retail trade in pig and sheet copper, tin, lead, antimony, etc.

Copper Sheets are quoted at 37c. per lb. for hot rolled, and 1c. higher for cold rolled. Wire is quoted nominally at 33c. per lb., f.o.b. mill.

Tin—The market was quiet, business being estimated at not more than 35 to 40 tons per day. Quotations declined a little. Banka tin was relatively weaker than Straits, being quoted at 58½c. at the close.

Lead—This market was rather queer, and there was much irregularity in quotations on business actually done. There was some reselling by consumers, comprising some round lots, which were let go as low as 10½c., New York, for prompt shipment. On the other hand, buyers paid the full price asked by the A. S. & R. Co., and at the close of the week a large tonnage was placed at that price, while at the same time other large tonnages were under negotiation at lower prices. The delivery required for lead made considerable difference, buyers who needed lead for immediate shipment from New York finding great difficulty in obtaining it at less than 11c., and, indeed, an impossibility when the quantity wanted was large.

Zinc—As the time for putting in the bids for the Government order for Grade C spelter on Aug. 10 approached, it was thought that an improvement in this market might be on the point of being ushered in, and there was a slightly firmer tone, but hopes were disappointed and the market then went off, sellers being unable to realize as much as 8½c. any more, the small business reported having been done at 8⅜c.

Zinc Sheets—Price of zinc sheets has not been changed. Market is still at $19 per 100 lb. f.o.b. Peru, Ill., less 8% discount.

Other Metals

Aluminum—The aluminum market is inactive and quotations are nominal at 48@50c. per lb. for No. 1 ingots at New York.

Antimony—Practically no business was reported and the quotation was unchanged at 15@15½c. for spot.

Bismuth—Unchanged at $3.50 per pound.

Cadmium—Unchanged at $1.40@1.60 per pound.

Nickel—Steady at 50c. per lb., premium of 5c. per lb. for electrolytic.

Quicksilver—Unchanged at $115. San Francisco reports, by telegraph, $112, market steady.

Gold, Silver and Platinum

Gold in the United States Aug. 1 is estimated by the Treasury Department as follows: Held in Treasury against gold certificates outstanding, $2,146,706,639; in Treasury current balances, $188,163,487; in banks and circulation, $751,248,372; total, $3,086,218,498, which is an increase of $585,988,934 over Aug. 1 of last year.

Gold will be purchased at Government assay offices in the future on a basis of fineness. The Director of the Mint has canceled previous regulations under which bullion was purchased on the basis of the value of its silver content. Bullion containing not less than one part of gold and not more than 800 parts base metals in a total of 1000 parts may be purchased under the new regulation. Heretofore only bullion containing at least 10 times in gold the value of the silver content has been purchased. The old regulation had been in effect more than 44 years.

Silver—The London market held steady at 42 1/16d. from Aug. 9 to Aug. 13; then jumped to 42½d. on Aug. 14, and closed excited at 44d. on Aug. 15. The rise is due to an insistent demand coming on a market short of supplies. The future is uncertain but favors still higher prices.

Mexican dollars at New York: Aug. 8. 63⅜c.; 9, 64¾c.; 10, 64¾c.; 11, 64¾c.; 13, 64¾c.; 14, 65c.

Platinum—Unchanged at $105, in fair demand.

Palladium—Easier; quoted at $115@120.

Zinc and Lead Ore Markets

Joplin, Mo., Aug. 11—Blende, per ton, high, $78.50, basis 60% Zn; premium, $75; medium to low, $70@65; calamine per ton, basis 40% Zn, $42@40; average selling price, all grades of zinc, $67.11 per ton.

Lead, high, $119.60, basis 80% Pb; $115@110; average selling price, all grades of lead, $114.02 per ton.

Shipments—Blende, 9006 tons; calamine, 506 tons; lead, 1131 tons. Value, all ores the week, $767,350.

Enlistment and draft is seriously lowering the working force in the mines, not only preventing an increase in output but actually causing a decrease of the production.

Platteville, Wis., Aug. 11—Blende, basis 60% Zn, $70 for premium ore down to $65 for medium grade. Lead ore, basis 80% Pb, $112 to $115 per ton. Shipments reported for the week are 2571 tons of zinc ore, 214 tons of lead ore, and 488 tons of sulphur ore. For the year to date, the figures are: 86,477 tons of zinc ore, 4120 tons of lead ore, and 17,823 tons of sulphur ore. Shipped during week to separating plants were 3559 tons of zinc ore.

Other Ores

Antimony Ore—Business was reported done at $2 per unit.

Chrome Ore—This ore is still in keen demand by manufacturers of chemicals and ferrochromium who need high-grade ore and have been cut off from supplies of foreign material, but the market is easier. Ore assaying upward of 50% chromic oxide is still salable at $1 per unit, but ore of 44 to 46% grade will not bring more than 80@85c. Lower grades of ore, marketable with the brick manufacturers, may bring no more than 50c. per unit.

Manganese Ore—The high prices have brought out an increasing supply, wherefore buyers are in a more independent position. High-grade metallurgical ore has declined to $1 per unit. Ore high in silica is now salable with difficulty.

Molybdenum Ore—Quoted at $2.10@2.15 per lb. of molybdenum sulphide in concentrates assaying 90 per cent.

Tungsten Ore—Strong at $25 for high-grade wolframite. Ore of lower grade is quoted at $20@24, with transactions reported at $22@23.50.

Pyrites—Spanish lump quoted at 15c. per unit on basis of 10s. ocean freight, buyer to pay war risk, excess freight and any duty. Ocean freights are 42s. 6d. from Huelva to southern ports. A recent sale of 1500 tons at this price cost the buyer 32c. per unit ex-ship, or about 35c. f.o.b. works. Scattering offers of domestic pyrites have not met requirements and many inland fertilizer plants are now burning brimstone obtained by special arrangement at $22, f.o.b. mines in Louisiana and Texas; this is cheaper than using pyrites at present prices.

Iron Ore—Prices, delivered lower Lake ports are for old-range bessemer, $5.95;

old-range nonbessemer, $5.20; Mesabi bessemer, $5.70; and Mesabi nonbessemer, $5.05.

Lake Superior Ore Shipments in July were 10,241,633 gross tons, being 491,476 tons more than in July, 1916. For the season to Aug. 1 the total shipments were in gross tons:

Port.	1916	1917	Changes
Escanaba	3,647,192	3,137,571	D. 509,621
Marquette	1,834,919	1,269,636	D. 565,283
Oakland	3,506,945	3,147,794	D. 359,151
Superior	5,865,546	5,757,384	D. 107,962
Duluth	9,338,482	8,672,767	D. 665,715
Two Harbors	5,172,640	4,391,416	D. 781,224
Total	29,365,724	26,376,768	D. 2,988,956

The total decrease this year was 10.2%; it was due to the late opening of navigation.

Iron Trade Review

NEW YORK—Aug. 15

Government orders for steel are increasing and the export movement is large in spite of embargoes; but ordinary domestic business in iron and steel is insignificant, says "Iron Age." Without taking a final position on the question of selling to the Allies at the same prices as to the Government, steel manufacturers have accepted orders from officials at Washington this week applying on 10,000 tons of annealed wire and 20,000 tons of wire rods for Italy, prices to be fixed after the Trade Commission's findings are made up.

PITTSBURGH—Aug. 14

The whole market continues stagnant, the stagnation which began developing late in June having been accentuated by the growing prospect that the Government will take a hand in price fixing. It is frequently represented that the Government has caused the stagnation in the markets but as a matter of fact it is clear that this would have developed in any event, for buyers had been purchasing early deliveries only at the high prices quoted as the market. There is, in a sense, another steel market on the level of prices now being realized on current shipments, but while the large mills regard this latter as the true market they are not quoting. It is certain that prices for forward deliveries will at least come down to about this level, but there is a question whether they will not be brought still lower. There will doubtless be further developments after the Government has fixed prices on coke, which it is expected to do within a few weeks, as this would materially lower the cost of making pig iron. Thus far the extent of the price readjustment is that scrap started to decline late in June and is now down 25 to 35%; pig iron started softening a trifle early in July and in the last 10 days unfinished steel is down $10 to $15 a ton. There have been no declines whatever in finished steel products, but also no advances since the close of June.

Pig Iron—There is practically no demand for pig iron and the furnaces are sitting tight, quoting practically their former prices, with output sold for this year and 35 to 60% of the first-half output sold. A little resale iron is offered, but this is not in demand. We quote: Bessemer, $55; basic, $52; malleable and foundry, $53@55, f.o.b. valley furnaces, 95c. higher delivered Pittsburgh.

Steel—In the last 10 days there have been offerings of unfinished steel from at least three sources at prices $10 to $15 under those established last June as the market but which had lately become nominal. Billets were offered at $85 and sheet bars and slabs at $90, against former quotations of $95@100 for billets and $105@110 for sheet bars, slabs having been unquotable because they were so scarce. Of these offerings a small tonnage of slabs was offered, and that is all.

Ferroalloys

Ferromanganese—The market is rather inactive, prompt and second half being $375@400 and first half $350@375, per ton delivered. Imports are light.

Coke

Connellsville—The market stiffened sharply late last week and is holding the higher level, $13.50@14 for furnace coke loaded in B & O or P & L E cars, and $14.50@15 for coke loaded in Pennsylvania cars, as these cars can go anywhere, cars of the other systems being held to their own rails. The Food Control bill was signed last Friday afternoon and Saturday morning the coke operators received telegrams from the Federal Trade Commission asking for their costs in June. These are now being compiled and show $4 a ton or even more.

STOCK QUOTATIONS

N. Y. EXCH.†	Aug. 14
Alaska Gold M	6
Alaska Juneau	3½
Am.Sm & Ref.,com	101¾
Am. Sm. & Ref., pf.	112½
Am. Sm. Sec., pf., A	98½
Am. Sm. Sec., pf. B	91½
Am. Zinc	22½
Am. Zinc, pf.	69
Anaconda	75¾
Batopilas Min	1
Bethlehem Steel	116½
Bethlehem Steel, pf.	115
Butte & Superior	38¾
Cerro de Pasco	36½
Chile Cop	19½
Chino	55½
Colo. Fuel & Iron	49
Crucible Steel	81¾
Dome Mines	9½
Federal M. & S.	22
Federal M. & S., pf	51½
Great Nor., ore ctf.	34
Greene Cananea	42½
Gulf States Steel	113
Homestake	103½
Inspiration Con	55½
International Nickel	40¾
Kennecott	43
Lackawanna Steel	91
Miami Copper	37½
Nat'l Lead, com.	55
National Lead, pf	105
Nev. Consol.	22½
Ontario Min	5½
Quicksilver	1½
Quicksilver, pf	1½
Ray Con	27
Republic I &S.,com.	89¾
Republic I & S., pf	104
Sloss-Sheffield	54½
Tennessee C. & C.	17½
U. S. Steel, com.	123½
U. S. Steel, pf	117½
Utah Copper	104¾
Va. Iron C. & C.	69

N. Y. CURB†	Aug. 14
Big Ledge	1½
Butte & N. Y.	1½
Butte C. & Z.	10½
Caledonia	72
Calumet & Jerome	1½
Can. Cop. Corpn.	2½
Carlisle	14
Cashboy	07
Con. Ariz. Sm	2½
Con. Coppermines	8½
Con. Nev.-Utah	04
Emma Con	1 1/16
Ferber	‡ 60
First Nat. Cop	2 11/16
Goldfield Con.	55
Goldfield Merger	05½
Greenmonster	½
Hecla Min	9
Howe Sound	5½
Jerome Verde	1 11/16
Kerr Lake	5¾
Magma	50
Majestic	40
McKinley-Dar-Sa	55
Milford	1 11/16
Mohican	½
Mother Lode	40
N. Y. & Hond	14
Nipissing Mines	7½
Ohio Cop	1½
Ray Hercules	3¾
Richmond	55
Rochester Mines	56
St. Joseph Lead	20½
Standard S. L.	65½
Stewart	½
Success	30
Tonopah	6½
Tonopah Ex	2 1/16
Tribullion	1/16
Troy Arizona	19
United Cop	½
United Verde Ext	36½
United Zinc	5
Utica Mines	21
White Knob, pf	1½
Yukon Gold	1½

SAN FRAN.*	Aug. 14
Alta	03
Andes	10
Best & Belcher	02
Bullion	01
Caledonia	10
Challenge Con	01
Confidence	05
Con. Virginia	16
Gould & Curry	02
Hale & Norcross	03
Jacket-Cr. Pt	10
Mexican	08
Occidental	60
Ophir	08
Overman	01
Savage	03
Seg. Belcher	01
Sierra Nevada	06
Union Con	11
Utah Con	01
Belmont	4 35
Jim Butler	84
MacNamara	12
Midway	11
Mont.-Tonopah	19
North Star	10
Rescue Eula	19
West End Con.	65
Atlanta	10
Booth	07
Comb. Frac	03
D'field Daisy	01
Florence	15
Jumbo Extension	25
Kewanas	12
Nevada Hills	20
Nevada Packard	31
Round Mountain	25
Silver Pick	10
White Caps	1 42½
Big Jim	‡ 69
United Eastern	4 25

BOSTON EXCH.*	Aug. 14
Adventure	2
Ahmeek	99½
Algomah	50
Allouez	64
Ariz. Com., ctfs	12½
Arnold	25
Bonanza	20
Butte-Ballaklava	.55
Calumet & Ariz	79
Calumet & Hecla	540
Centennial	16½
Copper Range	61¾
Daly West	1½
Davis-Daly	6½
East Butte	11½
Franklin	6¾
Granby	80
Hancock	13½
Hedley	15½
Helvetia	25
Indiana	2½
Isle Royale	30
Keweenaw	2
Lake	9½
La Salle	3½
Mason Valley	7½
Mass	11½
Mayflower	2
Michigan	1½
Mohawk	81¾
New Arcadian	3
New Idria	14
North Butte	17½
North Lake	1½
Ojibway	1½
Old Dominion	56
Osceola	85
Quincy	87
St. Mary's M. L.	78
Santa Fe	1
Seneca	9
Shannon	7½
Shattuck-Ariz.	24½
So. Lake	3
So. Utah	16
Superior	7½
Superior & Bost.	4
Trinity	6½
Tuolumne	1
U. S. Smelting	56½
U. S. Smelt'g, pf	49½
Utah Apex	2½
Utah Con	15½
Utah Metal	4½
Victoria	3½
Winona	3
Wolverine	47
Wyandot	25

BOSTON CURB*	Aug. 14
Alaska Mines Corp.	50
Bingham Mines	12½
Boston Ely	80
Boston & Mont	73
Butte & Lon'n Dev	15
Calaveras	3½
Calumet-Corbin	01
Chief Con	2½
Cortez	.15
Crown Reserve	23
Crystal Cop	90
Eagle & Blue Bell	2½
Houghton Copper	90
Intermountain	1 1/16
Iron Cap, Com	17½
Iron Cap Cop., pf	17
Mexican Metals	27
Mines of America	1½
Mojave Tungsten	45
Nat. Zinc & Lead	35
Nevada-Douglas	1 1/16
New Baltic	1½
New Cornelia	18½
Oneco	45
Pacific Mines	‡ 30
Rex Cons	22

SALT LAKE*	Aug. 14
Bannack	55
Big Four	17
Black Jack	‡ 06
Cardiff	5 00
Colorado Mining	18
Daly-Judge	8 60
Empire Copper	1 30
Gold Chain	18
Grand Central	54
Grand Gulch	‡ 19
Iron Blossom	86
Lower Mammoth	03
May Day	06½
Moscow	15
Prince Con	1 02½
Silver-King Coal'n	2 95
Silver King Con.	3 77½
Sioux Con	13
So. Hecla	1 42½
Uncle Sam	20
Wilbert	27
Yankee	07½

TORONTO*	Aug. 14
Bailey	‡ 03
Beaver Con	33
Buffalo Mines	1 00
Chambers Ferland	13½
Coniagas	3 60
Hargraves	11½
La Rose	45
Peterson Lake	10½
Right of Way	05
Temiskaming	32
Wettlaufer-Lor	05
Dome Exten	15
Dome Lake	15
Foley O'Brien	60
Hollinger	4 30
McIntyre	1 40
Newray	68
Porcu. Crown	36½
Schumacher	42
Teck Hughes	48
Vipond	32
West Dome	17½

STOCK QUOTATIONS—Continued

COLO. SPRINGS	Aug. 14
Cresson Con	5 62½
Doctor Jack Pot	04
Elkton Con.	04½
El Paso	26
Gold Sovereign	04½
Golden Cycle	2 10
Granite	48
Isabella	09½
Mary McKinney	11½
Portland	1 40
United Gold M	19½
Vindicator	.65

LONDON	Aug. 2		
Alaska Mexican	£0	10s	0d
Alaska Tre'dwell	1	2	6
Burma Corp.	3	18	9
Cam & Motor	0	10	0
Camp Bird	0	6	6
El Oro	0	9	0
Esperanza	0	9	0
Mexican Mines	4	7	6
Nechi, pfd.	0	12	6
Oroville	0	15	9
Santa Gert'dis	0	10	0
Tomboy	0	18	6

* Bid prices † Closing prices ‡ Last Quotations

MONTHLY AVERAGE PRICES OF METALS

Silver	New York			London		
	1915	1916	1917	1915	1916	1917
January	48.855	56.775	75.630	22.731	26.960	36.682
February	48.477	56.755	77.585	22.753	26.975	37.742
March	50.241	57.935	73.861	23.708	27.597	36.410
April	50.250	64.415	73.875	23.709	30.662	36.963
May	49.915	74.269	74.745	23.570	35.477	37.940
June	49.034	65.024	76.971	23.267	31.060	[illegible]
July	47.519	62.940	79.010	22.597	30.000	40.110
August	47.163	66.083		22.780	31.498	
September	48.680	68.515		23.591	32.584	
October	49.385	67.855		23.925	32.361	
November	51.714	71.604		25.094	34.192	
December	54.971	75.765		26.373	36.410	
Year	49.684	65.661		23.675	31.315	

New York quotations cents per ounce troy, fine silver London, pence per ounce, sterling silver, 0.925 fine

Copper	New York		London			
	Electrolytic		Standard		Electrolytic	
	1916	1917	1916	1917	1916	1917
Jan	24.008	28.673	88.083	131.921	116.167	142.895
Feb	26.440	31.750	102.667	137.895	133.167	148.100
Mar	26.310	31.481	107.714	136.750	136.000	151.000
April	27.895	27.935	124.319	133.842	137.389	147.158
May	28.625	28.788	135.457	130.000	152.522	142.000
June	26.601	[illegible]	112.432	140.000	137.455	142.000
July	23.865	26.620	95.119	128.409	125.500	140.409
Aug	26.120		110.283		126.304	
Sept	26.855		113.905		134.071	
Oct	27.193		122.750		142.523	
Nov	30.625		134.659		155.432	
Dec	31.890		145.316		162.842	
Year	27.202		116.059		138.281	

Tin	New York		London	
	1916	1917	1916	1917
January	41.825	44.175	175.548	185.813
February	42.717	51.420	181.107	198.974
March	50.741	54.388	193.609	207.443
April	51.230	55.910	199.736	220.171
May	49.125	63.173	196.511	245.114
June	42.231	62.053	179.466	[illegible]
July	38.510	62.570	168.357	242.181
August	38.565		169.870	
September	38.830		171.345	
October	41.241		179.307	
November	44.109		186.932	
December	42.635		183.368	
Av. year	43.480		182.096	

Lead	New York		St. Louis		London	
	1916	1917	1916	1917	1916	1917
January	5.921	7.626	5.826	7.530	31.167	30.500
February	6.246	8.636	6.164	8.595	31.988	30.500
March	7.136	9.199	7.375	9.120	34.440	30.500
April	7.630	9.288	7.655	9.158	34.368	30.500
May	7.463	10.207	7.332	10.202	32.967	30.500
June	6.936	11.171	6.749	[illegible]	31.011	[illegible]
July	6.352	10.710	6.185	10.644	28.137	30.500
August	6.244		6.088		29.731	
September	6.810		6.699		30.786	
October	7.000		6.898		30.716	
November	7.042		6.945		30.500	
December	7.513		7.405		30.500	
Year	6.853		6.777		31.359	

Spelter	New York		St. Louis		London	
	1916	1917	1916	1917	1916	1917
Jan	16.915	9.019	16.745	9.449	89.810	48.329
Feb	18.420	10.045	18.260	9.875	97.762	47.000
Mar	16.846	10.300	16.676	10.130	95.048	47.000
April	16.695	9.450	16.525	9.289	99.056	54.632
May	14.276	9.362	14.106	9.192	94.217	54.000
June	11.752	9.371	11.582	[illegible]	68.591	54.101
July	8.925	8.643	8.755	8.473	50.750	54.000
Aug	8.730		8.560		61.587	
Sept	8.990		8.820		62.095	
Oct	9.829		9.659		54.159	
Nov	11.592		11.422		56.023	
Dec	10.665		10.495		55.842	
Year	12.804		12.634		72.071	

New York and St. Louis quotations, cents per pound, London, pounds sterling per long ton

Pig Iron, Pitts.	Bessemer‡		Basic‡		No. 2 Foundry	
	1916	1917	1916	1917	1916	1917
January	$21.60	$35.95	$18.78	$30.95	$19.70	$30.95
February	21.16	36.37	18.93	30.95	19.61	30.95
March	21.81	37.37	19.20	33.49	19.45	35.91
April	21.65	42.23	18.95	38.90	19.45	40.06
May	21.78	46.94	19.11	47.84	19.68	43.60
June	21.95	54.22	18.95	50.05	19.34	50.14
July	21.95	57.45	18.95	53.80	19.20	53.95
August	21.95		18.95		19.22	
September	22.88		19.58		19.53	
October	24.61		21.26		21.51	
November	30.07		28.18		26.55	
December	35.16		30.95		30.79	
Year	$23.88		$20.98		$21.15	

‡ As reported by W. P. Snyder & Co.

Engineering and Mining Journal

VOLUME 104 AUGUST 25, 1917 NUMBER 8

British America Nickel Corporation's New Works in Ontario

By E. P. MATHEWSON

General Manager, British American Nickel Corporation, Toronto, Ont.

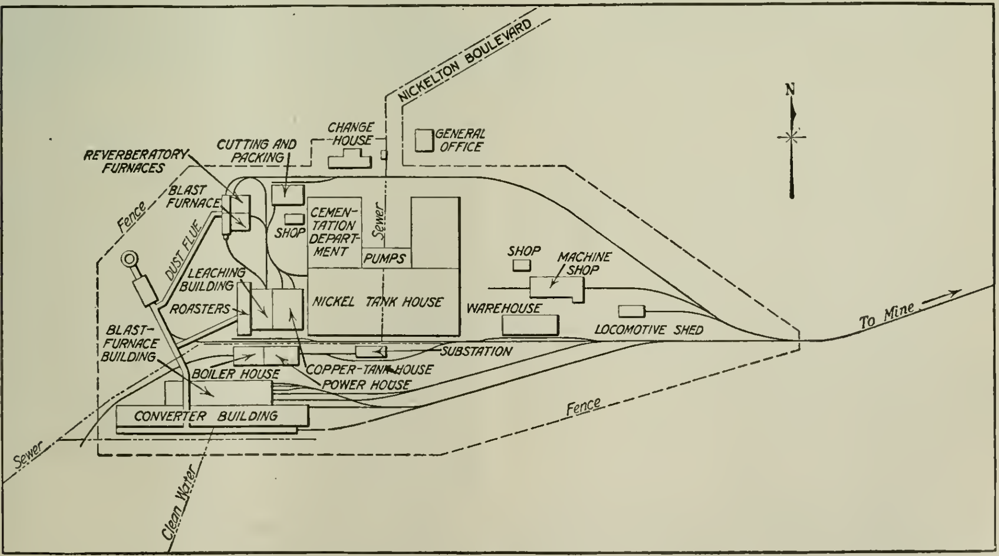
The British America Nickel Corporation is now constructing a 2500-ton smelting plant at Nickelton, Ont., four miles northwest of Sudbury; it will comprise four 25-ft. blast furnaces and seven 13 x 30-ft. Peirce-Smith converters. The refinery, which will be built adjacent to the smelting works, will use the Hybinette process and have a capacity of 10,000 tons of nickel per annum.

THE British America Nickel Corporation, Ltd., was most unfortunate in losing its chief promoter, Dr. F. S. Pearson, on the "Lusitania." The death of this captain of industry was a severe blow to the enterprise, and it was only after considerable effort on the part of Dr. Pearson's associates that the enterprise was refinanced and started off on a sound basis.

The corporation owns a considerable acreage of undeveloped nickel claims and has in the Murray mine great reserves of nickel ore developed by diamond drilling, to which are being added still further reserves by the diamond drilling which is now being done.

At first it was thought advisable by the new board of directors to build the smeltery near the mine and the refinery on the Niagara Peninsula, but when the present management investigated data, it was found expedient to change this plan and build the smeltery and refinery adjacent to each other on the site chosen for the smeltery in the first place. Preliminary work has been done, and a force of about 250 men is now at work putting in trackage and building foundations. The machine shop and warehouse are already up and in use. The site is connected by rail to the Canadian Pacific Ry. and the Algoma Eastern systems. The principal ore supply will be from the Murray mine, about one mile distant from the smeltery and connected therewith by standard-gage railway.

The ore coming from the mine will be picked on picking belts and screened over ¾-in. grizzlies. The coarse ore will be smelted in blast furnaces to a 10% copper-nickel matte; the fines will be added to the converter charge.



GENERAL PLAN OF NEW WORKS OF BRITISH AMERICA NICKEL CORPORATION AT NICKELTON, ONT.

The blast furnaces will be four in number, 25 ft. in length by 50 in. wide at tuyeres, but so arranged that if necessary they can be coupled together to give nearly double the hearth area. These furnaces are to be charged from both sides and will tap into the usual settlers, the slag being drawn off into slag cars and transported to the dump by electric locomotives.

The converter plant will be larger than usual and will consist of seven of the latest type of Peirce-Smith converters, with shells 13 ft. in diameter by 30 ft. long, outside measurements. These will be fitted with the Garr silica gun. A portion of the converter slag will be cast on the converter floor, broken up and used in the blast furnaces as flux. The remainder will be poured into the blast-furnace forehearths for settlement. The converter matte produced will contain about 80% copper and nickel, approximately 1% iron, the remainder being mostly sulphur. This will be granulated and taken to the refinery, where it will be roasted in mechanical furnaces of the Wedge type, then leached to extract the bulk of the copper, which will be recovered electrolytically, using insoluble anodes. The residue from the leaching will be melted down and cast into anodes which will be electrolyzed by the Hybinette process.

The attached plan gives a clear idea of the layout of the plant. Sufficient room has been left for extension in all departments. The smeltery building proper will be 160 ft. wide and 360 ft. long; the refinery building, 225 ft. wide by 400 ft. long. In addition to these buildings there will be provided shops, changehouse, clubhouse, laboratory, general office, warehouse, power house, substation, etc. The capacity of the plant to be installed will be about 2500 tons of ore per day, or a nickel production of 10,000 tons per annum.

Power will be secured from the Hydro-Electric Commission of Ontario, and all machinery will be operated by electricity. However, a steam plant of about 1000 hp. will be required to heat the various buildings and solutions. Steam-generator sets will be used as pressure reducers, the electricity to be used in connection with the main power plant and also for emergency purposes. The main power plant will consist of steam-generator sets, turbo-blowers, electrically driven for both converters and blast furnaces, air compressors, motor generator sets, etc. About 10,000 e.hp. will be necessary for the operation of the plant.

Owing to war conditions, causing great scarcity of labor and making it extremely difficult to obtain supplies, it will probably be two years from the date of this publication before the plant will be in full operation. In the meantime a great deal of development work has to be undertaken at the Murray mine to insure a sufficient supply of ore for the smeltery.

Mining Conditions in Australia

In an editorial in the *Mining and Engineering Review*, of Melbourne, Australia, is set forth a plain statement of what is happening to the mining industry of the Commonwealth while the politicians are telling what they are doing and what they have done to Germany. In brief, the article states that the copper producers of Australia cannot show very great reserves, the known zinc deposits are being rapidly worked out, Charters Towers, Bendigo, Gympie and Ballarat are moribund, and not a hand is being raised to stimulate the industry, while the government is talking of erecting huge metallurgical works to treat ores to come from goodness knows where. No inducement is offered to the miner, and during the controversy preceding the recent election not one word was offered on the need of encouraging the mineral industry.

On top of the continued agitation for a 44-hour week and the promises made by the labor agitators that a 40-hour week would eventually be secured (or bettered) comes the announcement in the *Queensland Government Mining Journal* that the English and Australian Copper Co. is prepared to receive offers for the purchase of its smelting and refining works at Waratah, N. S. W. Several properties in South Australia, formerly owned by this company, were recently compulsorily acquired by the government.

The curtailment of operations consequent to these acquirements is stated to be the cause of the intention of the company to dispose of its copper smelting and refining business, it being considered that under the altered conditions the Waratah works "can be more advantageously and economically controlled by Australian owners than by an English company."

The company has made a continuous and successful fight for its life for 45 years. Its Waratah plant was constructed in 1872, and the intention to dispose of the properties remaining, which "can be more economically and efficiently controlled by Australian owners than by the English company" is apparently the nice way of saying that it cannot exist under Australian labor conditions.

The *Queensland Government Mining Journal* publishes the following:

> Mr. Justice McCawley . . . then made an award, in which it was laid down that the following conditions shall apply to the employment by the Mount Morgan Co. of workers on work covered by the existing award for metalliferous mining in the Central Division, and by the existing award for the sawmilling industry in the Central Division: "(1) The company when employing or reëmploying any worker in connection with any such work shall make it a condition of employment, or reëmployment, that he shall not commence duty on any such work until he is, or until he shall become, a member of the A. W. U., or some other union recognized by it, and the company shall not permit any person to commence duty, or any such work, unless he is, or until he shall become, a member of the A. W. U., or of such other union recognized by it. (2) Nothing herein provided shall interfere with the right of the company to fulfill its undertakings to reëmploy nonmembers, if any, who left the company's service in order to enlist, or who enlisted, in the Australian Imperial Forces, but when reëmploying any such nonmembers, the company shall request them to join the union within one month of such reëmployment. (3) The company shall, on the request in writing of any employee, pay to the union, out of any money due to such employee in respect of wages, the actual contribution of such employee, as a member of the union. This decision shall remain in force for a period of 12 months from May 8, 1917." After the making of this award, it was decided to call the strike off.

In Article 3, whereby it is obligatory on the part of the company to collect the unions' moneys, it seems as if the secretaries and treasurers of the sundry branches of the A. W. U. were attempting to reduce their working hours. It would be interesting to know what the charges for administration of union funds amount to. In one district in New South Wales, where there were over 1000 members, it cost, according to their State Secretary Davis, 17s. 7d. to collect £1. Nice fund left for "benefits to workers?"

Development of La Africana Copper Mine, Lo Aguirre District, Chile

By Mark R. Lamb

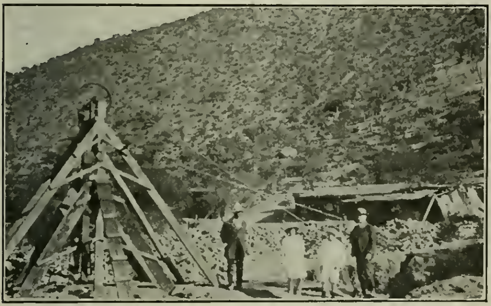
Metallurgical Engineer, 30 Church St., New York.

This is the story as Don Guillermo told it to me himself. At the beginning of the development of the story it was not his habit to talk of it. About the only ones who talked of it were his "friends," who took every opportunity to tell him that he was all of the different kinds of fools that there are.

Once upon a time a Chilean civil engineer saw a prospect hole with little or no copper in it, but he liked the surroundings and the formation and the type of deposit, for you should know that our engineer was not altogether ignorant of mining.

He took what little money he had and some of his wife's (and this is where his friends took hold) and went to work to make the little prospect hole a larger one. He succeeded in this perfectly—and that is all he did do for many months and several years.

Meantime, funds ran low, and as absolutely no money is available in Chile for mining investments, the engineer was obliged to reduce his operations in proportion as the bottom of his money bags came into view. He was sinking an incline, with the idea of cutting the vein and the sinking cost more than he expected, so that quite naturally he was anxious to cut the vein before his funds ran out. Of course he went through the usual process of asking his friends and the banks for advances to be paid out of his profits, which gave them all the opportunity they wanted to tell him about himself as stated above.



HEADFRAME AND GENERAL MANAGER'S RESIDENCE (ON RIGHT)

Anyone in Santiago can tell you that Don Guillermo was on his last legs—had mortgaged his house and farm and spent all his money—when he struck the vein. I am almost afraid to tell you what he struck. He has been working it for years now, shipping the rich sulphide ores to Naltagua where they were urgently required—and urgently paid for, trust Don Guillermo for that!

He had many ways of getting the last cent out of the ore, and he needed it, for you see, although Naltagua needed his ore, no one else nearby needed it, so that it was a question of selling to Naltagua or paying heavy shipping charges.

One day, during my early days in Chile, I received a call from Don Guillermo, who told me all about his mine and asked for a price on a smelting plant for his ore. He told me of his arrangement with Naltagua, but said that they did not pay enough for the ore, and he would have no more to do with them.

Of course it was a pleasure to quote him and I knew he was perfectly good for the plant, because he was making over $30,000 a month from his shipping ore. Think of it—when copper was worth 13c. a pound.

Well sir, you can imagine that I hurried up the estimate and was ready in short order, but Don Guillermo held back and hestitated and delayed, and I couldn't make it out. Meantime I had thoughtlessly mentioned the matter to Mr. Lehmann, of Naltagua, which was just what Don Guillermo had planned! I said "thoughtlessly," but should make it clear that the thoughtlessness was only on the part of Mr. Lehmann and myself. The plant was not put up, but the price of the ore was.

The illustration gives you an idea of the equipment on the mine. Did I say "equipment"? There ought to be a special word for the junk on that mine. The hoist consisted of a hand winch fitted with a wabbly pulley and belted to a 10-hp. oil engine. Hoisting was begun by starting the engine and then throwing the belt on, and lowering was accomplished by throwing off the belt and holding a foot against the pulley.

I forget how many inches an hour was the speed of the rope, but I do remember that the children tied a string to the cable while it was running, and after watching it until it reached the sheave, we walked around the house and waited until it reached the hoist. The mine production at that time was about 50 tons in 24 hours, and was limited, not by the vein, which is several meters wide, but by the hoist.

The mine, when Don Guillermo sold to the Andes Exploration Co., was far and away deeper than when he struck his vein during the early years of the mine—I think it has now reached a total depth of nearly 90 feet!

British Iron and Steel Trade

Imports of iron ore and scrap into Great Britain for the five months ended May 31, were valued at £10,312,752 in 1916, and £11,005,800 in 1917; an increase of £1,306,952. The quantities of iron ore are not stated.

Imports and exports of iron and steel and manufactures thereof for the five months ended May 31 are valued by the Board of Trade returns as follows:

	Imports		Exports	
	1916	1917	1916	1917
Iron and steel......	£4,247,437	£3,324,501	£23,826,285	£19,574,960
Machinery ..	3,524,679	3,281,961	5,850,686	7,009,394
Hardware, etc.	315,947	135,783	3,269,802	2,959,061
New ships....	...	...	299,043	504,092
Total ...	£8,088,063	£6,742,245	£33,245,816	£30,047,517

The total volume of iron and steel imports was 323,248 gross tons in 1916 and 168,687 tons in 1917; of exports, 1,572,704 tons in 1916 and 1,016,686 ton this year. The statistics in the reports as published have been curtailed this year, no figures for countries of origin or destination being given.

The imports for the five months show a decrease of £1,345,868 this year, and the exports a decrease of £3,198,304. The excess of exports over imports was £25,157,703 in 1916, and £23,305,267 this year. Reëxports of foreign iron, steel, etc., not included above were valued at £1,064,529 in 1916 and £747,151 this year.

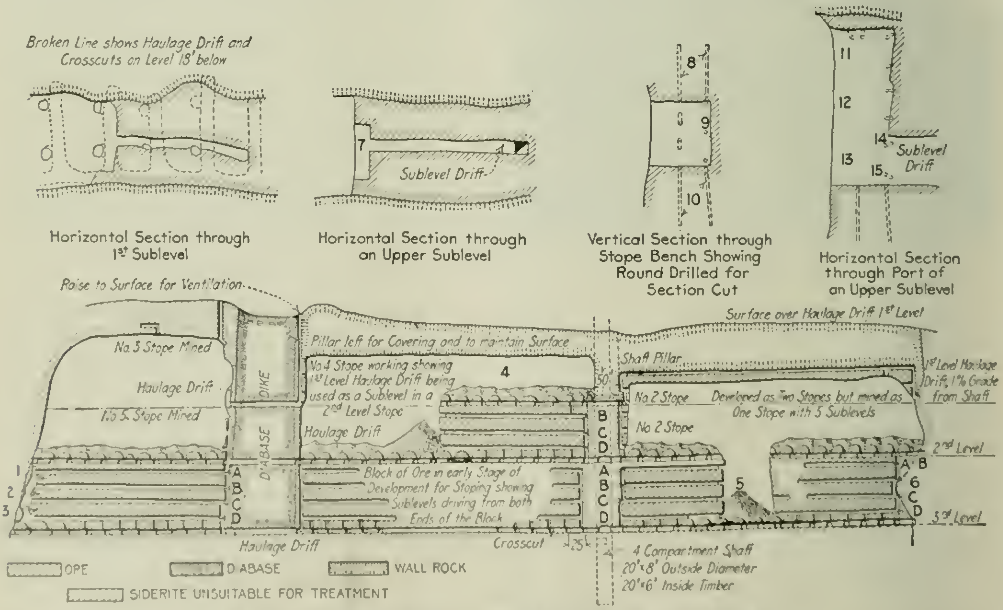
Mining Methods at Magpie Iron Mine*

A body of siderite in Ontario, containing many slips and cleavages, made it necessary to keep the men close to the backs of the stopes. Sublevels are run between levels, the stopes being cut back from each subline at the same time, keeping the stope face the full height of the distance between lines. "Mackinaws" used in place of cross switches, and skips are loaded while hanging on the cable, no chairs being used.

AT the Magpie mine, Michipicotan district, Ontario, is a body of siderite. It is now being mined and made into a merchantable ore by roasting. This roasting, which is done in cement kilns, drives off the volatile and at the same time reduces the sulphur to a point suitable for the blast furnace.

The siderite, together with the other carbonates, occurs as a band standing nearly vertical and striking northeast and southwest. The band is broken by folding and faults at several points. The width of the siderite that is being mined ranges from 28 ft. to 62 ft.; the average width is about 42 ft. The carbonate deposit, as a whole, is a sedimentary bed lying between a series of acid and basic flows and tuffs of volcanic origin. The wall rock on the south is a talcose schist with well-defined schistosity; while on the north it is an ellipsoidal basalt showing very little schistosity. The contacts are not well defined and are not clean, so that much care is necessary in mining to make sure that no ore is left on the wall and that no rock is broken into the stopes. The schist on the south wall underground has the appearance of the ore, but the drill cuttings from the holes give a good indication of when the wall has been reached. The body being mined has an approximate length of 1350 ft. The carbonate band is much longer than this, but narrows down on either end so that it is not found profitable to mine the ore except in this area.

The siderite, as a whole, is the usual light-colored ore having a slightly pink tinge due to the presence of manganese carbonate rhodochrosite; but on either side of the diabase dike, cutting the body, the siderite is dense-black ore very much resembling fine-grained magnetite. In the white siderite the volatile runs about 32%, but this gradually decreases near the dike until it is as low as 12%. The carbonate here contains magnetite in considerable amount and the iron contents of the ore are higher than in the light colored ore. The black ore is exceptionally hard, so hard in fact that a 3½-in. piston drill will drill only from 5 to 6 ft. of hole per shift. The character of the ore changes gradually as the distance from the dike increases, so that at about 100 ft. from the dike the siderite is all white.


Horizontol Section through 1st Sublevel

Horizontal Section through an Upper Sublevel

Vertical Section through Stope Bench Showing Round Drilled for Section Cut

Horizontal Section through Port of an Upper Sublevel

Broken Line shows Haulage Drift and Crosscuts on Level 18' below
7
Sublevel Drift
8
9
10
11
12
13
14
15
Sublevel Drift
Raise to Surface for Ventilation
No. 3 Stope Mined
Haulage Drift
No. 5 Stope Mined
DIKE
DIABASE
Pillar left for Covering and to maintain Surface
No. 4 Stope working showing 1st Level Haulage Drift being used as a Sublevel in a 2nd Level Stope
4
Haulage Drift
Block of Ore in early Stage of Development for Stoping showing Sublevels driving from both Ends of the Block
Surface over Haulage Drift 1st Level
Shaft Pillar
50'
No 2 Stope
Developed as Two Stopes but mined as One Stope with 5 Sublevels
No 2 Stope
1st Level Haulage Drift, 1% Grade from Shaft
2nd Level
3rd Level
1
2
3
A
B
C
D
5
6
Haulage Drift
Crosscut
25'
4 Compartment Shaft 20'×8' Outside Diameter 20'×6' Inside Timber
OPE
DIABASE
WALL ROCK
SIDERITE UNSUITABLE FOR TREATMENT

HORIZONTAL AND LONGITUDINAL SECTIONS OF MAGPIE MINE

In roasting the siderite at the Magpie there is a loss in volatile of about 30% by weight, so that nearly three tons of ore must be mined to produce two tons of finished material. Taking this into consideration, together with the fact that the actual roasting operation costs are considerable, it was necessary to devise a cheap mining system in order to make the operation commercially successful. Several mining methods were studied and approximate costs worked out; but before any method was definitely chosen, it was decided to sink the shaft and open up drifts on two main haulage levels to definitely determine the nature of the ground and the material to be mined. The shaft was accordingly started on the north side of the orebody, about 60 ft. from the north contact of the ore. The shaft is 24 x 8 ft. in the rough, and is timbered with 12 x 12-in. sets, so that the inside dimensions are 22 x 6 ft. It is divided into four compartments, two skip compartments for balanced Kimberly skips, one cage compartment and one ladder and pipe way. The shaft was sunk 205 ft. to the second level, it having been decided to cut 80-ft. levels and to leave a 45-ft. floor pillar on surface. A crosscut was run on each level from the shaft to the south contact of the ore, and drifts started thence in either direction. These drifts follow the south contact as nearly as possible. The nature of the ore passed through in the drifts was closely observed and samples taken and analysis made for each 10-ft. section of the drifts. No timber was necessary in any of the drifts, but it was noted that the ore showed a great number of slips or cleavage planes. These slips have no general direction but intersect one another at all angles and are extremely smooth. In scaling a new drift, large wedge-shaped pieces will fall out from the first blow of the scaling bar; but when a drift is once thoroughly scaled, little material loosens from later blasting. On account of this feature of the ore, it was necessary to decide on a method of mining that would keep the miners always close to the back and under cover. It was therefore decided to use the sublevel stoping system in mining this deposit.

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*Paper presented at the Montreal meeting of the Canadian Mining Institute, March, 1917, by A. Hasselbring, general superintendent, mining department, Algoma Steel Corporation, Magpie Mines, Ontario, Canada.

OREBODY DIVIDED INTO THREE STOPES

The orebody was blocked off into three stopes longitudinally, divided opposite the shaft by a 50-ft. shaft pillar and 400 ft. west of the shaft by a diabase dike 100 ft. wide, which cuts the body at right angles. This gives three stopes on each level, approximately 400 ft. long. To develop these stopes, a raise is made at each end of the block, and sublevels run to connect the raises, The first sublevel is 18 ft. above the level; the others are 23 ft. from floor to floor. On the upper levels three sublevels are used between levels, but below the second level four sublevels are used, making the distance between levels 103 ft. After the stopes have been developed in this manner, the raise at the end of the block nearest the shaft is made into a permanent ladder and pipe way.

Air lines are carried along the floor of the sublevels to the far end and mining commenced. Machines are employed in breaking down around the raise at the far end of the block, and this opening is enlarged until the stope is completely cut off. The first sublevel is then drawn back about 50 to 60 ft. By keeping the first sublevel back this distance, the muck does not run into the face. This also gives the men working on this sublevel a chance to sandblast a proportion of the larger pieces which break from the upper benches. Most of these drop so that they can be reached from the first sublevel, but those dropping in the open stope have to be blasted as they come down into the chutes.

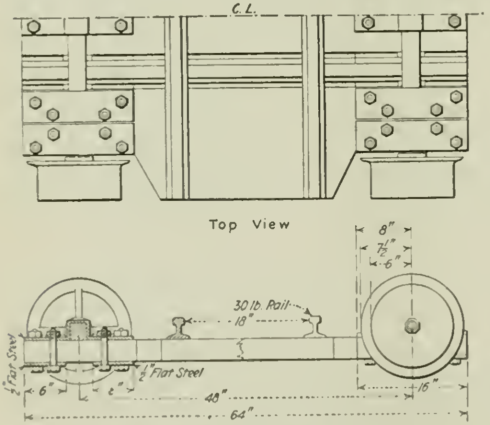
After the stope has been cut off from wall to wall, section-cutting is done on each sublevel. At first it was the intention to carry the sublevels step fashion with the upper sublevels overhanging the lower ones, but the ground was found to be so full of cleavage planes that these overhanging benches fell when blasting out the section cut, so that now all the sublevels except the bottom ones are carried back together, the face of the stope being vertical. In section-cutting the stope, the machine is set up in the sublevel and an 8-ft. bench blasted off. This requires five holes, two in front and three behind. These holes are about 7 ft. deep and break to the bottom. Little mucking is necessary for the next set-up, and there is little scaling, as the back is only 8 ft. high. This section cut is carried from wall to wall, and the stope holes are drilled in the bench below from the same set-ups. The back holes are drilled with stopers after the section cut has been completed. The whole face of the stope is then blasted off with a battery shot. Little powder is required, either in the section cut or in the stope blast, as there is always an open face to break to. When a stope on one level has been drawn back to the starting raise, the chutes are taken out, rails and pipe lines are removed and the main level is used as a sublevel. In this way all mucking is avoided, the ore remaining in the bottom of one level which will not run out of the chutes being dropped to the level below. On the bottom sublevel no back holes are used, except in the corners of the stope, as this sublevel is carried higher than the others, thus leaving a thinner block of ground between it and the second sub. The rail and pipe lines, removed from the level which is drawn back, are used on the lower level in the development work, so that very few new pipes or rails are required.

CROSSCUTS ON HAULAGE LEVEL

On the main haulage level, crosscuts are driven off the main drift at 25-ft. intervals. Raises are made from these crosscuts so that the raises are spaced about 25 ft. center to center each way. The raises extend only to the first sublevel. Ordinary round-timber chutes with 3-in. round birch stoppers, are in use in the raises. Much blasting is necessary in the chutes at times on account of the benches falling in large pieces, but otherwise no trouble is experienced in loading cars. All tramming is done by hand, two-ton cars being used on a grade of 1% in favor of the loads. Cross switches for spotting cars at the shaft have been discarded. In their stead a track, running on rails in a shallow pit transversely across the station and about 12 ft. back from the shaft, is employed. Cars can be pushed on this track from any track and spotted for either the skip track or the cage track as may be required. All outbound loaded cars come up the main crosscut on the one track. The "mackinaw," if not in use, is spotted for this track. The lead for No. 1 skip lines with this main line. Cars to dump in No. 1 skip come up the main, cross the mackinaw to this lead and dump directly in the skip. Returning, they are backed on the mackinaw, which is then spotted for the return track, and shoved down the return track through a spring switch out on the main line and back in again for loading. This spring switch is the only switch on the level. Ordinarily trammers dump their own cars, but when for any reason it is necessary to speed up the hoisting, dumping is done by a gang of dumpers (two men) at the shaft. Trammers coming out leave their cars on the main line and go back with an empty from the return track. The gang at the shaft handle cars on the "mackinaw," dump them and shove them down the return track. Working in this way, 400 to 450 skips can be sent up in a shift.

Ore Hoisted in Two-Ton Balanced Skips

The ore is hoisted with two balanced Kimberly skips, which have a capacity of two tons each and dump directly into the crusher. The hoist consists of a 6-ft. drum, coned at each end and geared to a 150-hp. wound-rotor three-phase induction motor. This motor is remotely controlled and automatically protected against overloading. It is only, of course, when hoisting from the bottom level that the cone on the drum is of any use, but the motor has no difficulty in starting a loaded skip from any of the intermediate levels, even though no chair is used and the full load is hanging on the rope at the start. The full-load speed of the motor gives a rope speed of 750 ft. per min. The signal to hoist the skip is given to the hoistman by a bell which can be rung from only one level; namely, the one from which the most tramming is being done at that time. A skiptender is stationed there and the other levels ring to him when they want the skip or when they have finished dumping their car; he then relays the signal to the hoistman. The crusherman feeding the No. 8 crusher also has a switch by which he can ring the hoistman in case of trouble in connection with the crusher and when he wants to stop the skip before it dumps. This switch also gives the same signal to the skiptender, so that he knows that the skip has been stopped at the crusher. This stopping for a minute or two is fairly frequent, as a big chunk of ore often has to be broken with a hammer before it will go into the crusher. The skips dump into a No. 8 gyratory crusher which breaks the ore to about 6-in. ring. The black ore from near the diabase dike is, as stated previously, exceptionally hard, and it was found that the cast-iron spider, which is practically always supplied with these machines, was not strong enough to withstand the strain of breaking it and had to be replaced by a cast-steel one. Below the No. 8 crusher the ore passes over a set of grizzly bars and then to two No. 5 gyratory crushers. These are set to about 3 in. and from them the ore is carried on a 24-in. belt to storage bins in the roast plant.



TRANSFER CAR USED AT THE MAGPIE MINE

The roasting kilns are 8 ft. x 125 ft. and lined with 9-in. hard firebrick. The fuel used is powdered slack coal which gives a temperature of about 1100° C. for about 20 ft. in the kiln. This is not hot enough to make the ore sticky and is sufficient to drive off the CO_2 and eliminate nearly all the sulphur.

After passing through the roasting kilns, both the light- and dark-colored ores have the same appearance and are not distinguishable in any way. The finished ore is nearly black in color, and comes out of the kilns in a porous condition in rounded lumps about 2 in. in diameter, the large pieces breaking up when passing through the kiln. This finished product has the following composition: Iron, 50.00%; phosphorus, 0.013; silica, 9.60; manganese, 2.75; alumina, 1.24; lime, 7.69; magnesia, 7.75; sulphur, 0.196; loss on ignition, nil. The product is suited for the blast furnace both on account of its physical condition and its chemical composition.

Research Corporation's Report

The organization and development of a corporation, unique in that its charter provides that no dividends shall be paid on its stock, is described in a booklet just issued by the Research Corporation of New York.

When Dr. Cottrell offered, in 1911, to give the Smithsonian Institution extensive rights in his patents on processes of "electrical precipitation of suspended particles" in order that any profits they might earn might be spent on scientific research, the proposition was recognized, says the booklet, as generous and original.

However, for administrative purposes the Research Corporation was substituted for the Smithsonian Institution as custodian of the patents with the responsibility of furthering their technical and commercial development. This corporation has aimed, to quote its own words, to serve as an experimental laboratory in practical economics where altruistic considerations need not be subordinated to the necessity of paying dividends, the primary and controlling consideration being the ascertainment of the most practical and effective means of developing the industrial arts.

Demonstrations to determine the practical value of the patents have been made, since the corporation's birth, with such success that in most cases the companies that permitted tests to be made have sought to secure permanent installations. The corporation now has a staff of 45 engineers, and its monthly expenditure equals its original cash capital. Installations of the processes are in successful operation in 20 plants, including those of the American Smelting and Refining Co. at Garfield, Maurer and Omaha. The corporation's assets, as reported in February, 1917, in cash and securities were $217,862.72.

A laboratory has been established, and experts have been employed to improve the processes if possible. The corporation feels that there is need of an organization that can act as intermediary between inventor and manufacturer and that can test discoveries or inventions and render a trustworthy opinion to the manufacturer.

Molybdenite and its Occurences

By SYDNEY H. BALL
Mining Geologist, 71 Broadway, New York

The demand for molybdenum, of which molybdenite is the chief ore, has greatly increased since the beginning of the war, and prices have risen in proportion, thereby greatly stimulating production. Canada, the United States and Australia are the chief sources of supply. Molybdenite is widely distributed. It is of secondary origin and is commonly found in granites and granite-pegmatites. Contact-metamorphic deposits containing no copper are promising sources. Molybdenite occurs in small amounts in basic igneous rocks and occasionally in sedimentaries, though not characteristic of either.

MOLYBDENUM is one of the metals which through broader use in the future will probably benefit from the war. At present the world's consumption is small, and its value scarcely equals that of the output of a fair-sized mine. These notes are compiled to direct attention to the geological occurrence[1] of molybdenum ores, and their perusal will indicate that molybdenite prospectors should confine their efforts to granite countries, and more particularly to the bounding zone of the granite masses and the rocks they intrude.

The metal in small quantities is consumed by the electrical and scientific instruments trade. Its salts form chemical reagents, preservatives for explosives, pottery colorants and medicines. Molybdenite itself is reported to be suitable for lubricating purposes, but practically all of the world's production is used, with or without tungsten, nickel, chromium and cobalt, in making steel-alloys for cannon, armor plate, tool steel, automobile parts, and crank- and propeller-shafts. Its use in tool steel does not appear to be increasing, but the automobile industry will perhaps in the future consume a large amount.

MOLYBDENUM'S VALUE AS A WAR METAL

Even before 1914 its war value was indicated by the fact that Krupp of Germany, and Creusot of France were the principal consumers. The Germans have found that 3 or 4% of molybdenum greatly increases the life of their heavy artillery and of their rifle barrels. The present large consumption by the Allies shows they are using the metal in some similar way. Indeed, the British Empire does not permit the export of the metal or its alloys or ores even to its allies. Prior to the war France and Germany reduced most of the ore to metal, but now England, Canada and America are making both molybdenum and ferromolybdenum.

The recently increased production, by assuring the steel men an adequate supply to warrant experiments, will doubtless stabilize the market and create a regular demand for the ore. In the past with an increase in price, certain deposits have been feverishly exploited and, with a fall, as suddenly abandoned. To date, the better-established production basis of tungsten, the ownership or control of tungsten mines by some of the makers of steel-alloys, and the ownership by the Crucible Steel Company of the important Holcomb patents have not tended to increase the use of molybdenum, the chief competitor in many ways of tungsten.

The figures of the world's production of molybdenum ores are more or less unsatisfactory, but it appears that the output from 1902 to 1915 increased in quantity about 10 times and in value still more. In 1910 the production, valued at about $120,000, was about 210 tons, of which Queensland produced over one-half, New South Wales and Norway each almost a quarter, and Sweden and the United States a little. Prior to the war the United States produced negligible quantities of molybdenite, but in 1914 and in 1915 various small molybdenite mines sprang up in Colorado, New Mexico, Arizona, Maine, Utah, California, Montana, Nevada, Texas and Washington. In 1915 for the first time the United States became the most important producer. F. L. Hess gives the world production for 1915 as equivalent to 222.6 tons of metal, and the 1916 output was perhaps twice as great. In 1916 Canada became an important producer, as a number of mines were opened in Ontario and Quebec, and the British Columbia production notably increased. In 1917 Canada will doubtless take the lead in the world's production.

PRICES HAVE ADVANCED RAPIDLY

From 1910 to 1913 molybdenum was worth from $1.40 to $1.50 per lb., but soon after the war even $6 was obtained for small quantities. In April, 1916, the price was $3 to $4 per lb. Ferromolybdenum is quoted per pound of molybdenum contained, 50% to 80% of the metal being present in the alloy. The price is practically that of metallic molybdenum, and now is $4.25 per lb. of molybdenum content.

Molybdenite prices are quoted on a 90% MoS_2 product, 50% ore being worth approximately half as much and 95% ore about one-fifth more. When stocks are short, 20% concentrates are sometimes salable, and it would appear that a concentrate, lower in grade than the 90% usually required, could be handled readily by the smelters. Copper, arsenic, tin, bismuth, antimony, tungsten, calcium, barium and phosporus are injurious impurities, more than 2 or 3% of the first rendering the product unsalable. Tin and bismuth may be present up to 0.5%, without the ore being penalized. From 1902 to 1911, the price varied from $400 to $625 per ton; during 1912, from $900 to $1000 a ton. In 1914 it jumped, on account of heavy German buying and the opening of the war, to $2000, and since then has fluctuated from about $2000 to $3600. The latter is the present quotation, the demand being good. In

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[1] For more data see F. L. Hess, "Mineral Resources of the United States," United States Geological Survey; also Frederick W. Horton, United States Bureau of Mines, Bulletin 111, 1916.

October, 1915, the British Empire, through the Australian government, acquired the Australian production at a uniform price of $25.20 per unit of MoS_2, a 90% product being required. The Canadian production has been similarly commandeered, the buying agent being the Imperial Munitions Board at Ottawa. It is of interest to note that in 1916 the Dominion Mines Department was operating at Ottawa the largest molybdenite mill in Canada. On July 19, 1916, Japan prohibited the export of tungsten and molybdenum without a license.

Molybdenite is much the most common ore, and, with the exception of wulfenite, the only commercial source of the metal. The demand for and price of wulfenite (lead molybdate) is most variable, as, on account of its chemical composition and the impurities usually present, it is not a particularly desirable ore. In 1912 wulfenite containing at least 25% molybdic trioxide was worth $100 per ton, and after the war began the price doubled. Since then some sales have been made at $300 per ton. Wulfenite should contain at least 25% of molybdic trioxide, and at worst a low copper content. Arsenic, bismuth, tungsten, vanadium, antimony, chromium and phosphorus are also highly objectionable. Wulfenite, like most of the other molybdenum minerals except molybdenite, is a product of oxidation.

CHARACTERISTICS OF THE MOLYBDENUM MINERALS

Molybdite, a hydrous ferric molybdate (a little over 39% Mo), is not rare at the surface as a yellow stain or yellow earthy powder upon the outside or along the cleavage planes of molybdenite. As the sulphide is, however, relatively resistant to oxidation, molybdite does not occur in commercial quantities. Its brilliant color is, however, a valuable indicator in molybdenite prospecting and mining. There is no evidence that enough molybdenum is taken into solution to form secondarily enriched deposits, although molybdenite is undoubtedly altered at the surface to numerous oxidized minerals, and, locally at least, outcrops show casts of molybdenite crystals, and the presence of molybdenum in the mine waters of Idaho Springs, Colo., has been proved.

Wulfenite (a little less than 40% Mo_3) occurs in shiny yellow, orange or red tablets and is brittle, soft and heavy. Practically all the molybdenum ore produced in the United States prior to 1915 was wulfenite. It is a rather common mineral in the oxidized portions of lead-bearing orebodies. In North America it is one of the more characteristic desert minerals and in commercial quantities is practically confined to the arid region of the Southwest and Sonora and Chihuahua. Humid Japan, however, produces considerable quantities. Vanadinite and cerrusite are frequent and troublesome associates.

The name "molybdenite" (59.95% Mo) was first given to substances containing lead, but later graphite, molybdenite and certain antimony compounds were confused under the name. Molybdenite was only differentiated in 1778-9, by Scheele. The confusion of graphite and molybdenite by the early mineralogists is not surprising. The two occur as soft, black, metallic-lustred scales, frequently of hexagonal outline, and both are frequently associated with pegmatites and light-colored gneisses. Molybdenite, however, has a bluish caste which graphite has not, and of course is much heavier (sp.gr. 4.7). Moreover, its lead-gray streak has a greenish tint, and heated in an open tube it gives off sulphurous fumes. In the field, if alteration has taken place, the yellowish color of molybdite is diagnostic.

No molybdenite mine should be opened unless a 90% concentrate can be produced for from $800 to $1000 per ton. If the world's production should suddenly increase, the price might temporarily fall even below the former figure, but probably would eventually exceed it. Ore occurring in fair amounts and carrying 2% or even 0.5% MoS_2, if all factors are favorable, can be profitably treated. At present the price is about treble that of tungsten ore, but such a discrepancy is not justified, and eventually the price of the two ores will probably be more nearly equal. Over-estimation of the richness of molybdenite ore, like that of copper, must be guarded against, as molybdenite in white quartz is rather showy.

DISTRIBUTION OF MOLYBDENUM

Hillebrand[2] by chemical analysis found molybdenum present in the more siliceous rocks including rhyolite, granite, quartz-mica-diorite and monzonite. These rocks are its normal habitat, but the element is not unknown in basic rocks. Molybdenum is about as abundant a constituent of the world's crust as tungsten and bismuth. I am inclined to believe it may be more common than tungsten, but, like it, the high-grade oreshoots are small and erratic. On the other hand, low-grade molybdenite deposits which might form the basis of large mining operations are more common than those of the tungsten ores. This statement applies particularly to some granite orebodies. In the periodic law it occupies a place in the same group with its common associate, tungsten, and also with chromium, with which it has no common features of occurrence. The most common metallic elements in association with it are tungsten, tin and copper; less commonly, gold and bismuth. The relatively common association with tellurium and certain rare earths is worthy of note.

The principal ore, molybdenite, is widely, although in most cases sparingly, distributed. Its crystals or aggregates are usually rather small, but in instances crystals several inches across occur. Coarse and large crystals seem confined to occurrences formed at great or intermediate depths. It occurs in practically every country, but perhaps as a continent Australia is particularly rich in molybdenite. It occurs in granitoid and porphyritic rocks, particularly those of the granodiorite, monzonite and granite families, but is especially characteristic of pegmatitic and aplitic facies of these rocks. It is also common in orebodies of pegmatitic affinities and of veins of moderate or deep-seated origin. Tungsten deposits and quartz veins have to date yielded over three-fourths of the world's production, while pegmatites, bismuth and tin deposits have produced small amounts.

Molybdenite is a common constituent of granites, particularly those that are quartz rich and biotite poor (alaskites) and hence consolidated from a magma rather rich in mineralizers. In many cases, at least, the molybdenite was introduced after the granite had solidified, although Schrader and Hill consider that original which is sparingly present in the pre-Cambrian granite of Providencia Cañon, Ariz., and Laney likewise believes it of the molybdenite of the silicified pyrite-bearing biotite-granite of Loomis, Washington.

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[2] United States Geological Survey, Bulletin 167, pp. 49-55

F. C. Calkins[3] also describes the original occurrence of molybdenite on the property of the Molybdenum Syndicate, about 40 miles northeast of San Diego, Calif. The country rock is biotite-granite, cut by many aplite dikes. One of these which contains molybdenite is from 50 to 200 ft. wide and has been traced for a distance of 1500 ft. The ore is most irregularly distributed in the dike, the greater portion being barren. Where the aplite, in irregular masses, grades into a coarser pegmatitic rock, molybdenite is relatively common. The crystals rarely exceed ½ in. in diameter.

Charles Drysdale[4] describes the Molly mine in Lost Creek, near Salmo, B. C., which in part may be considered typical of the occurrences in which molybdenite has been introduced after the granite solidified. At this deposit, discovered in 1913, the molybdenite occurs around the periphery of granite, intrusive in Carboniferous schist and limestone. The chilled outer edge of the granite, some 6 ft. wide, is an aplite, containing a few scattered molybdenite grains. Within this is a 10-ft. zone of highly jointed granite. Reticulating veinlets of molybdenite cross from joint to joint, and molybdenite also impregnates the intervening granite. Pyrite and pyrrhotite are associated. Molybdenite is also a constituent of the contact metamorphic limestone on the granite order. It is not unusual to find granite in other localities between molybdenite-quartz or pegmatite veins similarly specked with molybdenite. Such molybdenite-impregnated granites appear promising if the market becomes such as to justify mining on a large scale. Recovery will be low, as the mineral tends to slime and the separation of mica is difficult.

Occurrence of Secondary Origin

Molybdenite in granite-gneiss and schist is at least usually of secondary origin, and it is doubtful if it ever represents an original constituent of the unsheared granite. Molybdenite in this form occurs at several localities in the United States, and the granite-gneiss at the important Norwegian mines of Kvinas and Knaben likewise contains disseminated molybdenite. Perhaps closely related to the younger molybdenite of certain granites is the molybdenite filling the interstices of brecciated veins in granitic rocks and disseminated in the brecciated fragments. From Frederick W. Horton's descriptions, the Empire, Colorado, and Chico, Hot Springs, Mont., occurrences belong here.

Iddings[5] states that molybdenite also occurs in syenites and nepheline syenites, and their pegmatitic facies. Molybdenum is reported by Cross from the trachyte obsidian of Puu Waawaa, Hawaii.

The most common habitat of the mineral is probably the granite pegmatites, coarse-grained rocks formed perhaps both by hot magmatic waters and vapors. Naturally, the country rock is usually granite or granite-gneiss. An interesting association is that of molybdenite in pegmatites with ores of tantalum and the rare earths in Yancey County, N. C.; at Bluffton, Llano County, Tex., and at Ivigtut, South Greenland.

Part of the ore of the important Norwegian mines, Kvinas and Knaben, is clearly pegmatite, and along the strike it grades into molybdenite-quartz. At both localities the granitic country rock between the veins contains scales of molybdenite. In the latter mine some rather large pockets of molybdenite occur. J. A. Dresser[6] says that the ore in at least one of the pits of the Wood mine at Quyai, Que., the chief Canadian producer, occurs in a fluorite- and pyrite-bearing pegmatite. The Cooper, Maine, occurrence is, according to G. O. Smith and F. L. Hess, a quartz-feldspar-pegmatite containing also fluorite and a little native bismuth. Molybdenite is particularly abundant in the more quartzose portions of the pegmatite. Molybdenite also impregnates the inclosing granite. F. W. Horton,[7] describes the property of the Romero Mining Co., near Porvenir, San Miguel County, N. M. Molybdenite and chalcopyrite are closely associated in pockets in a quartz-feldspar-biotite-fluorite pegmatite. A little scheelite and bismuthinite also are present. The country rock is an alaskitic granite.

The pegmatitic occurrences show many gradations to other molybdenite orebodies. The Norwegian deposits, like many others, grade from pegmatites to quartz veins; the auriferous pegmatites of the Pas, Manitoba, composed of orthoclase, quartz, tourmaline, molybdenite, pyrite and chalcopyrite, connect the pegmatites with the gold- and copper-bearing veins. The Summit County, Colo., quartz-feldspar-chalcopyrite pegmatite, and the bornite-chalcopyrite-feldspar-beryl-molybdenite pegmatite of the Lillian mine, Greenland, are equally closely related to the cupriferous molybdenite veins. Tungsten- and bismuth-bearing pegmatites are common, and those containing tin also occur. These pegmatites are scarcely as promising sources of molybdenite as the closely allied quartz veins. In instances, however, the content is high and the coarse grain of the rock and the clearness with which the ore breaks from its matrix facilitate hand sorting.

Orebodies Small but Frequent

Quartz-molybdenite veins and irregular bodies are important sources of the ore. Granite, or its gneissic form or some rock in the immediate vicinity of a granite mass, is the country rock. While these orebodies are of small tonnage and frequently of most irregular form, these disadvantages are offset in part by the large number of bodies usually found in a district. Accessory minerals or geological relations prove the dependence of these orebodies upon granitic intrusions. In addition to disseminated scales, molybdenite may form nests of considerable size. Its distribution is, as a rule, bunchy. Pyrite and, in instances, chalcopyrite are frequently present.

In sheeted rocks (granite-gneiss, for example) the molybdenite veins have their extension parallel to the walls of the inclosing veins, and in many cases at least the borders are unusually rich. A considerable portion of the Norwegian production comes from such veins.

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[3] United States Geological Survey, Bulletin 640, pp. 73-6, 1917.

[4] Bulletin of the Canadian Mining Institute, November, 1915.

[5] Iddings, "Igneous Rocks," Vol. 1, p. 69.

[6] Colorado Mining Institute, March, 1917.

[7] United States Bureau of Mines, Bulletin 111, pp. 78-9

In massive granite the veins may occur in joint fractures, as at the Crown Point mine, Washington, or in faults as south of Tucson, Ariz., or in pipes, characteristic of important Australian deposits, which usually contain in addition tungsten, tin or bismuth. The filling of some of these pipes grades from siliceous granite through pegmatite to quartz. The quartz-molybdenite veins and irregular masses frequently have a comparatively high molybdenite content, and milling is as a rule easy because the coarser varieties may be hand-sorted and the finer may be successfully milled as troublesome substances are not abundant.

TIN, TUNGSTEN AND BISMUTH DEPOSITS A SOURCE OF MOLYBDENITE

Molybdenite is a common accessory in tin deposits, which have produced some of it as a byproduct. Most tin deposits are of pneumatolytic origin, and in instances they are true pegmatites. Those containing molybdenite are interesting because of the other metallic susbtances present, which show gradations to other types. Such deposits occur in the following localities: Erongo Mountains, in what was formerly German Southwest Africa, containing also tantalum and lithium; New England district, New South Wales, bismuth and tungsten; Cornwall, copper; Saxony, lead and gold; Indo-China, bismuth, lead and copper; Caiaria, Mexico, tungsten and lead; Huayna Potosi, Bolivia, copper, iron, galena and bismuth. While of pneumatolytic origin, the casual rock at the latter two places is quartz-porphyry.

Ores of tungsten and molybdenum are closely associated, and the latter is an accessory in practically every wolframite deposit, and it is not rarely present in scheelite deposits. These are either pegmatitic veins or veins deposited by hot magmatic waters usually at great depth, the waters being derived from granitic intrusions. Wolframite, molybdenite and bismuth are obtained from orebodies in the gray biotite-granite of the Chillagoe or Hodgkinson gold fields of Queensland. A little arsenopyrite and pyrite occur with depth. The quartz bodies are pipe-like in form and are most irregular, pinching and expanding suddenly. Molybdenite usually begins to appear 10 to 12 ft. below the surface. The oreshoots within these pipes are most erratic and at comparatively slight depths (300 to 400 ft.) apparently become impoverished, although there seems no reason why the mineralization should not extend to considerable depths.

The granite country rock near the pipes contains both molybdenite and quartz. Possibly these pipes were formed at the junction of two joints. In the vicinity of Bamford, Queensland, the granite surrounding the pipes is frequently altered to a greisen (quartz, muscovite, pyrite, molybdenite and wolframite), and that in immediate contact with the pipes is silicified to a molybdenite-quartz rock. The pipes in this part of the state usually pitch parallel to the roof of the granite batholith which is intrusive in porphyry. The filling is quartz, wolframite and molybdenite which latter may form 1% of the mass. Scheelite is not uncommonly associated. Iron pyrite, chalcopyrite, blende, galena, bismuth and fluorite occur in vugs and are younger than the filling mentioned. Granite is the usual country rock of the molybdenite-tungsten deposits, but at Scamander, Tasmania, the veins are in micaceous quartzite and the molybdenite occurs not only in the veins but in the country rock as well. A granite boss is near. Molybdenite and hübnerite are associated in the silver-copper-lead-zinc veins of the Potosi, Mont., district, and in the blende-galena veins of Blue Wing, Idaho. Molybdenite is an accessory of the ferberite veins of Boulder, Colorado.

Molybdenum may replace a considerable amount of tungsten in scheelite and, while molybdenite is associated with this tungsten mineral at numerous widely scattered places, I know of no such deposit which is of value.

Bismuth and molybdenite occur together in tungsten and tin deposits, and bismuth and molybdenite are associated in pegmatites at Cooper, Washington County, Maine, and those of the township of Villemontel, Que. At Kingsgate, N. S. W., molybdenite, bismuth and quartz are associated, gold and silver also being present. The country rock is granite intrusive into slate. The minerals occur in pipes from 6 to 25 ft. in diameter, which are twisted around their vertical axes. The masses of molybdenite in instances weigh over half a ton. At the Jingera mines near Wyndham, N. S. W., similar pipes contain feldspar and a little mica and garnet, in addition to quartz. The pipes are from 15 to 20 ft. in diameter.

At present the tungsten, tin and bismuth deposits are the source of considerable molybdenite and presumably will in the future be the source of a larger production (tin, New England district of New South Wales and Hozaribagh, India; tungsten, Hodgkinson, Queensland; bismuth, Kingsgate, N. S. W.). Any one of the metallic minerals may serve as a byproduct of the mining of the other. Often the coarseness of the molybdenite is advantageous to milling. On the other hand, the irregularity of the orebodies is not conducive to low mining costs.

Molybdenite is present in small amounts in cobalt veins which are dependent on the after effects of granitic intrusions, as at Tunaberg, Sweden, at Kakhetie, Caucasus, and Balmoral, Transvaal.

OCCURS IN AURIFEROUS VEINS AND IS COMMONLY ASSOCIATED WITH COPPER

Molybdenite occurs, as before mentioned, in auriferous copper veins and in auriferous tungsten veins, and is also not unusual in auriferous pyrite veins and in auriferous telluride veins. These gold veins as a rule were formed at depth by hot magmatic waters derived from the cooling granitic masses (usually granite or monzonite and, less commonly, diorite). Many of them are of pre-Cambrian age. The molybdenite may antedate the quartz, or it may occur along slip planes in the same. Gold quartz veins are not believed to be an important future source of the molybdenite.

The occurrence of molybdenite in copper deposits is world-wide, and, with the exception of quartz, perhaps no other mineral is as commonly associated with it as chalcopyrite. Molybdenite, while by no means an abundant constituent of the disseminated porphyry coppers, is present in most of them. It is also a common constituent of cupriferous quartz veins derived in most cases from magmatic waters given off by igneous rocks of the granite or monzonite families. The veins were formed at medium or great depths. These veins are linked by gradational types to the quartz-molybdenite veins, the auriferous veins and the tungsten ore deposits. They are to be found in practically every country in which mining is an important industry. In addition to molybdenite the more common sulphides are chalcopyrite, sphalerite and pyrite.

As a rule the molybdenite is present in these copper veins in too small quantities to be exploitable, and in addition the copper is difficult to separate. There are, however, exceptions, the chief molybdenite mines of Sweden on Ekholmen Island, in the Westerivik Archipelago, being of this type. The country rock, amphibole-gneiss and mica-schist, is cut by seven veins from 0.15 to 0.5 m. wide. At one place four join one another and form a quartz mass 1.5 m. thick. The vein matter consists of molybdenite, chalcopyrite, quartz and feldspar. The largest masses of molybdenite weigh 5 lb., and the ore is easily cleaned. Another exception is the property of the Leviathan Mines Co., situated in Copper Canyon, Mohave County, Ariz., on the eastern slope of the Hualpai Mountains. Frederick W. Horton says that two veins, one 6-40 ft., and the other 2-20 ft. wide, cut granite. They consist of quartz and considerable molybdenite and chalcopyrite, with a little pyrite and sphalerite. The ore contains from 2 to 3% molybdenite.

MOLYBDENITE IN CONTACT-METAMORPHIC DEPOSITS

Molybdenite is a common, although usually not an abundant constituent of many cupriferous contact-metamorphic deposits. These deposits were formed by hot waters and gases given off by intrusive bodies of granite, monzonite, granodiorite or diorite. As a source of molybdenite, they are of little promise, as a clean separation of the copper would be almost impossible. Flotation may in instances, however, eliminate the difficulty.

Contact-metamorphic deposits containing no copper are more promising sources of the metal, but milling will not be easy. A common occurrence of molybdenite in Ontario and Quebec consists of an acid rock (granite, aplite or pegmatite) which may be molybdenite-bearing, and which is intrusive into limestone. As a result of the metamorphism, next to the intrusive vein-like masses of pyroxene there are calcite, quartz, molybdenite, mica, pyrite and pyrrhotite, etc. At Haliburton, Ont., molybdenite, pyrrhotite and chalcopyrite form veins in a contact metamorphic limestone.

Schrader and Hill[8] state that the Leader mine, near Helvetia, Ariz., is in Paleozoic limestone intruded by post-Carboniferous aplite and granite-phorphyry. The molybdenite occurs in lenses, irregular bodies, or in masses and crystal aggregates embedded in both silicified garnetiferous limestone and in quartz masses in it. In the quartz, pyrite and chalcopyrite are associated with molybdenite. The molybdenite is in part contemporaneous with quartz and in part younger than it, both being dependent in origin on the granite-porphyry intrusion. The molybdenite is mostly fine-grained, but in places it is found in crystals ranging up to ½ in. and more in diameter. Waterhouse describes a scheelite-bearing, garnetized limestone containing molybdenite, on Kings Island, near Tasmania, which may be of commercial importance. The molybdenite not only is a constituent of the contact-metamorphic rock, but occurs in quartz veinlets cutting it and also is a constituent of an intrusive aplite near by. Bismuth and pyrite are also associated, and assays show the presence of tin. Molybdenite is an accessory mineral in the scheelite contact-metamorphic deposit of Bishop, Calif., and in Carpenter Gulch, Powell County, Mont., it occurs in metamorphic limestone.

MOLYBDENITE ASSOCIATED WITH IRON AND LEAD

The Foley pyrite deposit[9] in Lanark County, Eastern Ontario, occurs in a small body of pre-Cambrian marble inclosed in granite. Pyrite and pyrrhotite are equally abundant, and with them occur pyroxene, calcite, mica and molybdenite. This is probably a replacement deposit formed at high temperature and considerable depth. Merrill reports molybdenite as disseminated scales and small bunches in iron ore of the Hude mine, at Stanhope, N. J., sometimes making up 2% of the ore. It is also reported from the Ogden mine, in Sussex County, New Jersey.

Molybdenite or some other primary form of molybdenum must be comparatively common in lead deposits, judging from the frequent occurrence of wulfenite as a secondary mineral in the oxidized zone of these orebodies. In the Cottonwood, Utah, district, molybdenite is common at depth, accounting for the wulfenite in the outcrops. Molybdenite also occurs in the lead deposits of Sarrabus, Sardinia; Nertschinsk, Siberia; Dusquesne and Covado, Wash., and Grout Lake, B. C.; all were deposited by granitic magmatic waters. Molybdenite is a sparse constituent of a number of the comparatively shallow precious-metal orebodies formed by Tertiary igneous rocks, particularly those containing tellurium.

SMALL AMOUNTS IN SEDIMENTARY AND BASIC IGNEOUS ROCKS

While not characteristic of sedimentary rocks, Hillebrand found traces of molybdenum in a limestone from northwestern Mexico, Stutzer reports it from coal, and it is present in traces in the Mansfeld copper deposit, which many authorities consider of sedimentary origin. At Impendhle, South Africa, a horizontal bed of pyritiferous sandstone is said to contain 5% of molybdenite. The bed is from 3 to 4 ft. thick. The presence of molybdenum in mine waters in Idaho Springs, Colo., has already been mentioned, and Fleck reports it from the alkali waters of Soda Lake, San Bernardino County, California.

While typically an associate of siliceous igneous rocks, molybdenum occurs, in small amounts at least, in basic igneous rocks. Thus it has been detected in two basic lavas from the Hawaiian Islands. Powellite, a calcium molybdate containing tungsten, is one of the rare constituents of the Lake Superior copper deposits, and traces of molybdenite are reported in the Worthington mine of the Sudbury district. Molybdenite is mentioned by Diller as one of the later constituents of the Klamath Mountains, Oregon, gold mines, which he apparently considers dependent on the intrusion of a peridotite. It will be remembered that Bastin and Hill believe that the tungsten ores of Boulder County, Colo., which contain molybdenite, are dependent upon the intrusion of gabbros and iron-ore rocks, differentiates of a monzonitic magma. It is not to be expected, however, that commercial bodies of ore will be associated with igneous rocks.

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[8] United States Geological Survey, Bulletin 430, pp. 156-7, 1909.

[9] P. E. Houkins, Bulletin, American Institute of Mining Engineers, August, 1916, p. 1369.

Iron and Steel Production of the World

The production of pig iron in the world in 1916 showed a considerable increase notwithstanding—perhaps it would be more correct to say in consequence of—the continuance of war conditions. It has been difficult to get even approximate figures for some countries, and exact returns are impossible for others. For instance, it is known that a number of furnaces are in blast in Belgium and in the northern part of France under German occupation, but no exact figures for their make of iron are obtainable. The publication of monthly statements of production in Germany itself has been suspended since last October, although there had been no previous break in their issue since the war began. With these limitations and by careful comparison of all available information, we find that the pig-iron production of the world in 1916 reached a total of 78,286,630 metric tons, showing an increase of 12,407,985 tons, or 18.4%, over the preceding year. Over 70% of this gain was due to the large production of the United States. Great Britain and Germany both made considerable gains.

The blast furnaces of the United States furnished 51.2% of the world's make of pig iron in 1916, against 46.1% in 1915; while the total make by the three chief producers—the United States, Germany and Great Britain—increased from 77.6% in 1915 to 81% in 1916. The United States output in 1916 was thus a little over one-half of the world's total, and promises to continue at that level while present conditions last.

The figures indicate that there has been little or no difficulty about supplies of iron ore. British imports from Sweden have been rather difficult, but those from Spain were heavy throughout the year, and home production was large. Germany was able to retain control of the Minette ore deposits of Lorraine and Luxemburg, as well as most of the Belgian mines, and, it is understood, also obtained considerable quantities from Sweden. France suffered from a lack of raw material, as did Russia from the suspension of the mines in Poland.

Table I gives the production of pig iron for two years, the figures for the United States and Great Britain being reduced to metric tons for purposes of comparison. In Table II is given the production of steel for two years, also in metric tons. This table is compiled under the same conditions and limitations as that of pig-iron production.

The total production of steel as shown in the table was 86,843,651 metric tons in 1916, being 16,268,876 tons, or 23%, more than in 1915. For the second time the make of steel largely exceeded that of pig iron, the excess being 4,695,130 tons in 1915 and 7,284,057 tons last year. This was due to the nature of the demand for material and especially for war munitions where steel is needed; and to the widely extended employment of the open-hearth process, permitting the use of large quantities of steel scrap. Probably a higher proportion of scrap found its way into the furnaces in 1916 than ever before. Of the increase in the total production of steel last year, 10,792,505 tons, or 66.4%, was due to the great output of the United States. Our country furnished 50% and the three chief producers 79.3% of the whole production last year. Some of the minor countries showed considerable gains, notably Austria-Hungary. The German production was kept up well, partly by the extensive use of scrap and partly, without doubt, by the use of pig iron made in Belgium and in the occupied districts of France.

As in the previous year, a very large part of the steel output was absorbed in the manufacture of shells, guns and other munitions of war. There was also a good demand for material for new construction, and in the United States in the latter part of the year a great demand developed for plates and shapes for shipbuilding. This has continued during the current year. The future demand and production depends to a large extent on the course of the war; but there is little doubt that the world will absorb the largest make of iron and steel which is possible for some time to come.

TABLE I. PIG-IRON PRODUCTION OF THE WORLD

(In Metric Tons)

	1915	1916
United States	30,394,872	40,063,714
Germany	11,790,199	13,190,172
Great Britain	8,934,348	9,191,836
Three chief producers	51,119,419	62,445,722
Canada	838,626	1,086,659
Austria Hungary	1,960,000	2,005,000
France	4,750,000	5,250,000
Belgium	550,000	1,050,000
Italy	395,000	386,249
Russia	4,600,000	4,350,000
Spain	419,000	448,000
Sweden	767,600	760,000
Other countries	480,000	505,000
Totals	65,879,645	78,286,630

TABLE II STEEL PRODUCTION OF THE WORLD

(In Metric Tons)

	1915	1916
United States	32,665,453	43,457,958
Germany	13,237,696	16,050,000
Great Britain	8,484,559	9,391,963
Three chief producers	54,387,708	68,899,921
Canada	927,359	1,307,883
Austria-Hungary	2,686,626	3,336,607
France	4,875,000	5,225,000
Belgium	405,000	750,000
Italy	965,000	1,009,240
Russia	4,900,000	4,850,000
Spain	398,000	425,000
Sweden	580,000	570,000
Other countries	450,000	470,000
Totals	70,574,775	86,843,651

Broken Hill Proprietary Co., of Melbourne, Australia, shows the production of ore from the company's mines for the second half of 1916 to have been 110,276 tons, 97,630 tons of which were milled, producing 17,065 tons of 58.733% lead concentrates carrying 28.12 oz. Ag per ton. The zinc flotation plant treated 13,232 tons of tailings, producing 2805 tons of concentrates containing 58.73% Zn and 5.72% Pb per ton. No dividends were declared, although net profits of £159,429 were earned. A large addition to the company's steel plant at Newcastle is under construction.

Prospecting with Electricity

By H. R. Conklin
Mining and Electrical Engineer

The basic problem to the mining industry is the finding of ore in paying quantities. This difficulty has produced many operators of the divining rod, and several other methods have been tried in the effort to determine the hidden ore conditions underground and avoid the expense of drilling or of sinking shafts in barren ground. The whole subject is of great interest, and the possibilities are so vast that no one need be surprised at the large number of divining-rod operators or their varied methods of working. I have known some remarkable facts about divining rods, but the final results in every case have had no probability of development to a condition of certainty that would warrant a business investment, and almost every operator of a divining rod is afflicted with an over-developed imagination.

In an effort to reach the desired result of being able to determine the position of an orebody under the surface of the ground, the idea of exploring the ground magnetically was conceived, and during the last three years has been developed, first by laboratory work to establish a suitable method, and later by field work to apply the laboratory method to actual working conditions. Patents are pending for this method, which will be of interest in many fields of prospecting work.

If a high-frequency oscillating electric current, such as is used in wireless telegraphy, be confined to a closed circular circuit, a high-frequency oscillating magnetic field is induced within this circuit, and the arrangement becomes a solenoid of practically no length and of large diameter. Any electrical conductor that may be included in this induced magnetic field will have an oscillating current induced within it, and this induced current in turn induces a high-frequency oscillating magnetic field, which reacts on the original magnetic field, reducing its intensity.

The necessary conditions are that the ore or ores sought for shall be conductors of electricity, for the method described enables the location of an electrical conductor, and the fact that certain ores are such conductors makes their location possible. An ore that is not electrically conductive cannot be determined by this method. Native metals, most sulphides and chlorides, but very few carbonates, silicates or oxides are such conductors.

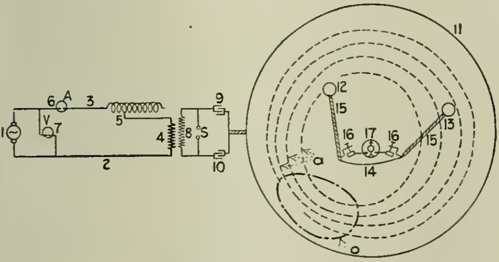


FIG. 1. ARRANGEMENT OF PROSPECTING APPARATUS

The progress of laboratory experiments was slow and tedious, and the difficulty of adapting these experiments to field work and designing the necessary instruments was even greater. The final satisfactory results are shown by reference to Fig. 1, in which 1 is an alternating-current generator or other source of alternating current, supplying the low-tension coil 4 of a transformer, through a regulating, inductive resistance 5. The high-tension transformer coil 8 is connected to a suitable spark gap *s* in parallel with condensers 9 and 10 and the primary coil 11.

The primary coil 11 is laid in a circle on the surface of the ground, and within it is produced the oscillating magnetic field. This magnetic field decreases toward the center of the primary coil and might be plotted as shown in Fig. 2, in which the ordinates represent change in magnetic flux. Owing to unavoidable variations in the original source of power, these ordinates may vary during observations to an extent greater than their diminution due to the neighborhood of an electrical conductor, so that the measurement of this magnetic field requires a balanced method.

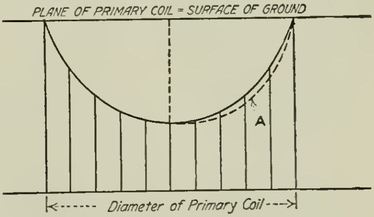


FIG. 2. PLOT OF THE MAGNETIC FIELD

For measuring this magnetic field, two identical exploring coils 12 and 13 (Fig. 1), of suitable diameter and number of turns, are connected in series with two current rectifiers 16 and a sensitive galvanometer 17. By placing one of these exploring coils at a measured distance from the center of the primary coil and moving the other around the center, the induced currents in the exploring coils being opposed to each other, a line, along which the magnetic flux is equal, is established and may be plotted. The location of the movable exploring coil, when the galvanometer reading is a minimum, determines this line, which may be called an isogonic line and is similar to a contour line on a topographic map. In the latter comparison the completed plot of these lines suggests contour lines defining a depression, as shown in cross-section in Fig. 2. Now if the magnetic flux be decreased as at *A* in Fig. 2, due to the presence of a conductor of electricity, the contour lines are drawn out in the direction of the conductor, and the plotted curves are distorted from the normal circular form, enabling the location of the conductor to be determined.

Several sets of actual distorted contour lines, as determined in the field, are shown in Figs. 3 and 4. All were observed with the primary coil 200 ft. in diameter. One of these plots, in Fig. 4, shows the location of a 2-in. iron pipe line buried about a foot underground. and is also distorted by a body of conductor still deeper

The primary coil is shifted and these contour lines plotted for a sufficient number of centers to determine the general size and dimensions of the body of conductor, after which prospect drilling is done to prove the depth, thickness and quality of the conducting orebody. If the conducting orebody be below and nearly symmetrical about the center of the primary coil, the magnetic field will be weakened, but the contour lines are not distorted from their normal circular form. However, with a sufficient number of sets of contours, the presence of the conducting orebody is positively determined.

If the conductor be close to the surface, or nearly in the plane of the primary coil, the galvanometer shows a minimum reading when the same amount of magnetic flux is inclosed by both exploring coils, but this minimum reading is not zero, since some current will flow between the exploring coils, probably due to a difference in phase caused by the angle between the lines of force in the two magnetic fields.

The presence of water courses, puddles on the surface or solutions in the ground does not affect this method, since liquids are not appreciably conductive of the low-voltage oscillating current that is induced. Contour lines about any given center can be practically duplicated at any time, regardless of the weather conditions or variations in ground water.

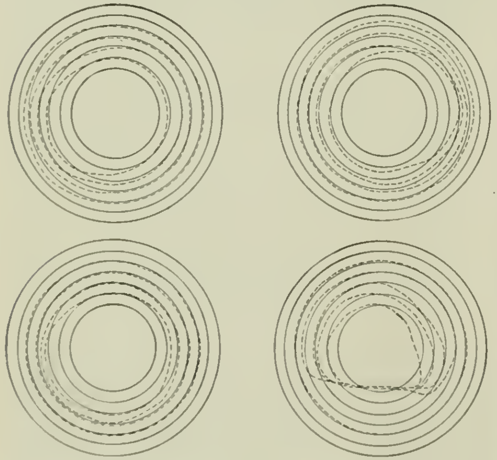


FIG 3 FIG.4

ACTUAL DISTORTED CONTOUR LINES IN THE FIELD

Theoretically, the presence of a conductor within a distance from the plane of the primary coil, of two-thirds the diameter of the primary coil, will measurably affect the magnetic flux in the plane of the coil. This has been proved practically, so that if the primary coil is 200 ft. in diameter, a conductor within 130 ft. of the surface or, if the primary coil is 400 ft. in diameter, a conductor within 260 ft. of the surface, will cause distortion of the contour lines.

The field development of this method was carried out in the Joplin district, Missouri. Of the ores found in this district—namely, zinc blende, galena and pyrite—the zinc blende is not a conductor and cannot be determined, but the galena and pyrite may be determined satisfactorily. Both galena and pyrite are conductors, and as this electrical method does not distinguish the quality of the conductor, drilling is necessary after determining the orebody electrically for identifying the mineral by drill cuttings. This disadvantage is somewhat offset by the fact that all three minerals are often closely associated, so that the electrical determination of an orebody which consists of either galena or pyrite may incidentally, by drilling, develop an orebody of blende.

In order to operate with efficiency, an automobile truck has been equipped with self-exciting alternating-current generator, driven by a gasoline engine, and all instruments and machinery required for producing the high-frequency oscillating magnetic field are mounted in the truck body. An instrument box containing galvanometer, current rectifiers and switches is provided for convenience and portability when exploring the magnetic field to determine the contour lines. Portable reels carry the necessary wires. The entire equipment may be placed in the truck for moving, making a complete outfit which is very similar to the automobile wireless plants that are used in the army.

For prospecting in any mineralized district, the first requirement is the tabulation of all ores liable to be found in that district, with their degrees of conductivity. I have been unable to find any record of work done toward such a tabulation of ores. A partial list of minerals, with their comparative degrees of conductivity, has been determined for this work, as shown in the accompanying table.

COMPARATIVE ELECTRICAL CONDUCTIVITY OF MINERALS

Proustite	18	Zinkite	115
Cerargyrite	0	Blende	0
Pyrargyrite	20	Hydrozincite	0
Bromirite	0	Calamine	0
Chalcocite	115	Smithsonite	0
Chalcopyrite	115	Willemite	0
Enargite	110	Magnetite	120
Tetrahedrite	110	Specular Hematite	50
Malachite	0	Pyrite	110
Chrysocolla	0	Red Hematite	0
Cuprite	0	Limonite	0
Tenorite	0	Pyrolusite	115
Azurite	0	Psilomelane	0
Atacamite	0	Manganite	0
Galena	105	Braunite	0
Jamesonite	40	Hausmanite	0
Boulangerite	90	Rhodonite	0

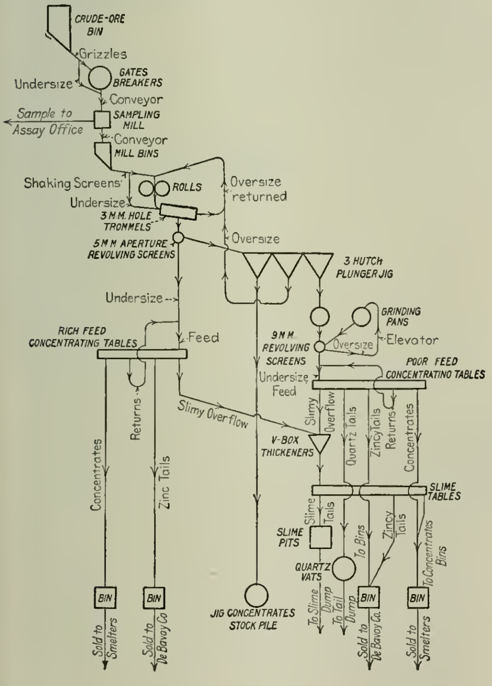
The main difficulties, in the district where the method was developed, are the frequent occurrence of pyrite, which is of no value, and the nonconductivity of zinc blende, which is the most desirable ore. The Joplin district, however, has proved a most advantageous place for the development of this method, since the orebodies are generally less than 200 ft. below the surface, and facilities for experimental work are ample and convenient. Field experiments have been carried on for over a year. Of eleven locations tested by drilling, after the electrical observations had indicated a conductor, seven proved the presence of the conductor, six cases being pyrite and one case galena. The four locations not proved by drilling occurred in the early part of the work, before enough data had been accumulated to assure proper interpretation of the contour lines.

A new type of agitator for liquids has been developed at the Johns Hopkins University, suitable for producing very minute subdivisions of liquids containing finely divided solids, and has been applied to cleaning used lubricating oils. By the use of the agitator, finely divided carbon or other solid matter can be easily and cheaply separated out.

Broken Hill South Mill

The mine of the Broken Hill South Silver Mining Co., of Broken Hill, N. S. W., Australia, has a weekly capacity of 8000 tons. The zinky tailings are re-treated at a separate plant. Operations are in charge of W. E. Wainwright, general manager, J. C. Cunningham, engineer, and W. J. McBride, metallurgist.

The headframe at the main shaft is 60 ft. above the ground level, in order to permit of the gravitation of the ore into the crude-ore bins, through the Gates breakers, into the crushed-ore bins and upon a combined horizontal and inclined conveyor for reëlevation to the mill bins. The mill is adjacent to the main shaft, and the general operation of the crushing and concentrating mill is set out as shown in the flow sheet.



FLOW SHEET, BROKEN HILL SOUTH, N. S. W., AUSTRALIA

The ore is raised in cages that will hold two mine cars having a carrying capacity of 24 cwt. The cars are run by trammers from the headframe to rotary tipples of the gravity side-tip type, which deliver into the crude-ore bins. The ore is fed through 4-ft. openings on the face of these bins, and in gravitating toward the opening passes over a grizzly set in the back of the bins. The ore is crushed in three No. 5 Gates crushers and one 30 x 18-in. Hadfield jawbreaker; all these breakers crush to 1½- to 2-in. gage, the larger breaker being used for breaking lumps of ore that are too large for the Gates crushers. A chain strung across the opening of the crude-ore bin restrains the gravitation of the ore from the bin to Gates breaker hoppers. The crushed ore drops from the crushers into the bins directly underneath, and each of these bins feeds to a combined horizontal and inclined conveyor, which raises the ore to a sampling plant in which a 1/100 part of the total ore is cut out for sampling purposes. After the sample cut has been taken, the ore is passed to another belt, which raises the ore to the level of the four mill bins, and by means of a traveling tripper discharges into any one of these. The ore is fed by feed rollers from these bins on to inclined shaking screens. These screens have perforated plates set in the bottom so that the water that is applied to the head of the shaker removes all material less than 4 mm. and passes the balance to the crushing rolls, which are the flanged and plain type, 36 in. in diameter by 18 in. face. These are driven through gearing at 17 r.p.m. and in accordance with the practice of the last 20 years, the tension between the crushing rolls is maintained by large rubber buffers 15 in. in diameter and 1¼ in. thick, 32 of these being distributed over the four tension bolts used in this design of rolls. The rolls deliver to trommels immediately underneath, all material under 4 mm. being passed to the jigs, the oversize returned to the rolls. There is one duplex plunger jig to each of the four sections of the mill. Each jig has 4 mm. screens and three hutches on each of the duplex sides. The first hutch yields concentrates, the second hutch returns the water and material to the rolls, and the third hutch, which is without screens or plungers, discharges to 5-ft. grinding pans. The product from the grinding pans is reëlevated and passed over revolving screens covered with 16-mesh screen, of 25-gage wire, the undersize is passed to one section of concentrating tables, and the oversize is returned to the grinding pans. The undersize from the roll trommels, before being fed to the jigs, is passed over revolving screens having 30-mesh screen of 28-gage wire, in order to eliminate the very fine material from the jig feed. This fine material is fed upon a special section of concentrating tables, and the return, or middlings product produced from this, together with a similar product produced from the grinding-pan undersize, is returned to other tables for re-treatment. The slimes from the feed end of all concentrating tables is thickened and fed to similar tables for separate treatment. The final products from all these table treatments are concentrates, zinky tailings, quartz tailings and slime tailings. All concentrates, zinky tailings and quartz tailings are elevated and fed into bins or vats which are fitted with filter bottoms. These products, when drained sufficiently, are loaded direct through chutes to the railway cars, all concentrates being shipped to the smelteries, and zinky tailings to the flotation mill of the Amalgamated Zinc, Ltd., while the quartz tailings are returned underground and used with other similar material for filling. Slime tailings are thickened in pits, which, when full, are discharged, elevated and laundered upon a slime dump, from which they will be drawn for re-treatment in the future.

Although no ore sorting is done at the present time, it is contemplated for the future; it may be of interest to know that the average percentage of slime produced is, by weight, 15%, having an approximate assay value of 11% Pb, 7 oz. Ag and 13% Zn per ton. The crude ore average assay is 15% Pb, 7 oz. Ag and 14% Zn.

The concentrating tables in operation are special Wilfleys and are fitted with wooden decks having rows of grooves running parallel to the length of the table.

Tonopah Belmont's Expansion

In line with the policy of expansion of a number of successful mining companies, the Tonopah Belmont Development Co. has been acquiring additional properties during the last few years, not only in the Tonopah district where its original mine is situated, but wherever good properties could be found. From the company's fourteenth annual report, for the year 1916, the following data are taken regarding the newer properties that have been purchased or secured under various option agreements.

In the Tonopah section proper the company has optioned an area extending easterly about 9000 ft. from the Halifax and Mizpah Extension mine, which adjoins the Tonopah Belmont mine on the east. The ore-bearing rocks (trachytes, etc.) do not come to the surface in this territory, but it is regarded as possible that they will be found underneath the cap rock. Diamond-drill prospecting of the area at depth has been started. Four holes are being drilled, but up to the date of the issuing of the report the cap rock had not been entirely passed through.

The Emma mine, at Dunton, Dolores County, Colo., was optioned early in 1916, when development work was undertaken to determine the tonnage and grade of ore that may be found below the old No. 5 tunnel level. The mine in the past was developed through a series of tunnels, and the lowest, the No. 5, was situated on the bank of a small river, a few feet above the water, so that deeper development was possible only through a shaft. The No. 5 tunnel was 3285 ft. long and showed five oreshoots having a combined length of 1240 ft. On the new sixth level, 160 ft. below the No. 5 tunnel, drifts have been pushed out north and south, but the development at the date of the report had not proved or disproved the mine, and the work is to be continued under a modified agreement.

In California the company acquired in February, 1917, the Eagle-Shawmut mine, on the Mother Lode at Shawmut, in Tuolumne County. This property has a record of production of about $4,500,000 in gold and was worked to a depth of 2300 ft. The mining plant and the 100-stamp concentration mill and chlorination plant will be utilized with some improvements. The future of the operation is in the downward extension of the main oreshoot. On the 16th, or lowest, level the shoot consists of a series of closely joined or overlapping lenses of sulphide ore, with a length on the vein of about 490 ft. and an average horizontal width of about 10 ft. The average value per ton is about $7.50. An operation of 400 tons per day is planned if the oreshoot continues to sufficient depth. At present the ore reserve of positive and probable ore is about 159,000 tons. The mill, which will be remodeled, will not be started until further development work has been done.

Surf Inlet Mine Now the Most Important New Property

The Surf Inlet mine, on Princess Royal Island, British Columbia, is at present the most important of the Tonopah Belmont new properties, and production at this gold property is expected to be initiated during the present summer. The "available and probably indicated ore reserves" are given as 385,320 tons, having an average value of $11.22 per ton in gold. During the last year 2595 ft. of development has been done underground, consisting of drifts, crosscuts, raises and winzes. No special effort is being made during the current year to increase the ore reserves, but this feature will not be lost sight of in the future.

The company has been engaged lately in the installation of a mining and milling plant and the hydro-electric power plant and transportation systems, the mine being 7½ miles from the coast. At the hydro-electric plant two turbine units, of the single-spiral volute cast-iron case, horizontal single-runner, double-discharge, Pelton-Francis type, built by the Pelton Water Wheel Co., of Harrisburg, Penn., have been installed. Each turbine is direct-connected to a 468 kv.-a. (375 kw. at 0.80 power factor) three-phase 60-cycle 440-volt generator running at 600 r.p.m. The power-transmission line from the station to the mine plant is about 5.65 miles long. An Ambursen hollow reinforced-concrete dam has been built, with the crest of the spillway 288 ft. long, and at an elevation of 73 ft. above main high tide in Surf Inlet. The total length, including abutment, is 420 ft., and the greatest height from the bottom of cut-off wall to the spillway crest is 64 ft. The dam raises the level of Cougar Lake about 40 ft. and the levels of Bear and Deer Lakes about 6 ft. A variety of transport systems has been arranged to connect with the various plants. Cars may be loaded at the Surf Inlet wharf, hauled up over the dam on an incline engine plane, and dropped on a lighter, which is towed to the Paradise Creek wharf, where the 3-ft. gage railroad follows the south bank of Paradise Creek for 3500 ft. and then crosses the creek on a trestle about 500 ft. long and terminates at the mine yards, 5100 ft. from the starting point.

Copper as Well as Gold Will Be Recovered at the Surf Inlet Mine

The first concentrator unit at the Surf Inlet mine is designed for a capacity of 250 to 300 tons per day. After extended testing a combination concentration-cyanidation process was adopted. In the first stage, or concentration part of the process, the ore is broken by gyratory crushers, the grinding is done in ball mills, and a rough concentration is made on tables. The tailings from the tables are to be reground in tube mills, and the resultant fine pulp will be concentrated by flotation in Jones-Belmont machines. About half of the valuable mineral is recovered by table concentration and the remainder by flotation. The tests have indicated that about 94% of the total gold and 96% of the total copper will be recovered in the combined concentrates. Bullion is to be the ultimate product on the ground.

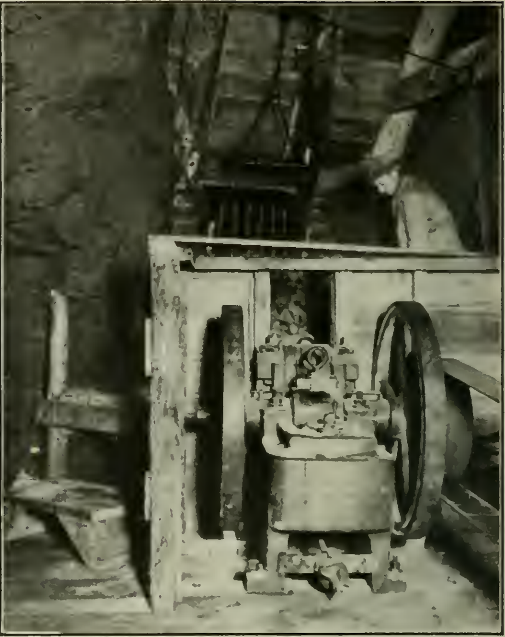
Another mine, the so-called Pugsley mine, the property of the Princess Royal Gold Mines, Ltd., comprising three claims immediately south of the Surf Inlet mine, was optioned in April, 1916, for two years. Several veins had been under development, and up to March, 1917, drifting and crosscutting amounting to 170 ft. had been done by the Tonopah Belmont company. If sufficient tonnage is developed, the railroad will be extended so as to bring the Pugsley ore to the Surf Inlet mill.

Colorado's Underground Milling Plant

MOUNTAIN TOP MINE BUILDINGS AT PORTAL OF SUNRISE TUNNEL; ALTITUDE, 12,000 FEET

The mill for this mine was installed in chambers excavated out of solid rock in hillside, thereby making operations secure from the menace of snowslides

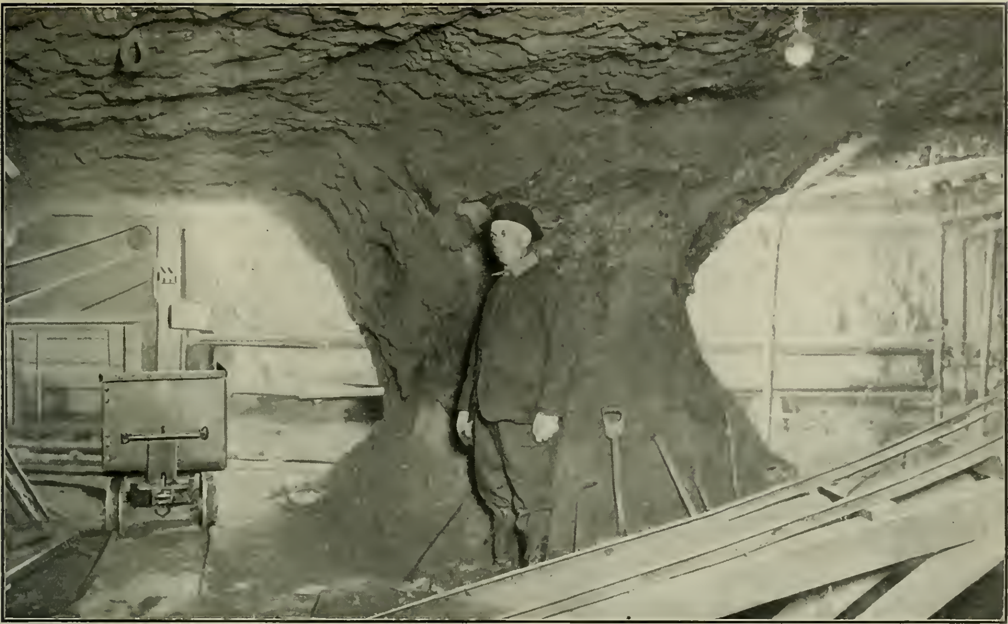
Automatic dumping skip at main tunnel, capacity 42 cu.ft.



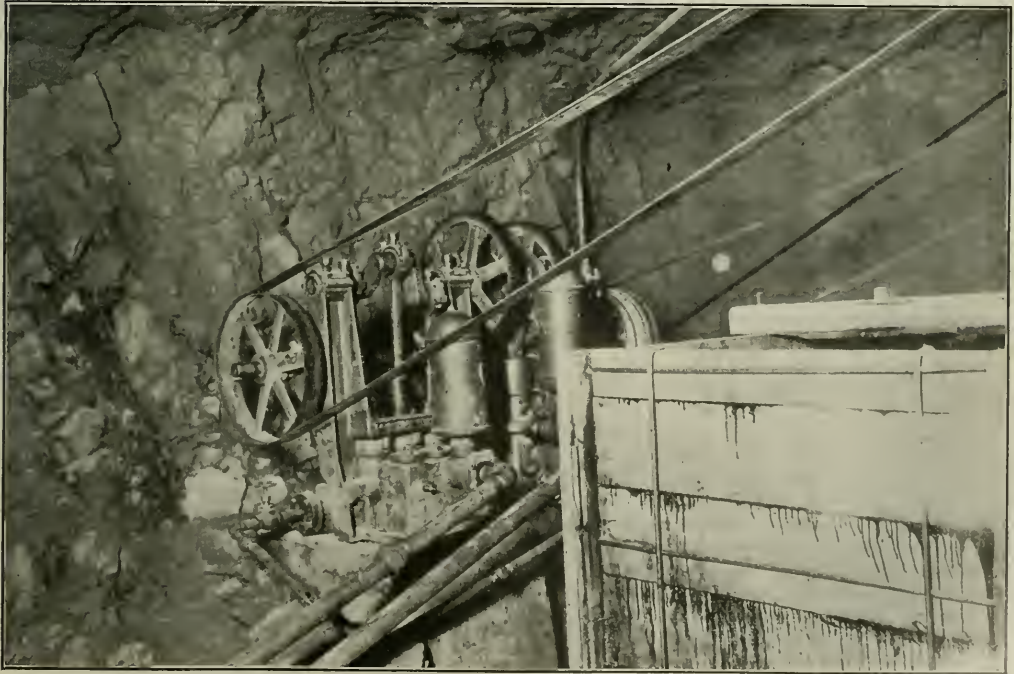
Crusher room with chute cut in solid rock at head of Mountain Top mill

The lower table room with two froth-cleaning tables

VIEWS OF MOUNTAIN TOP MILL, SHOWING VARIOUS OPERATIONS CONDUCTED



The lower room of the mill, looking toward the main tunnel



Supply pump for sump—Mountain Top mill

IN UNDERGROUND CHAMBERS WITH COMFORT AND SAFETY

Correspondence and Discussion

Tabulated Air-Lift Data

In the *Journal* of Apr. 14, 1917, there was an article by A. W. Allen giving tabulated air-lift data. There seems to be one item missing that is needed to make this full and complete; namely, the cubic feet of free air required to elevate one gallon of solution.

From time to time articles have appeared giving these data, but on large and individual installations, such as "Water Problem at the Old Dominion Mine," by P. G. Beckett, in the bulletin of the A.I.M.E., Sept., 1916, where we find roughly that one cubic foot of air was required to elevate 1½ gal. of water, submergence being 179 ft. and lift 198 ft., with air pressure at 80 to 90 lb. The efficiency was 36%. Will you ask Mr. Allen if he will not supply these data for addition to his already valuable contribution? DOUGLAS MUIR.

La Jolla, Calif., June 26, 1917.

Mining Engineers Overestimated

I had always thought that, owing to his experience, the average mining engineer was particularly well fitted to grasp the essential features of a problem of administration. It always seemed to me that the President could do no better than to choose all his assistants from among members of the A. I. M. E. or from the list in the back of the *Journal*.

However, after attending a certain meeting of fifty mining engineers recently and hearing them gravely discuss for half an hour a question of internal finance involving a total of not to exceed $7.39, I have decided that I was wrong. Not a single protest from anyone! Not a single suggestion leading to the lynching of the treasurer! If the time of the other members is half as valuable as mine, the time lost by the fifty who gravely discussed this financial problem would be worth $5000. HENRY B. WORKS.

York, Penn., Aug. 13, 1917

Sane Oil and Gas Legislation a Necessity

The Senate Committee on Public Lands has decided to hold no further hearings on oil-land legislation, but to report the Walsh Bill (S. 45) to the Senate in essentially its present form so far as it relates to oil lands, except for the introduction of remedial provisions along the lines of the Phelan amendments of the preceding session.

This decision, reached in the face of the fact that the bill does not accord with the ideas of those, both in the Government service and outside of it, who have given most study to the matter, ends all hope that a good bill might be reported by the Senate committee. The one remaining hope that a good law may be enacted at this session lies in amendment of the bill on the floor of the Senate. Only the voice of the public, raised in protest against the tremendous waste of oil and gas that the enactment of the Walsh Bill would entail, can bring about such amendment or prevent the passage of the bill in its present form. MAX W. BALL.

Washington, Aug. 9, 1917.

Reflected Glory of Mining Engineers

Every time the *Journal* or the New York daily papers publish anything about Mr. Hoover I feel a glow of self-satisfaction—or perhaps it should be called reflected glory—due to the fact that we are both mining engineers. I think you feel the same way.

I was lately expressing myself in this vein to my better half, who, I regret to say, did not enthuse. Her repeated demands for a list of other mining engineers who had ever been prominent as anything else brought out the fact that I was able to refer to only one other, who, besides being the most prominent gold, silver and diamond miner of the period, was also the most prominent and successful in government and diplomatic circles.

In view of this and in order to provide a better foundation for my admiration for mining engineers in general, I suggest that the *Journal* run an occasional paragraph on "Cleopatra." MARK R. LAMB.

New York, Aug. 6, 1917.

A Florida Rare-Mineral Deposit

The article by Donald M. Liddell, in the *Journal* of July 28, calls attention to some results of a mineralogical study of the Florida sands which I had communicated some time ago in a private way to Buckman & Pritchard, owners of the enterprise now operating near Pablo Beach, outside of Jacksonville. In view of the context, which appears to give a broader application to the results than they perhaps deserve, I wish to state that the mineral identification, as well as the determination of the order of abundance, was based on a sample taken from near the works and does not necessarily hold for the deposit at large, which, as noted in the article, occupies a stretch of many miles along the coast. There is likely to be considerable variation in the relative proportions of the different ingredients, especially of those of lighter gravity. It is certain, also, that other minerals occur, in addition to those listed, which represent the more prominent species responsive to simpler tests.

The doubt cast by Mr. Liddell as to the presence of epidote seems hardly well founded. The grains so identified showed no anomalies, and I suspect the material that contained 15% of titanium to have been a mixture; at least the latter was not compared with the results of my determination.

From many points of view the deposit claims our interest. It is a most notable addition to the list of rare-earth deposits. How the sands could lie so long in plain view without attracting notice may seem remarkable, but there is really very little in their appearance to distinguish them from any other beach sand except for their fineness and evenness of grain. Their occurrence so far from possible sources of origin in the crystalline rocks would prove a puzzle if it were not that their accumulation probably involves a long geological story with more than one cycle of concentration and deposition by water. An ultimate source in the Appalachian highland seems the most reasonable view to take, and in fact no other derivation at present appears possible. I feel that there is something very suggestive in regard to this question in the existence of the ilmenite-zircon sandstone, described by Thomas L. Watson and Frank L. Hess, from the vicinity of Ashland, Va., which is on the inner margin of the Coastal Plain, where the Tertiary beds overlap on the pre-Cambrian formations. It is at least not unlikely that the present sands have been through such a stage of consolidation and may have been gathered from a wide drainage area. D. H. NEWLAND.

Albany, N. Y., Aug. 16, 1917.

Waterproofing Leather Boots

In the *Journal* of Mar. 24, 1917, there was an interesting article about waterproofing leather boots, in which it was said that tallow is good but troublesome and nasty for the purpose.

Authorities on the treatment of leather disagree with that statement, because tallow usually has a high content of fatty acid.

The waterproofing of leather with other substances is a very simple matter, however, and it is not necessary for the miner or owner of the boots to go to the trouble of preparing his own waterproofing out of grease and old rubber boots. Any good heavy grease that is really preservative will make the boot waterproof, provided the leather is filled with it. This can be accomplished by merely painting the boots time after time and putting them in a warm place so that they will absorb it. A good belt preservative such as Cling-Surface, which penetrates and makes leather belts waterproof, will do very well, for it is soft enough to be absorbed and yet heavy enough to stay in the leather and fill all the pores. At the same time it preserves the leather, keeping it flexible and preventing cracking.

The great factor in making boots really waterproof is to use something that will fill up the stitch holes or other tiny openings. This is more difficult than filling the leather's pores. A Western boot company made a good waterproof boot for a number of years, but they failed recently and have gone into other hands. The boots the new company manufactures are not waterproof. The old company used a substance that they said was fed to the needle as the boots were sewed. Whether this is true or not, the boots, for at least a year after purchase, were waterproof.

It is my belief, however, that a good belt preservative is the proper "medicine" for filling the stitch holes as well as the leather because of the affinity of leather for such substance. I know of instances where the good waterproof boots mentioned were treated with belt preservative after about a year's use, and after they had begun to open up and leak, and were almost as waterproof and satisfactory in every way as the original boot when new. This treatment will also make the soles wear longer.

Of course a boot cannot be polished after it has been soaked full of this belt preservative, but this is true with any grease. In treating the boot it can simply be washed off clean and then put in a warm spot back of the boiler or in the door of an oven, but it must not be allowed to get very hot. Leather will stand no more heat safely than the human hand. The belt preservative is then heated and painted on the boots and worked well into the stitch holes and around the upper edges of the soles where the uppers are sewed on. Then put them back in a warm place and allow to penetrate. This application can thereafter be repeated from time to time. The time will come when there will be patches of unabsorbed preservative remaining on the surface, which will prove that the leather is saturated in those portions, and can take no more. This excess will simply have to be wiped off and the boot is ready for use. A month later, more or less, it will probably take some more preservative, particularly around the seams.

New York, July 10, 1917. N. G. NEAR.

Credits in South America

In the *Journal* of June 30, p. 1157, Case 3, I find "a New York bank canceled a 'confirmed credit'—a thing unheard of in South American banking circles." Being astonished at this action of the New York bank, and suspecting that there might be another side to the story, I have had the case investigated through banking circles and am informed on the highest authority, which I am not authorized to give at this moment, but which will doubtless be forthcoming if necessary, that this "Case 3" is not correctly stated. The correct statement is as follows:

> A steel concern in this country opened an ordinary credit through this bank and its branch in South America for the purchase of wolfram, but the price having gone up, the beneficiary insisted upon a confirmed credit. This was referred to the steel manufacturer, who then asked specifically that the credit be confirmed.
>
> The price of the material continued to rise and the South American mine owner refused to make delivery. While negotiations were in progress, the bottom dropped out of the market so that the price of the material was exceedingly low.
>
> The South American mine owner then tendered the necessary documents to the bank, but the American manufacturer instructed the bank not to negotiate the drafts under the credit, but to consider it canceled.
>
> This the bank absolutely refused to do. Knowing full well what it meant to give a confirmed credit the bank refused to cancel, even under threat of suit at law, and the full amount of the credit opened has been paid to the South American mine owner with full knowledge that the bank would have difficulty in collecting it from its client here.
>
> In fact, the matter is now a subject of litigation inasmuch as the American manufacturer is suing the bank for recovery of the amount which it claims was improperly paid out.

How the matter could be perverted in the way this has been in the report of the *Journal*, I am at a loss to understand, but the foregoing are the facts in the case. TRUTHSEEKER.

San Francisco, Aug. 10, 1917.

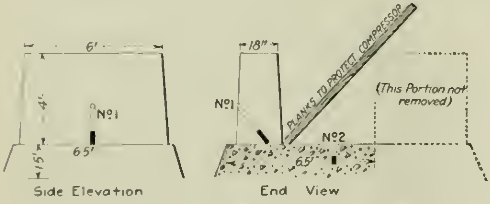
Details of Practical Mining

An Interesting Blasting Job

At a mine of the Piokee Mining Co., of Picher, Okla., an interesting blasting job was performed recently. A concrete foundation had to be removed. Owing to the shortage of labor, blasting was decided upon, although such indoor work had never been attempted before.

The foundation was on a base 1½ ft. thick, 6½ x 6½ ft. square. The pillar extending upward was 6 ft. long, 4 ft. high, 24 in. at the base and 18 in. on top. It was necessary to remove this portion in order to install a new engine in a 30 x 40 ft. engine room. The illustration shows the method used to blast out the foundation.

Two holes were drilled, as shown, at points where the charge would exert its greatest force throughout the mass. No. 1 hole was charged with a little less than one-half cartridge of 1¼ x 8-in. Red Cross gelatin, 40% strength, and No. 2 hole was charged with a little less than one-fourth of a cartridge. Both charges were confined by tamping fine sand in the holes.



BLASTING OUT AN OLD FOUNDATION

The entire portion that was to be moved was shattered, there being only one piece over one-man size. The blasting was done in an engine room 30 x 40 ft., with a compressor 10 ft. to the right, and the side wall of the room 3 ft. to the left. A few planks were placed as shown to protect the compressor in the event of some flying particles.

No damage was done to machinery or building, and the explosive proved a good workman, as the holes were drilled, and the débris all cleared away in less than an hour's time.

Breaking Large Boulders by Heat

An oil-burner torch was used by the New York Subway Construction Co. in breaking up large boulders encountered in connection with its subway work in New York City, says *Engineering and Contracting*.

One of these niggerhead boulders, 8 ft. high and 10 ft. thick, was uncovered near the Borough Hall in Brooklyn. Owing to local conditions, the use of dynamite was prohibited. The contractor therefore decided to use a Hauck oil burner, and by playing the concentrated flame on one spot on the stone for 10 or 15 min. the rock was split at the seams. By repeating the operation it was reduced to a size that could be handled conveniently. The boulder was broken up in about one hour at a total cost of approximately 60c., this including the 1 gal. of kerosene consumed by the burner and the part time of two men.

Turnouts for Narrow-Gage Track

By Robert S. Lewis

Professor of Mining, University of Utah

Tables for turnouts and switches on standard and narrow (36-in.) gage railroads are to be found in nearly all handbooks dealing with railroad surveying. However, at some mines a track 20-in. wide is used, and the following table has been constructed to facilitate the laying out of switches on a railroad of this gage.

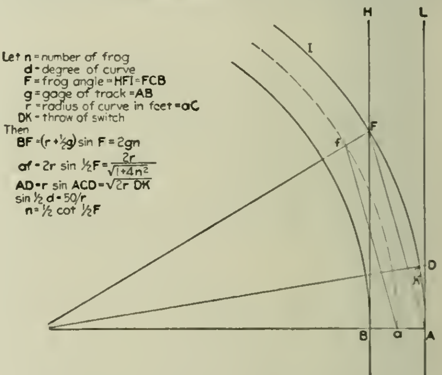

H
L
I
F
f
D
K
B
a
A
Let n = number of frog
d = degree of curve
F = frog angle = HFI = FCB
g = gage of track = AB
r = radius of curve in feet = aC
DK = throw of switch
Then
BF = (r + ½g) sin F = 2gn
af = 2r sin ½F = 2r/√(1+4n²)
AD = r sin ACD = √(2r DK)
sin ½ d = 50/r
n = ½ cot ½F

DIAGRAM OF TURNOUT FOR MINE TRACKS

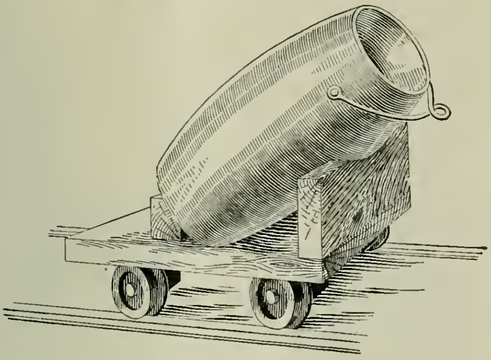
TABLE FOR 20-IN. TRACK: THROW OF SWITCH, 4 IN

No. n	Angle F		Distance, BF	Chord, af	Switch, AD	Radius, r	Degree of Curve, d	
	Deg	Min.					Deg	Min
4	14	15	13 34	13 32	5 96	52 33	139	16
4½	12	41	15 00	14 91	6 70	67 50	95	34
5	11	25	16 67	16 58	7 45	83 33	73	44
5½	10	23	18 34	18 25	8 20	100 83	59	24
6	9	32	20 00	19 93	8 95	120 00	49	14
6½	8	48	21 67	21 61	9 69	140 83	41	34
7	8	10	23 33	23 28	10 44	163 33	35	40
7½	7	38	25 00	24 95	11 18	187 50	30	56
8	7	09	26 67	26 62	11 93	213 33	27	05
8½	6	44	28 33	28 29	12 67	240 83	23	55
9	6	23	30 00	29 95	13 42	270 00	21	20
9½	6	02	31 67	31 63	14 16	300 83	19	08
10	5	43	33 33	33 30	14 91	333 33	17	14
10½	5	27	35 00	34 97	15 65	367 50	15	38
11	5	12	36 67	36 63	16 40	403 33	14	14
11½	4	59	38 33	38 30	17 14	440 83	13	02
12	4	46	40 00	39 96	17 89	480 00	11	0[illegible]

It is convenient to remember that no matter what the length of the chord *af* may be, its middle ordinate is always equal to $\frac{1}{4}g$ and the ordinates at the quarter points are equal to $\frac{3}{16}g$. Should it be necessary to use another length of throw for the switches, the quantity *AD* only need be calculated. However, for a different gage a similar table must be constructed.

Bucket Truck for Mine Levels

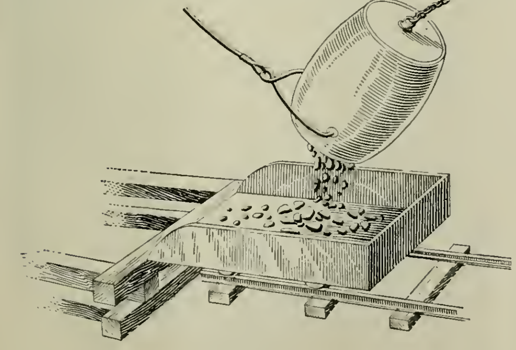
In driving a level from a prospect shaft one of the awkward pieces of equipment to handle is the ore bucket. A great deal of difficulty can be avoided if the bucket is placed in an inclined position on the truck with the mouth facing the shoveler. A large and heavy bucket can be easily "trucked" and "caged" by the use of the truck shown in the illustration. When the bucket is "rung down," one edge strikes the block on the truck, which, being off center, causes it to fall forward (toward the face from which the waste is being hoisted) and into the supporting block; filling the bucket at the angle at which it rests is easy. When the hoisting signal is given, the engineer takes the slack in the cable and chain and enough more to swing the bucket on to the guides or off the truck under the crosshead, the trammer steadies it and with or without another signal, according to prearranged plan, up she goes!



TRUCK FOR ORE BUCKETS

Ore-Sorting Car for Prospects

In prospecting shafts, when the material is hoisted in a bucket, amounts of ore are frequently brought up in the waste, which is sorted on the dump. If hoisting is not too rapid, a top car from which sorting may be done direct may be constructed as shown in the illustration. The bed of the car may be built in accordance with the materials available, and the arrangement for shifting should be such that the car may be kept out of the way when not needed. The dimensions of course vary with the size of the bucket used. When dumping into this car, the end of the car, and possibly both sides, will have to be supported until the material is dressed. Dumping may be a little "sudden" or a little "heavy" according to the way the material is handled in sorting, but after a short time the sorter will learn when to hold big rocks to help tip and when to throw them off to keep from tipping the car before it is time to do so.



ORE-SORTING CAR

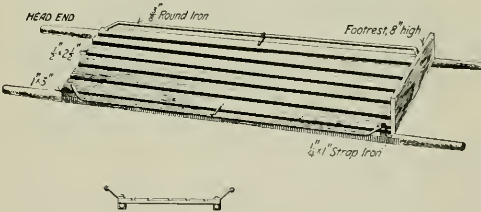
Rigid Underground Stretcher

By Albert G. Wolf

Mining Engineer, Denver, Colo.

Various kinds of stretchers for underground use have been proposed, but forms of construction involving the use of canvas, which does not give absolute rigidity, are not to be recommended. Light, folding stretchers of canvas, with folding straps, straps for holding the patient, etc., have been discussed in different publications. These canvas stretchers are convenient for those who have to carry the contrivances in and out of the mine, but in case of a mine accident, that is a secondary consideration. What is needed is a stretcher that will permit the conveyance of the injured man from any part of the mine workings—out of stopes, down manways, up winzes or shafts and through drifts, and with the least torture to him.

Such a stretcher, constructed entirely of wood and metal, is shown in the accompanying illustration. The flat, wood bed insures absolute rigidity of the patient when properly tied down. The iron side-rods are a convenience in handling and in fastening ropes, and the foot-rest helps support the injured man when hoisting or lowering him. A quilt and several yards of cotton rope should always accompany the stretcher, the former to serve as padding and more particularly for warmth, as a severely injured man is almost always cold, owing to shock and exposure; the rope is to fasten the man securely to the stretcher. Fastening straps secured to stretchers are rarely adequate for this purpose and are often in an impossible place with respect to the injury and therefore are only in the way. The total weight of such a stretcher is 25 to 30 lb., a considerable addition to the weight of a man, yet of small moment if it saves the victim of an accident minutes or hours of pain. Having had experience both in carrying injured men and being carried from mine workings when injured, I can recommend a rigid stretcher as far superior to the usual canvas stretcher.



RIGID STRETCHER FOR USE UNDERGROUND

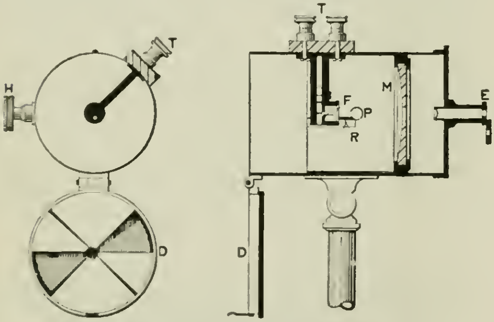
Mining and Metallurgical Machinery

A Pyrometer for the Blacksmith Shop

With the advent of oil- and gas-burning furnaces in the blacksmith shop and the more systematic methods of shaping and sharpening drill bits, the question of tempering is receiving more and more attention by the mining companies that use enough steel to warrant sharpening machines.

As stated by George H. Gilman, in "Drill Bits and Drill Steel for Metal Mining," in the *Journal* of May 12, "the eye gets off color" and "the critical point (for tempering) is reached when its rising temperature is suddenly halted by the physical and chemical changes that take place in the steel, which cause it to absorb a certain amount of heat."

Forging heat, according to Mr. Gilman, should not exceed 1600° F; tempering temperature will vary, according to the grade of steel used, this temperature being determined only by actual tests. Once determined, however, the furnace temperature can be maintained by the use of the Féry radiation pyrometer (manufactured by the Taylor Instrument Co., of Rochester, N. Y.) which not only may be used on the tempering forges, but may be made to cover the sharpening forges as well, thus giving control of the forge heat of the entire shop.



SECTION OF THE FÉRY PYROMETER FOR DIRECT READING

The instrument hitherto available had many defects. The Le Chatelier, or rare-metal thermocouple, must be protected from furnace gases, molten metals and other injurious substances, and this fact limits its use to the temperature that the protection will bear—about 2500° F., or even less for long exposure. Thermocouples of cheaper alloys are liable to rapid failure at high temperatures, no matter how well protected. Their cheapness is only in first cost, and they require frequent renewal, while their accuracy is gone, in many cases, long before they are actually burned out.

A thermocouple may give accurate readings, but the temperature indicated will be the temperature immediately surrounding its end.

Optical pyrometers—those depending on color comparison—need much skill and experience on the part of the user and also frequent standardization. They cannot be made automatic or continuous in action. Seger cones of fusible clay mixtures as used by potters are only approximations, and unless watched constantly on a rising temperature, all the information given by a melted cone is that the temperature at some time has passed some more or less uncertain limit. The Seger cone can only, at best, measure the temperature of its softening or melting point. This will be the temperature of the product under treatment, if both the cone and product have been in an evenly heated furnace for a long time.

The Féry radiation pyrometer when pointed at a hot body will give continuous automatic readings of temperature, and this temperature will be, not an arbitrary measurement, but the temperature of the body at which it is pointed. The instrument is optical only in the method of pointing; once set up and pointed, the user needs only to watch a needle as it moves over a temperature scale.

The time required to set up the outfit is less than two minutes. If readings are wanted even quicker than this, the telescope may be held in the hand. In this way the instrument may be used to rapidly explore any hot body. For instance, it can measure the temperature of steel passing through the forge or any portion of the furnace upon which it may be sighted.

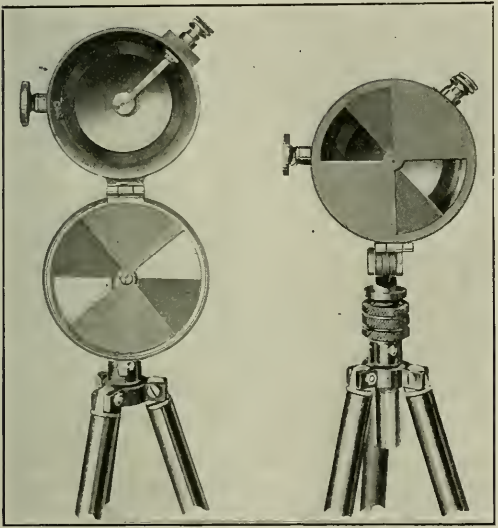
With the recording outfit the telescope is fixed, pointed in the required direction and connected to a recorder, which makes a continuous record of the temperature. This recorder may be at any required distance from the furnace; records are made on paper charts in ink lines. The record can be read as it is made, while it is ready for handling as soon as it is taken from the drum. The recorder can be fitted with an alarm attachment to ring a bell whenever the temperature goes above or below any required limit; it never need go into or very near to the hot body, so that its life is not shortened by use at very high temperatures.

To understand the working it is only necessary to remember that all bodies radiate heat to their surroundings and the amount of heat radiated increases so rapidly with rise of temperature that it can be felt even before the body is hot enough to give out light. Heat rays can be reflected and brought together at a focus just as light rays can, so that where a concave mirror brings light to a focused image, there is also a "heat image" at the same spot. The well-known burning glass, which is used to set fire to a piece of paper by focusing heat rays from the sun, is an example of this, and the same thing that is done by a lens or burning glass can be done better by a concave mirror, and for that reason a mirror is used in the Féry pyrometer.

If two different metals are joined together and their junction is heated, an electric current will be generated. The more the junction is heated the bigger will be the current. This device is called a "thermocouple," and the place where the two metals are joined together and heated is called the "hot junction." The place where the two metals are joined to the rest of the circuit is called the "cold junction," and it is the difference in temperature between the hot and cold junction that causes a current to flow.

The heat rays given out by a hot body fall on a concave mirror in the pyrometer telescope and are brought together to a focus. At this focus is the hot junction of a thermocouple, and as this junction is heated by the focused heat rays, the hotter the body the hotter the junction will be heated.

Referring to the illustration, a section of the pyrometer telescope is shown on the right. The mirror *M* receives the heat rays and brings them together to a focus at *F*. Here is the hot junction of a thermocouple. The cold junction is quite near the hot junction, but is screened from the focused heat rays. Thus the two junctions are equally affected by changes in air temperature, and the difference in temperature which causes a current to flow will be due to the temperature of the hot body.



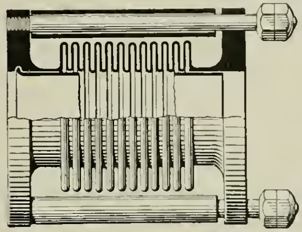
FÉRY PYROMETER FOR THE BLACKSMITH SHOP

To guide the pointing of the telescope an eyepiece *E* is provided at the rear end of the telescope, through which a reflected image of the hot body can be seen. In the center of the field of view, as seen in the eyepiece, the hot junction of the thermocouple is seen as a black spot, and this must be overlapped all around by the image of the hot body. The telescope may be taken as much nearer as is desired without altering the temperature reading. As the telescope gets nearer to the hot body the mirror *M* receives more heat, but at the same time this greater amount of heat is spread over a larger image and the intensity of heat remains the same. Thus the only effect of going nearer to the hot body is to increase the amount of overlapping of the image beyond the black spot. This distance can be as much as thirty times the diameter of the hot body.

The telescope is focused by turning the milled head *H* at the side, a simple operation; an indicator may be connected to the telescope by a flexible cable. This indicator measures the current generated by the thermocouple in the telescope and reads the temperature of the hot body direct.

One-Piece Expansion Joint

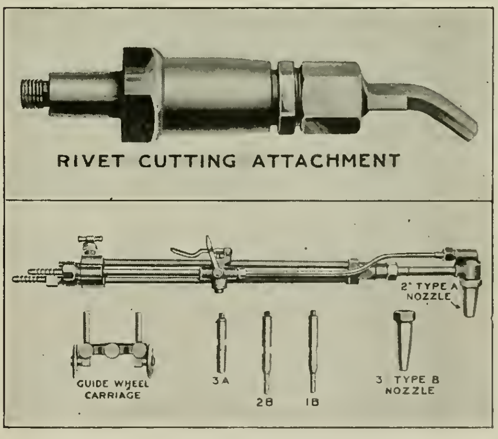
A one-piece expansion joint that requires no packing has recently been placed upon the market by the Nuttall Manufacturing Co., of Pittsburgh, Penn. This joint is made of a hammer-forged oil-tempered steel blank and is made for both high and low pressures. The accompanying illustration shows in cross section the general design. The total sweep of the joint varies from $\frac{5}{8}$ in. in the low pressures to 2 in. in the high pressures.



A ONE-PIECE EXPANSION JOINT

Rivet-Head and Stay-Bolt Cutter

For cutting off rivet heads and stay-bolts flush with plates, by the oxyacetylene process, it is desirable to have a cutting tip so designed as to permit the gas jet to play parallel with the plates. To meet this need the Prest-O-Lite Co., Inc., of Indianapolis, Ind., is manufacturing a special rivet and stay-bolt cutting attachment. This is used in connection with the Type K cutting blowpipe shown, being screwed into the head in place of the regular cutting nozzles. The copper tip is bent at a convenient angle and is adjustable to any position, facilitating operation in close quarters. Much cleaner work in rivet and stay-bolt cutting is possible with this attachment than with standard cutting tips, which do not permit of a cut truly parallel with the plates.



RIVET-HEAD AND STAY-BOLT CUTTER FOR OXYACETYLENE BURNER

Price Fixing

Wall Street is remarking that if the Administration's plan of fixing "one price for all" for various commodities is not actually unconstitutional, it would in any event be found impossible of enforcement, says the *Evening Post*. Whenever it stops to think of it (and that has lately been a frequent occurrence), its mind breaks down in confusion. It cannot see the beginning or the end. It believes that fixing prices to all consumers would have certain definite results, but it believes it would be just as impossible for it to have the desired results as it would be for a man to take a handful of water and squeeze it into a desired shape. The old difficulties reappear. The Government could fix prices for the large companies, for they are easy to put one's hand on; but could it make certain that hundreds of smaller concerns were not charging higher prices? Would not buyers who wanted to make certain of getting goods bid secretly for them at higher than the fixed price? That they could afford to pay more is proved by the fact that they are at present doing it.

And the question of unfairness bobs up on every side. Must high-cost producers go out of business in order that low-cost producers shall not reap fancy profits? If the price of steel is fixed, will pig-iron and iron-ore prices be fixed? Will the prices of all finished products be fixed? If prices are fixed in half a dozen large industries, why should they not be fixed in all industries? For prices have risen in nearly all industries. To regulate one industry, or the product of one stage of one industry, while other industries go unregulated, is unfair to the industry regulated. To regulate all industries is impossible. As one broker expressed it: "The daily activities, needs and production of 100,000,000 people, interacting, have fixed prices. The prices hitherto fixed by 100,000,000 people are now to be fixed by five men.

Excess-profits taxation insures that low-cost producers will pay back part of their fancy prices, while high-cost producers will be let alone. It insures that every process in an industry shall pay its rightful share, according to its profits. It insures that all industries, of the country indiscriminately, shall shoulder part of the cost of war in proportion to their ability.

A student of war financing, who is quoted by the Boston *News Bureau*, says: "It becomes increasingly evident that the Government intends to pursue to the end its policy of price fixation. It is most unfortunate that this is so, and in the end it would seem reasonable to expect that this policy must fail. But affairs in a republic are run not always effectively and often unwisely. It seems probable that Washington must pursue this price-fixing program until it has broken down and proved its impracticability.

"The wiser course for the Government to pursue would seem to have been to allow economic laws to play their natural part even though this involved some excessively high prices. Extortionate profits would have automatically reverted back to the Government in the form of taxes. Under a policy of price fixation the excess-profits tax is morally bound to suffer severe shrinkage. And if this shrinkage is not severe enough to upset the entire taxation program, it will be one of the wonders of the age.

"Price fixation, if persisted in logically, is bound to bring with it liquidation of labor. There is a deal of talk about the six-hour day. The striking miners of Butte are demanding it. And the papermakers' unions are hot on its trail. How a country with millions of drafted men is going to reduce prices, assimilate a six-hour day and not reduce wages very drastically, passes the comprehension of anyone who keeps to the fundamentals of finance.

"Another serious side of the price-fixation policy is that it means the elimination through a cruel grinding process of the little producer. As things have been moving for the last three years, hundreds of little producers have made money; they have reinvested in expansion. But their financial base is fragile, and in the revamping process now under way many cannot stand up. And this in turn means that if the price-fixation program is rigidly adhered to, there will be a lot of business that little people cannot afford to take that will go to the big people, even though on a very narrow margin of profit. In other words, it looks as if the Government by this course were tending to drive the little producer out of business."

The difficulty of the "cost-plus-percentage" Government contract is that the higher the cost runs the higher the profit in terms of dollars. The form of contract puts an actual premium on inefficiency. Cost plus a fixed profit per article does not put a positive premium on inefficiency, but, on the other hand, it offers no incentive for bringing costs down. The story is told of a New England plant which took a "cost-plus-percentage" contract—but it is perhaps best told in the words of a company official: "We were asked if we wanted any Government business on the cost-plus-10% basis. We replied that we were full up with orders and did not care for any business on that basis. We were then invited to name our prices, which we did, and the Government booked another million of business with us. Not far from us a contractor is building a cantonment on the Government's cost and percentage basis. He started with labor at 23c. an hour. The moment his cost and percentage basis was known, the men advanced their wages to 45c. an hour. The result was to make more money for the contractor, increase the wages and decrease the efficiency of the men, and 1500 men were drawn away from plants nearby already doing Government business."

NEVADA WONDER MINING Co. reports that during the 15 months ended Dec. 31, 1916, 72,241 tons of ore was treated for the recovery of 10,933 oz. Au and 1,243,753 oz. Ag, the ores averaging 0.159 oz. Au and 18.72 oz. Ag, with a total average value of $15.40 per ton. Costs were: Mining, $5.33; milling, $3.31; marketing, $0.26; total, $8.90. Loss in tailings was $1.13; recovery, $14.27; profit, $5.37 per ton of material mined and milled. Two dividends of 10% each were paid during the period, and 5% of the total dividend, amounting to $6043, was distributed among the employees who had been in the service of the company for one year or over.

Industrial News from Washington

By Our Special Correspondent

New Stations of Bureau of Mines

The three newly authorized stations of the United States Bureau of Mines will specialize in ceramography, ferro-metallurgy and petroleum research respectively.

The one to be devoted to ceramic research will be situated at Columbus, Ohio, in charge of R. T. Stull, who is a ceramic chemist. Though having much money invested, the ceramic industry has not been progressive, due, it is said, to lack of technical knowledge. There is also great waste of fuel in this industry. As fuel represents 20% of the value of the wares produced, means for saving it will be especially studied at the new station.

The station for research in ferro-metallurgy will be situated in Minneapolis. The name of the superintendent will be announced later. The work will be confined to problems of iron mining and will be pursued in coöperation with the School of Mines of the University of Minnesota. It is mapped out by Director Manning as follows:

To devise means of concentrating 35-50% hematite ores profitably and of concentrating magnetite ores, especially those of the eastern end of the Mesabi range.

To discover a way of concentrating low-grade manganiferous ores from the Cuyuna range so as to lower their phosphorus content to the point where they may be used.

To solve the problem of smelting the titaniferous ores of northeastern Minnesota.

The station will, moreover, probably join with the State of Minnesota in investigating the methods of mining iron-ore deposits on state lands, which include 34 properties, estimated by the United States Geological Survey to contain 35,000,000,000 tons of iron ore. An effort will be made to determine whether commercial lean ores have been left in mining operations.

The situation of the station for petroleum research has not yet been announced by Director Manning.

Metallurgical Effort to Win War

That Verdun was a metallurgical battle is pointed out by Dr. G. K. Burgess, chief metallurgist of the Bureau of Standards and a member of the American Scientific Mission recently returned from Europe. Verdun is a salient into the German lines, dangerously close to the great iron-mining region which is held by the Teutons. For this reason Dr. Burgess believes that there will be no cessation of stupendous efforts made by the contestants at Verdun.

Under the stimulus of the sternest of necessities, the French and English have made gigantic strides in metallurgical practice, Dr. Burgess reports. He is particularly impressed with the great development in the hydro-electric plants in the French Alps. Many happy surprises are certain to come to American metallurgists and chemists when, with the coming of peace, the progress that has been made can be set forth in perspective.

Since in European practice it has been possible to eliminate piping in the casting of ingots, Dr. Burgess is of the opinion that American manufacturers must turn out a sounder type of ingot. Steps also must be taken, he thinks, to spur all the metallurgical industries to a higher state of efficiency. The volume of output must be increased to points heretofore considered impossible of attainment. Comparatively few persons in America realize the magnitude of the struggle in which we are engaged, Dr. Burgess believes, and while he thinks the war is won for the Allies as certainly as if the decisive engagement were already fought, he points out that stupendous metallurgical effort will be required before our enemy can be induced to lay down arms.

Production of Iron Ore in 1916

Iron ore mined in the United States in 1916 was 40% greater in quantity and 80% greater in value than the 1915 output, according to the figures of the United States Geological Survey. The average value per ton at the mines in 1916 was $2.34. The states leading in production are Minnesota, Michigan and Alabama, with increases over their 1915 output of 33%, 44% and 27% respectively. The Lake Superior district produced 85% of the total, while but 8% came from the Birmingham district.

The Hull-Rust mine at Hibbing, Minn., produced 10% of the country's 1916 output, or 7,658,201 tons. Red Mountain mine, near Bessemer, Ala., comes second with 2,899,588 tons. Fayal mine at Eveleth, Minn., and Mahoning mine at Hibbing are third and fourth with 2,252,008 tons and 2,215,788 tons respectively.

Mineral Imports Increase

Imports of crude material, of which minerals form a large part, were valued at $1,110,000,000 for the fiscal year ended June 30, 1917, the Department of Commerce reports. This is an increase of 42% over the fiscal year ending in 1914, just preceding the outbreak of the war. Important items in the increase were unrefined copper ingots, nitrate of soda, and tin in bars.

Greater Interest in Strontium

The English embargo on strontium salts and the possibility of using them in sugar refining have caused increased interest in the mining of strontium minerals, according to the Geological Survey. Known deposits in Arizona and California, recently investigated by the Survey, are being actively worked and much prospecting is being done.

Events and Economics of the War

Pope Benedict's peace proposals, irrespective of their terms or inspiration, seem likely to draw from the belligerents a statement of their war aims. British labor unions endorse by a margin of 3000 the plan to send delegates to the Stockholm council, the total vote cast being 2,500,000. The council is not approved of by Gompers.

Langemarck has fallen to the British in Flanders and further ground at Ypres and Lens. The French have broken the German lines at Verdun and the Italians have gained toward Trieste. The Russian front is quiet. Mackensen continues his minor successes in Moldavia. China has declared war on the Central Powers and Japan pledges a fight to the finish.

In this country, the Government has formed the Wheat Corporation to control the 1917 crop. The President has fixed the price of soft coal. The National Guard is making ready for France. A second liberty loan of 7½ billions at 4% is recommended, the first loan to be retired. At Spokane, troops seized 27 I. W. W. members who may be tried for treason.

Hoover's Wheat Corporation

The Food Administration has formed a $50,000,000 wheat corporation to buy and sell wheat at the principal terminals, as a step preparatory to taking over the 1917 wheat crop. All stock is held by the Federal Government.

The executive officers of the corporation are: Herbert C. Hoover, chairman, Julius Barnes, Duluth, Minn., president, Gates W. McGarrah, New York, treasurer, F. G. Crowell, Kansas City, vice president, Edward Chambers, Chicago, transportation director, Curtis H. Lindley, San Francisco, counsel, J. W. Shorthill, York, Neb., secretary.

The Wheat Corporation will be under the Administration's grain division which will be represented, as follows, at the terminals named:

Edward M. Flesh, at St. Louis, M. H. Houser, Portland, Ore., C. B. Fox, New Orleans, H. B. Irwin, Philadelphia, P. H. Ginder, Duluth, Frank L. Carey, Minneapolis, George S. Jackson, Baltimore, H. B. Jackson, Chicago, Charles Kennedy, Buffalo, R. A. Lewin, San Francisco, D. F. Piazzek, Kansas City, Charles T. Neal, Omaha.

The committee that will fix the price of wheat comprises the following men:

Harry A. Garfield, president of Williams College, chairman; Charles J. Barrett, Union City, Ga., president of the Farmers' Union; William N. Doak, Roanoke, Va., vice president of the Brotherhood of Railroad Trainmen; Eugene E. Funk, Bloomington, Ill., president of the National Corn Association; Edward F. Ladd, Fargo, N. D., president of the North Dakota Agricultural College; R. Goodwyn Rhett, Charleston, S. C., president of the Chamber of Commerce of the United States; J. W. Shorthill, York, Neb., secretary of the National Council of Farmers' Co-operative Association; James W. Sullivan, Brooklyn, N. Y., of the American Federation of Labor; L. J. Tabor, Barnesville, Ohio, master of the Ohio State Grange; Frank W. Taussig, chairman of the Tariff Commission; Theodore N. Vail, president of the American Telephone and Telegraph Co.; Henry J. Waters, president of Kansas State Agricultural College.

Agencies will be opened at the terminals named and transactions will be carried on with the usual dealers through the regular channels. "If found advisable," says the New York *Times*, "the Corporation also will serve as broker for the milling interests, purchasing wheat for the flour mills, to keep the market steady. The Allies will be required to purchase flour instead of wheat, on the theory that manufacturing costs will be reduced and American industry encouraged.

"All of the grain men who are taken into the Food Administration's grain division will dissociate themselves from business interests and will give their entire time to the Government without remuneration.

"Authority to license grain elevators and milling concerns was given to the Food Administration in a proclamation by President Wilson. Mr. Hoover hopes that operation of the licensing system will make unnecessary any extensive Government purchases of wheat, except for the Government itself and for the Allies. He believes a stable export price and proper supervision of exchange dealings will do more than anything else to keep prices on a constant level."

Another Appeal for Car Saving

Because the demand for freight cars is greater today that ever before in the history of the country, and is increasing daily, the Commission on Car Service of the Railroads' War Board has issued a second appeal asking still further coöperation from both shippers and receivers of freight. The Commission states that the ability of the railroads to move crops depends largely upon the full loading of cars and the elimination of all delay in loading and unloading them.

The movement of lumber to the cantonments and the shipping yards has monopolized the use of more than 100,000 cars and made serious inroads into the supply that under normal conditions would handle the movement of crops and food products. To offset this handicap and secure the maximum amount of service from the cars that the nation is dependent upon for the transportation of food supplies, the following suggestions are made to shippers and receivers:

Unload promptly all loaded cars received; load promptly all outgoing cars and release them immediately to the railroad; anticipate disposition of freight before its arrival; do not order special types of cars when ordinary types will serve; eliminate use of railway equipment when tonnage can be handled by motor trucks or wagon; load all cars to their full carrying capacity.

The Commission on Car Service points out that there are six ways in which the loading of cars to their full carrying capacity can be achieved, and enumerates them as follows:

More careful supervision of loading; producers and buyers agreeing to disregard established trade units and increase the units as a war measure; waiving rights in regard to minimum weights under tariff and traffic regulations; buyers increasing their orders so as to fill the car, and producers disposing of their output on a basis of full carrying capacity of equipment furnished; buyers who cannot handle larger quantities clubbing together with other buyers to make full-capacity cars; showing customers who desire, merely as a matter of convenience, smaller units than maximum how they can help the general situation by enduring inconvenience.

Reports from practically all parts of the country indicate that the movement of grain and food products is going to be especially heavy during the next few months. As more than 600,000 recruits for the draft army will have to be transported to the cantonments next month, and as similar unusual traffic movements produced by the war are pending and threatening severe congestion, the Railroads' War Board feels that everyone should coöperate in the movement of freight.

"Keep the cars moving with a full load and settle differences of opinion afterward!" is the War Board's advice.

Points About Potash

Ever since the war started, according to the *Boston News Bureau*, there has been a deal of newspaper publicity given to potash discoveries and new sources of potash supply in the United States. It was part of the cleverness of the Germans that through their propaganda they planted in the minds of Americans an exaggerated idea of the value of potash. Thousands of Americans even today believe that potash is the most essential instead of the least essential element in artificial fertilizers.

It is only fair to admit, however, that the progress of this country toward discovering new sources of potash has been most disappointing. Government figures show that in 1916 there was produced in the United States 8830 tons of potash. This was valued at about $3,000,000, or 10 times its ante-bellum price.

The output in 1917 will unquestionably be much larger, but even if by some unexpected stimulus it should reach 20,000 to 25,000 tons, it would be but a small fraction of the normal consumption of the United States, which amounts to about 1100 tons daily. In other words, at the best we cannot hope in 1917 to make more than one month's production of potash.

Perhaps the best thing that has been done in the potash line has been to discover substitutes. Some very effective work has been done along this line. In some manufacturing concerns new chemical reactions with other and cheaper minerals substituted have actually worked out better than in the potash days. It is safe to say that the wiles of the Kali syndicate will not tempt these people back to the use of potash.

A lot of talk is being made about the extraction of potash from kelp on the Pacific coast. Something has been done in this direction. In 1916 about 1100 tons of potash were recovered from kelp. It is not a difficult proceeding, but is done on a basis that would not be commercial with muriate of potash selling on the normal peace basis of about $32 to $35 per ton. It works all right when this same grade of potash salts has jumped to $350 or $400 per ton and is not obtainable at this figure.

About 20 tons of potash is being made daily from alunite ores by a concern in which Boston capital is incidentally interested. It is understood, however, that the process is not a full success for the reason that it was expected to recover both potash and the ore from which aluminum is made. The potash has been recovered, but the aluminum end is not a success, with the result that the potash is costing far too much even at existing abnormal prices.

How Can Our Boys Fight Without Guns?

The following editorial, appearing in *American Machinist* in the issue of Aug. 16, 1917, under the above title, is accompanied by the statement of the editor that the charge is based not simply on editorial knowledge of the facts but on incontrovertible proof, photographic and otherwise, in the editor's possession.

"This editorial is not an attack on any individual, but on a system.

"Suppose, Mr. Manufacturer, with emergency orders filling your shop, you should discover that through a lack of executive decision your workmen had been forced to kill time by playing checkers and cards during working hours! What would *you* do with the man responsible for this condition? Would you accept *any* excuse from the official who exercised full authority?

"Scores of skilled rifle makers in one of our best-known American plants have been for weeks and are today retained on the payroll, killing time with checkers and cards during working hours, simply because certain officials have been unable to arrive at a decision regarding details. This work is being done on a 'cost-plus' basis for our Government, so that you and I must pay these men for killing time. But this is of small moment compared to the inexcusable and dangerous loss of time in making our new army rifles.

"These mechanics are not responsible for this condition. The shop management is not responsible for it. Somebody is. Who is it?

"England was forced by bitter experience and delays of this kind to eliminate bureaucratic control of all munition manufacture and place this work in the hands of those qualified by experience to decide quickly between the essential and the non-essential.

"Experienced engineers and works managers are the men who should decide upon specifications, manufacture and inspection.

"We have not published these facts without due deliberation. But we believe that truth in this matter is more important than the personal feelings of well-intentioned officials whose duty it is to decide on specifications but who are incapable of coming to a decision.

"Months after war has been declared—months after the type of our rifle has been determined—it is a crime against our boys who will bear rifles at the front to permit American rifle makers at home to pass week after week playing checkers and waiting for something to do."

Manning on Gasoline Economy

The following statement of Van H. Manning, Director of the Bureau of Mines, in regard to the gasoline situation, appears in the *Official Bulletin*.

"One-half of the gasoline used in the United States (1,250,000,000 gal.) is used in pleasure riding. It is estimated that the United States Army will need 350,000,000 gal. for airplanes, trucks, automobile tractors, etc. There is no way of obtaining this in this country except by saving from the existing supply, and this economy may be effected by voluntary cutting down of pleasure riding.

"It has been estimated that by economical use enough gasoline can be saved to supply not only the United States but also its allies for war purposes.

"The following suggestions should be observed by automobile owners: (1) Do not allow your engine to run idle; (2) use kerosene, not gasoline, for cleaning purposes in the garage; (3) see that the carbureter does not leak, and form the habit of shutting off the gasoline at the tank; (4) by judicious regulation of the mixture of gasoline and air in the motor, both greater power and economy of fuel may be obtained.

"Automobile owners need not lay up cars, but should use them either for trade or pleasure purposes thoughtfully and judiciously. If this advice is followed there will be no undue scarcity, for the United States possesses an abundant supply for ordinary purposes."

Steel Industry After the War

"Before the war the maximum steel capacity of the United States was roughly 27,000,000 tons a year," says the Boston *News Bureau*. "Great Britain was capable of something under 7,000,000 tons a year and Germany's capacity has been placed at 22,000,000 tons. These three big steel-producing countries of the world represented together a productive capacity of 56,000,000 tons.

"As a result of tremendous plant expansion in the past two years the United States today has a steel capacity of practically 47,000,000 tons a year and England is now outputting at the rate of close to 12,000,000 tons. Obviously, nothing authentic on the German situation can be had, but there is no doubt that under the necessity of supplying the munition requirements of Austria and Turkey, as well as its own, Germany has undoubtedly increased her steel output tremendously. In fact, it is probably safe to place her output at 30,000,000 tons a year.

"In other words, the combined steel capacity of the United States, Great Britain and Germany is now 89,000,000 tons, whereas before the war it was but 56,000,000 tons. Considering the normal aggregate world peace demand before the war was only 60,000,000 tons a year, the one conclusion is that when peace returns the excess capacity to be utilized will necessitate a sharp reduction in prices, for the laws of supply and demand are bound to continue.

"The tremendous reconstruction demand of a devastated Europe will increase for some time the normal peace demand, but there are those who feel that when the demand from this source subsides, another big world-wide readjustment of the steel industry will have to take place.

"The question of the future will be how far the vastly expanded steel-making capacity conjured into being by imperative needs of war will in a new era of peace—perhaps with radically altered alignments of trade competition and geography—find new or enlarged uses for steel in older countries and perhaps now undreamed of potential demands from newly developed countries such as Russia."

Women in Technical Industry

The extent to which men have been replaced by women in the English metal and chemical industries is partly shown by photographs in recent issues of the *Coal and Iron Trade Review*. Exhibits have been held at Bristol and Leeds of samples and photographs of women's work.

At the Leeds exhibit, says the *Review*, women "were shown daubing coke-oven doors, discharging and quenching coke, stacking and loading it into wagons, receiving it from aërial ropeways, and doing general laboring. In a rolling mill they were shown carrying rails to the saw, operating the saw, and punching spike holes in light rails, as well as charging the furnaces of the rail mills. They were shown also doing a variety of work, such as the preparation of light railway trucks and the drilling of points crossings for heavy tracks.

"In a chemical works they are seen carrying molten naphthalene in a ladle and breaking it up, operating the benzol washer, loading trucks, etc. In a steel works they were depicted marking and nicking billets with the oxyacetylene blowpipe, operating the hydraulic charging of a continuous furnace, feeding reheating furnaces and scaling hot billets, operating hydraulic presses, and doing a variety of laboring work. In a foundry they were shown making cores, both by hand and machine, doing machine molding, skin-drying molds, mixing sand in the pug mills, operating the band saw and grinder in the fettling shop, and doing general laboring work."

It is desired to point out, not that war has forced women into such work in the absence of men, but that such work and others like it can be done by women, doubtless much less efficiently than by men, but still sufficiently well to cause their continuance in it after peace has come.

Toluol from City Gas

There is a scarcity of toluol for making high explosives, and the chemical committee of the Council of National Defense is taking steps to have the gas supply of large cities stripped of this byproduct. This will change the nature of gas to some extent, but it will be treated in other ways to maintain a satisfactory illuminating standard. Gas consumers in cities will have to become accustomed to a different kind of gas. Toluol is used in making trinitrotoluol, one of the most valuable high explosives.

Editorials

The Matter of Coal Prices

The President has spoken as follows:

> The following scale of prices is prescribed for bituminous coal at the mine in the several coal-producing districts. It is provisional only. It is subject to reconsideration when the whole method of administering the fuel supplies of the country shall have been satisfactorily organized and put into operation. Subsequent measures will have as their object a fair and equitable control of the distribution of the supply and of the prices not only at the mines but also in the hands of the middlemen and the retailers.
>
> The prices provisionally fixed here are fixed by my authority under the provisions of the recent act of Congress regarding administration of the food supply of the country, which also conferred upon the Executive control of the fuel supply. They are based upon the actual cost of production and are deemed to be not only fair and just but liberal as well. Under them the industry should nowhere lack stimulation. (Signed) WOODROW WILSON.

It is unfortunate that so many statements from Washington, even by the President himself, are made in such cryptic language. This statement of Aug. 21 leaves us in doubt as to whether the President is fixing a coal price for the Government alone or for the public generally. If the latter, the meaning is that the Government has ventured upon a great experiment, leaving it for time to tell how it is going to work. Let us hope that industrial disorder will not be permitted to go beyond the line of easy correction. The President leaves a loophole for himself in his qualification that his present scale of prices is only provisional.

Of course, no one of knowledge imagines that the President himself has investigated coal mining conditions all over the country. Probably what he has done is to take the reports and opinions of clerks in the Federal Trade Commission, summarized and endorsed by the lawyer heads of that Commission. The opinions of the industry are discredited. Prices fixed on Aug. 21 are practically $1 a ton below the scale drawn by the Peabody Committee after a conference with 400 coal operators last June. This was the conference at which Secretary Lane praised the coal men for their patriotic action in cutting prices. The action of that conference was repudiated by Secretary Baker, and Secretary Lane was consequently discredited. Now he stands discredited by the President, while Daniels and Baker are jubilant.

Miss Rankin's Views

Miss Rankin, having signalized herself in Congress by some foolish remarks respecting the economics of the copper industry, took it upon herself to champion the cause of the striking miners of Butte and said, among other things:

> The conditions of the mines (of Butte) have grown more and more unsafe. I have had heart-breaking letters from the wives of some of the miners, saying that when their husbands went to work in the morning they never knew whether they would ever return, and that they lived in constant anxiety. On June 8, 160 men were burned in a fire in one mine. This was the climax. The men stopped work. The workers knew that they would never be safe as long as the rustling card system existed, for under that system every man who complained of conditions or reported dangers or endeavored to form an organization was laid off for one reason or another, and it would be impossible for him to obtain work again in any mine in Montana or elsewhere.

When she said those things, Miss Rankin doubtless supposed that she was voicing genuine grievances of the miners of Butte. But before she said them it was her duty as a member of Congress to ascertain if they were correct, although we grant that it is the fashion among members of Congress to make allegations based only on gossip, hearsay and idle expression of opinion that would not obtain credence in any respectable business office. If Miss Rankin had taken the trouble to inquire she could easily have learned these facts:

1. That the accident rate in the mines of Butte has been diminishing, wholly through the efforts of the operating companies, which have a selfish interest (if no other) in reducing it in order to save expense under the Workmen's Compensation law.

2. That the terrible disaster of June 8, in the North Butte mine, was due to the criminal carelessness of a workman, for which the North Butte company was in no way responsible morally.

3. That the "rustling card" system has nothing to do with the dangers in the mines. On the contrary the companies welcome any reporting of hazardous conditions for the reason stated under article 1 (if no other). The much criticized "rustling card" system is simply the establishment of credentials of good character, working record, etc., for applicants for work to foremen of operations that are scattered over a large district, who are individually unable to investigate the standing of the applicant. The rustling card is equivalent to the letter of recommendation that may be given to a chauffeur or a gardener and takes the place of the inquiry that anybody makes before taking somebody into his employment.

4. That if the miners of Butte are not satisfied with the safety measures that the companies have taken, all they need to do is to elect a legislature that will amend the rather defective mining law of Montana; and the U. S. Bureau of Mines issued several years ago a report on this subject comprising a specific draft of what an adequate state law ought to be.

All of these things could have been ascertained by Miss Rankin, but she preferred to accept the disingenuous mouthings of the I. W. W. agitators, whose avowed purpose is to destroy industry, produce anarchy, repudiate all claims of country, and who boast of their employment of dynamiting and assassination in order to accomplish their evil ends. The alliance between Miss Rankin and William D. Haywood would be humorous if it were not so pitiful, and we may add so unpatriotic in the present juncture.

All this is quite apart from Miss Rankin's main proposition that the copper mines be taken over by the Government. This was simply an emotional and sensational appeal that exhibited an absolute ignorance of government and economics, or such a perverted conception thereof as might be entertained by the I. W. W. To Miss Rankin the owners of the copper mines are rich men. She seems to think that John D. Ryan is the owner of the Anaconda, disregarding the fact that the owners are 20,000 persons, many of them poor men and many of them women, widows and orphans. To Miss Rankin the miners are the only poor men and some of them are discontented. Therefore let the Government take the mines and see if that won't make the miners happier. If the Government will not do that—and Heaven knows it has got enough on its hands—let's see what more may be got out of the 20,000 persons who comprise the company.

Is it to be wondered that when Miss Rankin makes her sensational visit to Butte and offers her services as mediator, the companies knowing her views refuse to accept her offer? Is it to be wondered that 10,000 miners applaud her in a mass-meeting? If Miss Rankin wants to do real service to her state and to her country, she will go back to Washington and work for the passage of a bill to incarcerate or execute the agitators who are preaching sedition and treason. If some of those people were apprehended it is not unlikely that the labor troubles would cease quickly.

Quelling the Labor Disorders

The insidious German propaganda works in the same way in several countries, especially in Russia and the United States. In both it seeks to seduce the pacifists, the mild socialists and the dreamers of an economic millenium. In both it incites the anarchists—the Bolsheviki in Russia and the I. W. W., their American counterpart. There is strong ground for the suspicion that the activities of those gentry are inspired by German money, shrewdly distributed among their leaders.

A courageous officer in Spokane arrested one Rowan and 26 of his followers and put them in jail as military prisoners, whereupon the general strike with which he had threatened the Northwest failed to materialize. This confirms the belief that many persons have entertained, namely, that if a few of the noisy, malevolent leaders should be summarily abstracted from the ordinary walks of life the labor troubles would promptly cease.

The Price for Silver

The price for silver has risen to the highest figure on record since the early '90s. The reason is simple, namely, the hoarding of gold by all the nations of the world and the increased use of silver to take the place of it as currency. With the expanding issues of paper money there is a tendency toward the hoarding of silver itself. At the same time the absorption of silver by the East for its usual purposes has been very large. So much for the demand. On the other hand the production may have decreased. We do not venture to say that it has decreased, for the statistics of silver production are not very up to date. However, until recently the rise in the value of silver has hardly been commensurate with the increase in the cost of mining, and that in itself would tend to discourage the production of silver.

German Steel Production

German steel production has kept up since the beginning of the war to nearly 70% of the total of 1913, which was a year of high output. For some reason not clear, the monthly reports of the German Iron and Steel Union, regularly issued up to that date, have been suspended since October last. For three years past the make of steel has considerably exceeded that of pig iron, a matter which is readily understood, when we remember that the German demand has been chiefly for finished steel in its various forms, and that much the larger part of the make has been basic openhearth steel, permitting the use of a large proportion of scrap. The total production of steel, according to the Union reports, was 13,188,019 metric tons in 1915; in 1916, estimating November and December as closely as possible, it was 16,050,000 tons, or nearly 2,800,000 tons more than in the previous year; an increase of 21.7%.

This is a remarkable result, all things considered. No doubt the government has been careful not to draw too heavily on the working forces of the steel mills and their auxiliary mines and coke ovens, realizing the necessity of maintaining the supply of war steel. Fuel has certainly been in sufficient supply since the German coal-mining districts have not been touched by the war except so far as the labor supply may have been concerned; while some additional supplies may have been drawn from Belgium.

The only iron-ore supplies which have been cut off are the high-grade bessemer ores from Spain and those have never been important in the German iron trade. The great supply of that trade, the minette ores of Lorraine and Luxemburg, have been under German control for the most part, and it has been possible to obtain ores from Sweden to any extent needed.

Whatever may be the reason for suspending the monthly returns, it does not seem probable that any great decrease in production was one of them. It is not prudent to underestimate an enemy's resources, and we cannot calculate on a shortage of steel for German munitions—at least until Essen and the Rhenish Westphalia districts are covered by the Allies' lines.

Australia continues to show material decreases in its gold output. In the first quarter of the current year the four important gold producing states, Western Australia, Victoria, Queensland and New South Wales, showed decreases from last year varying from 10 to 30%, the average of the whole being nearly 20%. This decrease is in large part due to reduced forces at mines and general shortage of labor. In Queensland a special cause was found in a strike at the great Mount Morgan mine, now worked chiefly for copper, but still a large gold producer. Coupled with the labor conditions—and partly in consequence of them—is an almost total absence of prospecting and new exploration. No new gold deposits have been opened, and extensions of existing mines are few and far between, while public interest in gold mining is far from active.

BY THE WAY

In the *Canadian Engineer* E. R. Bingham gives an easy rule for approximating the number of acres in a given number of square feet. This is: Multiply the number of square feet by 23, point off six decimal places and deduct 0.002 for each acre. For example, 43,560 × 23 = 1,001,880 (a difference of 0.001,880). Deducting 0.002, the result would be 0.999,880, an error of 0.00012. For 10 acres the actual difference would be 0.0012, for 100 acres, 0.012—for many purposes close enough.

Irrelevant questions are not always confined to those asked by the small boy. A "scout" for a mining company happened to run across a prospector who was sinking a shaft. "Hello, friend, what you digging for?" he asked. "Cheese," replied the prospector. "Cheese? What do you mean?" "Well," said the prospector, "I got a d——d good cracker ledge on the other side of the gulch, and if I find cheese and then get down deep enough I may hit beer, that'll be almost a grubstake—then I'll hunt one of them there dissipated coppers you fellows want."

Under the title "Mr. Hoover's Conquests," the New York *Times* of Aug. 22 says: Business men who had witnessed the Food Administrator's complete triumph over the Chicago Board of Trade, to say nothing of the New York Produce Exchange and all the other grain markets, were not surprised to hear yesterday that he had also brought the New York Coffee and Sugar Exchange into line. Trading in sugar futures was an infant industry compared with the trading in grain futures, and not apt to give Mr. Hoover much trouble after what he had already accomplished, but it is worth mentioning that the committee of sugar men who went to Washington to confer with him returned chanting Mr. Hoover's praises if anything more enthusiastically than the grain men had done a week earlier. The Food Administrator appears to be the only man in the world who can, as one of his new coadjutors put it, "put you out of business and make you like and admire him for doing it."

The model of the Utah Copper Co.'s mining operation in Bingham Canyon, in preparation for some months, is now installed in the Division of Mineral Technology of the National Museum at Washington. This is one of a group of important mineral developments that are to be shown in miniature at the National Museum. The model of the Utah Copper mine was selected, says the *Evening Post*, not only to represent the opencut steam-shovel type of mining operation, but also because it represented a relatively new but important source of the essential metal, copper. The Bingham Canyon mine is one of the largest operations of this sort in the world. Where infrequent rains once washed furrows into the sage-covered slopes of the Oquirrh Mountains, a quarter-hundred hungry steam shovels are now eating their way into the heart of a mountain of copper ore—not copper ore as ordinarily seen, rich and heavy, in conspicuous seams and veins, but the new sort of copper ore, rock with such a scant scattering of copper minerals that to the ordinary eye it looks no more like ore than common granite, rock so lean in copper values that to old-line methods it remains as unprofitable to mine as common granite. Yet this new type of copper ore, developed not only at Bingham, but also as a result of its leadership at other localities in the Southwest, as well as in Mexico and Chile, is now producing more copper than the whole United States provided a decade past. Here is an object lesson of the present, a vision of the future, that all should see. Without a railroad journey to Utah, the museum visitor may obtain a panoramic view of this great mining operation. He sees a whole mountain, resting against the crest-line of a snow-clad range, stripped bare of its mantle of soil, raw and naked in its demolishment. Terrace after terrace of gray rock, 25 in all, rise step-like from the valley bottom and extend like giant stairs to the very summit, supporting nearly 50 miles of railroad. As the eye wanders up to the top, it catches here and there puffs of white vapor, accompanied by raucous noises, where ponderous steam shovels, looking tiny in the distance, are scooping out tons of copper rock and loading their charges into long trains of cars gaping for their burden. It is ugly, yet fascinating, this unwilling tribute yielded up to the wonderful effort of modern industry. This achievement of adding millions of tons of copper to the world's output is due to the vision and constructive imagination of a single mind—the dream of Daniel C. Jackling, now first vice president and managing director of the Utah Copper Company.

The Shifter's Advice

I've done my bit o' muckin',
  I've nipped and monkeyed well,
I've set most kind of timbers,
  I've hoisted at the bell.
I think I'm some machineman,
  At shiftin' rather neat,
And as for pumps and piping,
  I'm really 'ard to beat.

I call myself a miner,
  I'm happy at the name,
I sartin' think that minin'
  Is sure a real man's game.
Perhaps you're but a mucker;
  But think well of your job;
There ain't no place in such work
  For the lily-fingered snob.

Some look down on miners,
  For workin' with their 'ands,
And sneer at honest muckers,
  Not callin' the job a man's.
They make me sick as the devil,
  I want to swear and cuss;
They judge a man by what he wears,
  And not by the work he does.

But don't you care for that, my son,
  Let 'em think you're just a slob;
    But get in your round,
    And break your ground,
  And you've done a whole man's job.

B. A. Price.

Cost of Producing Copper

By T. D. McGrath

Auditor, Shattuck-Arizona Copper Co., Bisbee, Ariz.

Referring to the editorial in the Aug. 11 issue of the *Journal*, bearing the above heading, it would seem that the scope of the work of the *Engineering and Mining Journal* should include the advocating of uniform reports of costs, etc., by the copper-mining companies; that is, that the reports of the copper-mining companies shall be intelligible and cover all elements of expense of production or, at least, of operation. In the editorial numerous reasons were stated as to why this has not been done in the past. However, there seem to be no practical reasons why the managements should continue to "jolly" themselves, and to misinform the stockholders, investors, the tax commissioners, and the general public as to the real facts, especially in these times when such doings are working to the detriment of the companies and their stockholders.

Now that the Government is investigating this matter of the cost of copper, it would seem that the opportune time has arrived for the mining companies operating lens and fissure properties to come forth and endeavor to reach an agreement with the Government as to a reasonable and just yearly allowance for depreciation of equipment and depletion of mines. No one would expect such allowances to be exact, but such as would be fair for all concerned.

Elements of Operating Cost

Everyone who has made any serious study of the cost of mining knows that the operating-cost elements are: Labor, Supplies, Power, Repairs, Replacements, Expense and Overhead, and that all of these operating elements of expense should be charged to the cost of production; also that the other costs of production are: Administration, Depreciation of Equipment, and Depletion of Mines.

However, as a rule, the yearly reports to stockholders, issued by the large and responsible copper-mining companies, show with several exceptions, only the totals of the operating costs for each department of operation, as, for instance: The total operating costs for Development and Exploration; for Ore Extraction; Ore Transportation; Milling; Smelting; Bullion Freight and Refining; Selling; and Operating Overhead. This gives a total per pound of copper produced for operation only, and sometimes only the net total operating cost per pound is given after operation credits have been deducted. Such a cost does not include any charges for depreciation of equipment and depletion of mines, nor does it cover administrative expense, which includes corporate and income taxes, etc. Therefore it is not a production cost but an operating cost.

Taking one of the low-cost producers, the stock of which is listed on the New York Stock Exchange and which, in its annual report, shows only its operating cost, and figuring the total production to date against the initial property account gives a depletion charge of 3.25c. per pound of copper, and for Depreciation of Equipment and Administrative Expense to date about 0.5c. per lb. of copper produced.

Therefore, instead of an average total gross cost of all copper produced to date of 10c. per lb., and an average total net cost of 8.25c. after deducting credits (considering that the mine were now exhausted), the total gross cost would be 13.75c., and the total net production cost would be 12c. This would not include any interest charge on the original investment in mining property and equipment from the time of purchase to the time that the property became a paying proposition.

Average Depletion Charge

As the mineral life of every mining property has an end, the continuation of the existence of a mining company is generally maintained by accumulation and development of new properties, or the development of new processes, etc., which require expenditures that must be added to the total of the original property account, and be depreciated. Therefore, it can be stated with reasonable safety that an average depletion charge would be approximately 3c. per lb. of all copper now being produced.

The idea of mining companies classifying their dividends as "dividends earned" and "capital returned," having now received the approval of the Government, this fact should allow the lens and fissure properties to agree with the Government upon some uniform method of determining depreciation and depletion. The capital-return dividend could be determined by the amount of the depreciation of equipment and depletion of mines charged off on the books for the year, and the dividends earned could be the remainder of the net earnings set aside for dividends after the deduction of the above amount.

If it is true, as stated in the editorial, that the results of the Government "report cannot possibly be anything but a hodgepodge of fragmentary data, which will not be of value to anybody," such findings will be no reflection on the Government, but certainly will be a reflection on the efficiency of the management of the different producing copper mines, and shows a condition that certainly can be and should be remedied.

Reports Could Show Cost Elements

There is no reason why all the producing copper companies cannot easily arrange, without any great change in their present accounting and costing systems, to show in their reports total operating cost and net operating cost after deducting credits. The big low-grade companies could easily show, in addition to their total gross and net operating costs, their cost for administration, depreciation and depletion, which would give their total production cost; and if the other copper-mining companies would get together and reach some fair and definite agreement with the Government as to determining depreciation and depletion allowances they could likewise show their total production costs, and also obtain a fairer determination of net income for taxation purposes.

As shown in the July 28 issue of the *Journal*, under the heading "Average Price of Copper in 1916," the fact that out of fifteen copper companies producing electrolytic copper, which reported their average price received for copper sold, there were eight different methods used in arriving at the average price received for copper sold, would lead one to believe that the reports of operations, costs, earnings, etc., of the different producing copper companies certainly could be improved upon to the benefit of the companies themselves, their stockholders, and all others interested or concerned.

Government Fixes Coal Prices

President Wilson announced on Aug. 21 the scale of prices fixed by the Government for bituminous coal at the mine, at approximately $2 per ton of 2000 lb., or $1 a ton less than the price tentatively agreed upon at the recent conference of the Coal Production Committee and the operators. The President's statement is printed elsewhere in this issue and the prices allotted for the different districts are shown in the accompanying table.

COAL PRICES FIXED BY PRESIDENT

Per Ton of 2,000 Lb., F. O. B. Mine

	Run of Mine	Prepared Sizes	Slack or Screenings
Pennsylvania	2 00	2 25	1 75
Maryland	2 00	2 25	1 75
West Virginia	2 00	2 25	1 75
W. Virginia (N. River)	2 15	2 40	1 90
Virginia	2 00	2 25	1 75
Ohio (thick vein)	2 00	2 25	1 75
Ohio (thin vein)	2 35	2 60	2 10
Kentucky	1 95	2 20	1 70
Kentucky (Jellico)	2 40	2 65	2 15
Alabama (big seam)	1 90	2 15	1 65
Alabama (Pratt, Jaeger and Corona)	2 15	2 40	1 90
Alabama (Cahaba and Black Creek)	2 40	2 65	2 15
Tennessee (Eastern)	2 30	2 55	2 05
Tennessee (Jellico)	2 40	2 65	2 15
Indiana	1 95	2 20	1 70
Illinois	1 95	2 20	1 70
Illinois (third vein)	2 40	2 65	2 15
Arkansas	2 65	2 90	2 40
Iowa	2 70	2 95	2 45
Kansas	2 55	2 80	2 30
Missouri	2 70	2 95	2 45
Oklahoma	3 05	3 30	2 80
Texas	2 65	2 90	2 40
Colorado	2 45	2 70	2 20
Montana	2 70	2 95	2 45
New Mexico	2 40	2 65	2 15
Wyoming	2 50	2 75	2 25
Utah	2 60	2 85	2 35
Washington	3 25	3 50	3 00

The Formation of Zinc Ferrate

E. H. Hamilton, G. Murray and D. McIntosh, of the Consolidated Mining and Smelting Co., Trail, B. C., pubished in the July *Bulletin* of the Canadian Mining Institute a paper explaining the low solubility of zinc in some roasted blendes in dilute sulphuric acid. This solubility, as is well known, is due to the combination of zinc oxide with an oxide of iron, the compound being referred to commonly as zinc ferrite. The present author consider that it will be best to speak of the compound of zinc oxide with ferric as ferrate and with ferrous oxide as ferrite.

The authors present some interesting experimental data. A summary is as follows:

1. It is proved that zinc oxide and ferric oxide will combine readily at temperature above 1200° F., the amount of combination depending principally on the temperature and the time.

In the roasting of the ore in the Wedge furnace, however, in order to desulphurize the ore sufficiently, it is not possible to keep the temperature down to a point at which the formation of ferrate does not occur. In the upper part of the furnace, especially, it is difficult to keep the ore from becoming too hot, owing to the large amount of sulphur present, but it is possible that by decreasing the frequency of the rabbling the ore might be kept for a longer period in the furnace and subjected to a lower temperature, as the more rapid the stirring while the sulphur is burning the higher the temperature attained. In connection with this, in the case of the "Sullivan" ore as at present ~~roasted,~~ the maximum amount of ferrate seems to be formed, as some of the regular roast was heated to a temperature of 1500° for 5 hours and the extraction on this material was no worse than on the original.

2. Free alumina combines with zinc oxide, but when present as a silicate, the amount of combination is negligible.

3. There are four ways in which a better extraction of zinc might be obtained from an ore high in iron.

a. By roasting at a low temperature. (The remarks made at the beginning of the summary apply to this point.)

b. By eliminating the iron before roasting.

c. By the addition of some substance to the ore which would prevent the combination of the two oxides.

d. By finding some solvent for the zinc would leave the iron oxide undissolved.

St. Louis Meeting of Mining Engineers

The American Institute of Mining Engineers will hold its 115th meeting at St. Louis, Mo., on Oct. 8-13. The engineers will be guests of the St. Louis Section of the Institute, the chairman of committees including a number of well-known names. Among them are H. A. Buehler, state geologist of Missouri; F. W. DeWolf, Illinois, past president of the Association of State Geologists; James E. Castleton, A. H. Wheeler and E. F. Goltra, of St. Louis.

The program includes trips to the Joplin-Miami district, and the oil fields of Tulsa, Okla., also an inspection of the coal resources of Illinois. The meeting will be of a patriotic nature and methods of conserving the present supply and increasing the output of war minerals will receive attention.

The Institute now numbers more than 6000 members and representatives of all the principal American mining centers will be present.

Mineral Exports of Spain

The following table showing the principal exports of minerals and metals from Spain, is given in a supplement to *Commerce Reports*, dated June 22, 1917:

Substance	1915 Metric Tons	1916 Metric Tons
Copper ore	30,146	45,626
Copper precipitate	10,443	11,432
Copper bars	16,058	12,895
Iron ore	4,449,273	5,148,317
Iron pyrites	2,263,216	2,743,924
Iron and steel, manufactures of	125,838	117,667
Lead, in pigs	161,322	173,345
Quicksilver	1,121	1,276
Salt	487,567	425,022
Sphalerite or blende	11,570	59,734
Zinc, in pigs and sheets	4,581	4,856

Exports of metals and minerals for the four months ended Apr. 30 are reported by the *Revista Minera*, in metric tons:

	Metals		Ores, etc.	
	1916	1917	1916	1917
Iron	32,891	37,436	1,552,966	1,590,117
Copper	4,393	5,983	23,621	9,215
Copper precipitate	3,612	3,623	...	.....
Lead	64,229	46,432	893	76
Zinc	1,892	1,495	43,796	18,052
Quicksilver	830	......	...	.....
Manganese	....	......	356	2,196
Pyrites	..	......	1,024,895	638,823

Exports of salt decreased from 133,157 tons in 1916 to 89,516 tons in 1917. Imports of coal were 536,020 tons, a decrease of 20,680 tons; of ~~coke,~~ 28,194 tons, a decrease of 31,636 tons.

Personal

Archibald Stark and **William R. Wright** have left England for Mexico.

Robert E. Cranston is on a two weeks' trip in Colorado and Idaho on professional work.

George A. Easley sailed from New Orleans on Aug. 17 for Panama en route to La Paz, Bolivia.

Edwin E. Chase & Son have gone to Jarbidge, Nev., and will return to Denver the last of August.

S. Harbert Hamilton, mining geologist and engineer, has moved to 701 Colonial Trust Building, Philadelphia.

Dyke V. Keedy, who has been in the Guianas in South America since January, will arrive in New York about Sept. 1.

Ellard W. Carson, manager of the Oceanic quicksilver mine, Cambria, Calif., is examining mines in northeastern Nevada.

President Rodolphe L. Agassiz, of the Calumet & Hecla, has been at Calumet inspecting the Calumet & Hecla and its subsidiaries.

Col. Robert M. Thompson has been elected a director of the Consolidated Arizona Smelting Co., in place of Alfred E. Cortis, resigned.

Ray Lacey, of the engineering staff of the Ray Consolidated Mining Co., has joined the British engineering corps and left for the front.

E. M. Rabb, superintendent of the Tom Reed mine, has returned to Oatman, Ariz., after a month's absence, during which time he visited various camps in Colorado and Arizona.

O. P. Hood has been placed in general charge of the Pittsburgh station of the Bureau of Mines. His title is chief mechanical engineer. **Lauson Stone** has been made superintendent of the station.

G. Howard Ferguson, Minister of Lands, Forests and Mines for Ontario, Can., is making an extended trip through northwestern Ontario to familiarize himself with the industrial conditions of the region.

George A. Laird, who has recently been on the editorial staff of the "Journal," has gone to the Southwest to visit the Gulf and Midcontinental fields, preparatory to going to South America to take charge of the development of an oil field.

Prof. Milo F. Ketchum, dean of the College of Engineering of the University of Colorado, was elected president of the Society for the Promotion of Engineering Education at the annual meeting of the society recently held at Washington, D. C.

C. E. Julihn, of the Bureau of Mines staff, has returned from an examination of pyrrhotite deposits in Maine and an inspection of the Canadian nickel mines. He will now inspect the nickel-cobalt properties at La Motte and Fredericktown, Missouri.

Capt. Edwin C. Eckel, E. O. R. C., has given up his practice in engineering and mining geology and has closed his office in the Munsey Building, Washington. His address for the immediate future is Headquarters, American Expeditionary Force, France.

Henry M. Payne, consulting mining engineer, will remove his office Sept 1 from the Woolworth Building, New York, to 1203 Chamber of Commerce Building, Pittsburgh, Penn., where he will take the position of assistant to the president of the Bertha and affiliated coal companies.

Frank W. DeWolf, director of the Illinois Geological Survey, has begun his work in Washington as assistant director of the Bureau of Mines. Mr DeWolf has been "loaned" to the Federal Government for three months by the State of Illinois, which is paying his salary and expenses.

F. G. Cottrell, chief metallurgist of the Bureau of Mines, will spend the next two months in the field He expects to visit most of the mining-experiment stations of the Bureau and will pay special attention to metallurgical work in progress at Anaconda and in the Cœur d'Alene districts.

W. C. Thomas, consulting engineer of the Wolf Arizona Copper Co., Prescott, Ariz., is in Newark, N J., conferring with the president on future operations of the company's property at McCabe, Ariz His address until Sept 25 will be c/o Hugo C Wolf, Newark Bay Smelting & Refining Co., Newark, New Jersey.

Frank I. Ellis has recently opened offices at 2126 Farmers' Bank Building, Pittsburgh, as general contracting engineer Mr. Ellis had charge of the designing, building and puting in operation of the new pipe mills of the Jones & Laughlin Steel Co. at Aliquippa, Penn. He was also chief engineer for 12 years of the United Engineering & Foundry Co., Pittsburgh, and later was general manager of the pipe mills of the Mark Manufacturing Co. at Zanesville, Ohio.

Dr. A. B. Macallum of Toronto University, **Dr. R. F. Ruttan** and **Dr. Frank D. Adams**, of McGill University, members of the Canadian Advisory Council of Scientific and Industrial Research, have returned from an extended tour of western Canada where they delivered many addresses and held conferences with commercial and technical organizations with the object of promoting research work. They will make a report of their investigations to the Canadian government.

Eugene Meyer, Jr., and **Charles J. Thurnauer**, composing the firm of Eugene Meyer, Jr., & Co., of New York, will dissolve partnership on Sept. 30. This firm has been prominent in the past in financing several large mining companies. Mr. Meyer, the senior partner, has been in Washington assisting the Advisory Commission of the Council of National Defense since America's entry into the war. He is a director of the Inspiration Consolidated and Utah Copper companies. Mr. Thurnauer is a French citizen and has been called to the French colors.

Obituary

Antone Joseph died at his home in Yreka, Calif., on July 24, at the age of 72. He was among the pioneers who attracted prospectors to the mining regions of northern California.

Thomas Silva died at Plymouth, Calif., on July 20, aged 93 years. He was a native of Portugal and one of the early California pioneers, the discovery of gold having brought him to Eldorado County in 1850.

Charles W. Kempton, a mining engineer, died on July 26 in the Westboro State Hospital in Massachusetts at the age of 70 years. Upon graduation from high school, he was employed in the office of J. Herbert Shedd, of Boston, where he studied engineering. Later he took a position in the engineer's office of the Proprietors of Locks and Canals at Lawrence, Mass., remaining there several years. In 1880 he opened an office in New York City as mining engineer, which he maintained until health forced him to give up his business in 1910. During this period he traveled widely. He was successful in practice and introduced various processes in silver-ore reduction in Honduras and elsewhere. He was a member of several clubs and societies, including the Engineers' Club and the American Institute of Mining Engineers.

Societies

American Institute of Mining Engineers, Utah Section, recently issued an appeal for donations of books of all kinds, including technical works, to supply the camps and cantonments of soldiers with reading matter.

American Electrochemical Society—At the meeting of the board of directors on July 27, there were elected 28 new members to the society. The next meeting of the board will be on Aug 25. The program of the fall meeting at Pittsburgh on Oct. 3-6, will include, in addition to the symposium on electrochemical war supplies previously announced, optional excursions to various plants and institutes in Pittsburgh and vicinity A large number of papers have been promised for this meeting

National Safety Congress will be held at the Hotel Astor, New York, on Sept. 10-14 inclusive The first day will be given over to special committee meetings. On Tuesday, Sept 11, the annual meeting will take place at which officers for the ensuing year will be elected The iron-and-steel section will hold afternoon sessions on Sept 12, 13, 14, at which several addresses will be made, including one by L H Burnett, assistant to the president, Carnegie Steel Co., on "Unsettled Accident Prevention Problems in Iron and Steel Industries."

South African Institution of Engineers recently elected the following as officers for the ensuing year, the election of president being unavoidably deferred: Vice presidents, E. G Izod and C D Leslie; honorary treasurer, Edward Goffe, auditor, F W Bompas; honorary solicitors, Hayman and Godfrey; members of council: Percy Cazalet, G. M. Clark, W. Eldon Dew, W. Ingham, J. W. Kirkland, E. J. Laschinger, S. McChesney, H. Newbery, John Orr, T. G. Otley, C. B. Patrick and J. J. Wessels. Alfred Williams has been elected to represent the Kimberley branch on the council, and the retiring president is also a member ex-officio.

United Engineering Societies Engineering Council has held two meetings since its organization on June 27, 1917, which meetings were on July 13 and July 26. The following standing committees were appointed: On public affairs, Charles Whiting Baker, G. F. Swain, Sidney J. Jennings and E. W. Rice, Jr.; on rules, J. Parke Channing, Clemens Herschel, N. A. Carle and D. S. Jacobus; on finance, B. B. Thayer, I. E. Moultrop, Calvert Townley and Alexander C. Humphreys. A war-inventory committee was created including H. W. Buck, A. M. Greene, Jr., and E. B. Kirkby to coöperate with the Naval Advisory Board and departments at Washington in presenting to engineers war problems that can be solved by invention. George J. Foran, E. B. Sturgis, A. S. McAllister and A. D. Flinn were appointed a committee to secure such information about engineers in the country as will help the war-inventions committee in its work.

New Patents

United States patent specifications listed below may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

Copper Leaching—Method of Treating Copper-Bearing Substances. Charles S. Bradley, New York, N. Y. (U. S. No. 1,236,046; Aug. 7, 1917.)

Cyanogen Compounds—Process of Manufacturing Cyanogen Compounds. Hans Foersterling, Herbert Philipp and Ralph Nelson Sargent, Perth Amboy, N. J., assignors to the Roessler & Hasslacher Chemical Co., New York, N. Y. (U. S. No. 1,235,887; Aug. 7, 1917.)

Digging Machine. William L. Scott, Montreal, Quebec, Canada. (U. S. No. 1,236,112; Aug. 7, 1917.)

Drilling Apparatus. George H. Gilman, Claremont, N. H., assignor, by mesne assignments, to Sullivan Machinery Co., Boston, Mass. (U. S. No. 1,236,371; Aug. 7, 1917.)

Drill Stem and Method of Making the Same. Robert Lee Burns, Taft, Calif. (U. S. No. 1,236,145; Aug. 7, 1917.)

Electrolysis—Apparatus for the Production of Zinc, Copper or Other Metals by Electrolysis. Marcel Perreur-Lloyd, Boulogne-sur-Seine, France, assignor to Marie Victorine Bailly, Widow Garin, Paris, France. (U. S. No. 1,235,723, 1,235,724; Aug. 7, 1917.)

Flotation of Ores. Raymond F. Bacon, Pittsburgh, Penn., assignor to Metals Research Co., New York, N. Y. (U. S. No. 1,235,954; Aug. 7, 1917.)

Rotary-Mill Construction. Milton F. Williams, St. Louis, Mo., assignor to Williams Patent Crusher and Pulverizer Co., St. Louis, Mo (U. S. No. 1,235,868; Aug. 7, 1917.)

Titanium Oxide—Process for Obtaining Oxide of Titanium From Materials Incorporating Other Substances. Louis E Barton, Niagara Falls, N. Y., assignor to the Titanium Alloy Manufacturing Co., New York, N. Y. (U. S. No. 1,235,638; Aug. 7, 1917)

Tungsten Alloys—Process of Forming High-Percentage Tungsten Alloys. Hans Goldschmidt and Otto Weil, Essen-on-the-Ruhr, Germany, assignors to Goldschmidt Thermit Co., New York, N. Y. (U S No. 1,235,969; Aug. 7, 1917)

Tungsten-Molybdenum Alloy — Alloy of Tungsten and Molybdenum. Frank A Fahrenwald, Cleveland, Ohio, dedicated, by mesne assignments, to the Government of the United States of America and to the people of the United States of America (U S No 1,236,384; Aug 7, 1917)

Tungsten-Molybdenum—Process of Coating Tungsten or Molybdenum with Noble Metals. Frank A. Fahrenwald, Cleveland, Ohio, dedicated, by mesne assignments, to the Government of the United States of America and to the people of the United States of America. (U S. No 1,236,383; Aug 7, 1917)

Uniting Metals, Apparatus For. Augustus Kellogg Sloan, Brooklyn, N. Y. (U. S No. 1,235,608; Aug 7, 1917)

Editorial Correspondence

SAN FRANCISCO—Aug. 15

New Oil Wells reported to the State Mining Bureau, in the week ended Aug. 4, numbered only six and is the lowest recorded—except one other week—in the present year. Total number of new wells since Jan. 1 is 673. There is no definite indication of general decline in the bringing in of new wells, which may be expected from a shortage of casing and other material. But the fact that the Midway-Sunset started only one new well in the week is setting some people to thinking. The number of wells in course of drilling and ready for test of water shut-off is 22, which is near the normal; and the wells being deepened or redrilled to maintain or increase production were 15, which is also about the usual number. Only five wells were abandoned in the week, making a total of 211 for the year. But abandonment does not often correspond with other activities or operation.

Loring Interests operating various gold properties including Calaveras Consolidated Syndicate at Melones, in Calaveras County, Dutch-App mine in Tuolumne County, and the Hardenberg mine in Amador County, are preparing for increased outputs owing to new installations. The Calaveras Consolidated Syndicate, W. J. Loring, manager, has installed a new electric hoist capable of hoisting from 1000-ft. depth lifting loaded 1-ton skips. The 3-stamp experimental mill has been running continuously since Apr. 1, 1917, and has treated a total of 2130 tons of ore, averaging about $3 75 per ton; the concentrates averaging $57 per ton and saving about 1¾% of that value. Company is now installing and expects soon to begin operation of a new 10-stamp mill equipped with 1250-lb. stamps, with capacity of 90 to 100 tons in 24 hr. Owing to the difficulty of obtaining machinery the installation of flotation plant contemplated has been held in abeyance until the mill, which will be supplied with Frue vanners, has been put in commission. By grinding the ore to 80-mesh it is expected to recover 93% of the assay value of the ore, producing a concentrate valued at $52 per ton. Experiment in the treatment of the flotation concentrate has been made and it is found that the reagents used in flotation have no injurious effect in dissolving or precipitation of the gold. The Dutch-App mine in Tuolumne County is operating with 40 men. Deepening the Dutch shaft has started and will be carried down from the 1800-ft. level to the 2200-ft. point. Levels will be opened at 2200 and 2000-ft. points. It is probable that drifts at these points will total at least 1600 ft. This is the present tentative plan. Recent development on the 2150-ft. level, reached from the winze near the boundary between the Dutch and the App mines, has been highly satisfactory. The Heslop vein proved by this development showed better than at any other point below the 1500-ft. level. In addition to the Heslop orebody, lenses of good size have been disclosed carrying a high percentage of sulphides, the assay value of the ore averaging $11.50 per ton. Driving south on the 2150 level the quartz vein lying on the east side of the Heslop orebody, and averaging 20 in. in width, contains silver ranging from a few ounces to 56 oz. per ton. Sufficient work has not been done on this silver-bearing vein to reach a definite determination as to what this particular character of ore means at this point. Plans and specifications for a new mill are under way and the management hopes to order the plant soon. It will consist of ball mills and flotation, and it is expected to be an extremely simple and effective reduction plant. The Hardenberg mine in Amador County is continuing development. The vertical main working shaft has been deepened from 1000 ft. to 1500 ft. and three levels have been opened at the 1200-, 1334-, and 1500-ft. points. The vein has been intersected at the lower level at a point between the north and south shoots and it is expected soon to reach these shoots, as the crosscuts are being driven at the rate of 80 to 100 ft. a week. There is improvement in the vein material shown between the 1200- and 1334-ft. points, being better defined at the latter level. It is expected to find a more solid condition of the vein at the 1500, and this has induced the management to continue the development program to that depth. Mr. Loring states that this conclusion is based on the well-known fact that the oreshoots in the Mother Lode vein system have been proved to lie in horizontal planes. Where the oreshoots have been proved of payable values at or near the surface, the pay is invariably extended to several hundred feet in depth, and a poor zone encountered at deeper sinking. Still the rule obtains that other oreshoots may be and are found below the horizontal poor zones. It is also true that the horizons at which the poor and the payable zones have been encountered are at practically the same depth in the several mines of the Mother Lode.

BUTTE—Aug. 21

(By Telegraph)

Labor Condition continues unsatisfactory. While new men constantly report for work at the mines, others in equally large numbers quit after working a few shifts. Due to reduced output at the mines, many men have been laid off at the smelteries. The output of copper is still less than half of normal. While several thousand miners have left the district, there are still several thousand here who refuse to return to work without a wage settlement and abolition of rustling-card system. At mass meeting last Saturday, addressed by representative Jeannette Rankin, miners declared to her in answer to question asked, that they would return to work if rustling card was done away with, and leaders of strikers so assured her personally, but in their own meeting last night many speakers among strikers denounced men who say they would return to work. These hold for flat $6 per day and no card system. They also demand investigation of safety conditions in mines. Anaconda officials have been urged by citizens to grant concessions to men regarding rustling card, but officers declare card will not be abandoned. Representative Rankin declared that if the mines are not operated by companies, they will be taken over by the Government. She urged the men and companies to get together in this crisis of the nation and show their patriotism by making mutual concessions.

BUTTE—Aug. 16

Manganese, Butte's Newest Product, is attracting increasing attention. Gold, silver, copper and zinc, produced on as large a scale as Butte has to its credit, would seem marvelous enough for any single mining district only a few square miles in extent. But it now appears that the camp is to enter on a new venture in the production of manganese ore. The existence of manganese ores in the Butte district has, of course, been known for years but the profitable exploitation of these ores in competition with the supply coming to America chiefly from India and Brazil has heretofore been impossible. With the curtailment of this supply due to the war and the market price as high as $1.20 per unit for high-grade manganese ore, buyers of such ore have been in Butte for some time making arrangements for the purchase of manganese ores in quantity, offering attractive inducements to mine owners and prospectors who are in a position to furnish such ores. Under this stimulus, the most available deposits of manganese ore in the Butte camp are now being exploited by owners and leasers.

Hayden-Stone Interests have taken over another group of zinc and silver mines in the Butte district. The new group consists of nine claims, situated in the southwestern section of the district, adjoining the Britannia mine, which is being developed by W. L. Creden. Included in the new group is the Germania mine, an old-time silver producer, but which has been idle ever since silver was demonetized. When the Germania was worked, the zinc ore in the property had no value, in fact was a detriment to the recovery of the other minerals. Surface developments on the property also show the presence of manganese ores, which are just now in great demand. The Germania has a shaft 400 ft. deep, with extensive drifts run from the 100-, 200- and 300-ft. levels. Over 1000 ft. of drifts were made in the early days. There are several other shafts in the group of nine claims. The Germania workings are full of water and it will probably take two months to get the water out and prepare for development work. Old records of the Germania show that it had a large vein of ore running high in silver and zinc. The property belonged to James A. Murray, a private banker, who has owned much mining property in the Butte district, but who has never developed any mine. The mines have been taken over by J. L. Bruce, as trustee. Bruce is general manager of the Butte & Superior, and it is probable that a new company will be formed to carry on operations on the new property as soon as the preliminary development work is completed. The southwestern section of the Butte district is coming to the front wonderfully, as many of the old properties there are found to be rich in silver, zinc and manganese. In this section are situated the Emma mine of the Butte Copper and Zinc, the Ophir of the Butte-Detroit company, the Britannia of the Creden syndicate, and Senator W. A. Clark has just started work on some of his property in that section, included in the old Travonia group.

DENVER—Aug. 16

Gold Dredging in Lake County continues to be profitable, though the only operation is that of the Derry Ranch Gold Dredging Co. It happened also that this was the only mining operation in the Leadville region that continued without interruption during the recent strike. The dredge started this year on Apr. 22—about one month later than in 1916—and has been recovering about $22,000 per month in gold and paying a monthly dividend of 10%. This is only one example of latent resources of Colorado that have lain idle for many years. Engineers passed by this property almost daily for 40 years.

SALT LAKE CITY—Aug. 17

Adjudication of Water Rights is sought between the state water-rights commission and Federal officials in an effort to perfect a system of coöperation. A bill is to be drafted, covering the subject for presentation to and passage by the next legislature. A meeting was held recently to consider the question Aug. 8, at which Governor Bamberger, Harden Bennion, secretary of state, Dr. Samuel Fortier, chief of Federal irrigation investigation, F. G. Harden, Federal irrigation economist, L. M. Winsor, irrigation engineer for the extension division of the Agricultural College of Utah, Prof. O. W. Israelsen in charge of irrigation work at the Agricultural College were present.

Workmen's Compensation Act—which went into force Aug. 1—has caused the Scranton Leasing Co. of Tintic to bring before the courts the question as to whether employers may insure in participating companies or at a rate lower than that fixed by the State Industrial Commission for insurance with the state. This company, employing 30 men, has applied for a writ of mandamus in the supreme court to compel the industrial commission to reinstate a policy taken out by it with the Interstate Casualty Co. of Birmingham, Ala., and rejected by the commission on the grounds that the rate (fixed by the commission) is $5.59 per $100 of employees' payroll and that the policy provides for a rate of $5 per $100 of employees' payroll. Also the policy—as indicated above—is a participating one, and according to the ruling of the commission not allowed. Interesting questions are involved, among them the method employed by the industrial commission in arriving at the rate of insurance, etc.

Transport of Carbon County Coal Is Approaching normal tonnage, as the work of repair to the Scofield branch of the Denver Rio Grande R R, after the heavy damage from the Mammoth reservoir flood, progresses. The area flooded comprises over 20 miles, and in 8 miles of this the line was entirely destroyed. The railroad expects to have an improved double-track system operating smoothly in the near future as well as all the rolling stock needed for the output of the Carbon County coal mines. The railroad will be ready to turn over its second track between Thistle and Helper to the Utah Coal Route by Sept. 1, it is stated. Congestion at the Baldwin Locomotive Works—owing to special demand for work made by the Government—may delay the delivery of locomotives to the new company The date set by contract for the taking over of the Denver & Rio Grande second track by the Utah Coal Route is Nov 1, and whether this company will be able to begin operation before that date is of course dependent in a large measure upon how soon motive power will be available.

WALLACE, IDAHO—Aug. 18

Attempt to Unionize the mines and mills of the district by the wide distribution of handbills, which is evidently the first move in the campaign, has aroused considerable apprehension among the mining companies No name either of individual or organization appears on the bills, but it is known that a special representative and organizer of the International Union of Mine, Mill and Smelter workers is in the district, coming here from Utah, and it is assumed that it is through him that the campaign is to be inaugurated As is generally known, this organization is the Western Federation of Miners under a new name, but under the same leadership, Charles H Moyer being president. The handbill reads as follows: "MEN WANTED: The United States is in war for the purpose of making the world safe for democracy. Congress has established universal service and conscription The labor movement wants universal service and volunteers to assist in maintaining democracy in the United States. Changing industrial conditions make it imperative that the workers unite at once to protect their interests. Don't you think it is time, Mr Miner of the Cœur d'Alenes, that you join the union and begin to do your bit; time to forget that personal grievance and look ahead instead of backward? A campaign for the organization of the district is under way By Labor Day we want a 100% organization We want your assistance. Meetings this week at Gem, Mullan, Burke, Wallace and Nine Mile Boost for 3500 members in the Cœur d'Alenes by Nov 1" Following the blowing up of the Bunker Hill & Sullivan mill in 1899 by members of the Western Federation of Miners, that organization was driven from the district first by the rigid regulations adopted by the military authorities and for years afterward by the maintenance of an employment office in this city which exercised close discrimination in the selection of men for the mines and mills However, the local unions retained their charters and skeleton organizations, but they were thoroughly discredited and too weak numerically to make their influence felt These unions possess some traits which it would be well for the mining companies to emulate. They remain "on the job" whether in victory or defeat If victorious, they crowd their advantage to the limit; if defeated, they watch and wait, knowing by experience that the mining companies will relax their vigilance and give them the opening through which they may recover what was lost. The employment office was an effectual barrier to the old Federation gang. As years past following the trouble of 1899, one after another of the mining companies withdrew from the employment office until the first of this year, when the last one returned to direct employment and the office passed out of existence. From that date the union showed increased vitality and has been steadily gaining strength. Presuming upon the forgetfulness of the people, the Western Federation has seized upon the I. W W menace, denouncing that lawless and treasonable organization and making a patriotic pose in support of law and order. What the mining companies will do to meet the issue that is now about to be thrust upon them in this campaign to restore the power of the old union doth not yet appear Of late they as well as other citizens have been busily preparing to suppress the I. W. W. propaganda in this district, but what's the use if the bars are to remain down for the free entrance of the Western Federation, which, so far as methods are concerned, differs from the I. W. W. only in name?

JOPLIN, MO.—Aug. 18

Mining Costs will be investigated by a skilled accountant in the sheet-ground field by order of the Council of National Defense. The first man on the job is an expert from Kansas City, who has announced that the Government has no intention of making a probe, but that he is authorized to take the operator's figures.

Several Important Sales were recorded here during the last week. The largest was one wherein F. C. Wallower and P. E. Tabor of Joplin were reported as having paid $300,000 for the Golden Rod mill and lease of the Nichols-Williams Zinc Co. of Miami, Okla. Mr. Tabor says the deal has been closed, but Mr. Wallower says it has not been finally closed, but pending. The Chicago-Miami Mining Co. purchased the lease of the Producers Mining Co., situated just south of the Broom Factory tract and northwest of Picher, for a consideration given to the public as $100,000. The buying company has purchased the Franklin concentrating plant south of Carterville, Mo., a sheet-ground mill of 500 tons capacity, and will move it to the lease. E. L. Bucy of Bartlesville, Okla., and P. L. Grace, of Altus, Okla., yesterday purchased the lease of the Big Ben Mining Co. on the L. C. Church land just south of Century, Okla., for $75,000. The Big Ben Company was made up of investors from the State of Washington. A number of drill holes and a shaft into ore are all the developments on the property. E. A. Landreth of Joplin sold a lease on the Cooper estate, west of Baxter, to the owners of the Bethel and Croesus mines in this camp, for $40,000. S. A. Grantham, of Baxter and E. J. Pratt, of Webb City, sold a lease on the Eli Kane land, west of Baxter, to Kansas City investors for $10,000, and retained a substantial royalty.

AJO, ARIZ.—AUG. 18

New Cornelia Leaching Plant now has been running a month and a half, giving full demonstration of the success of the process. The copper produced is being shipped directly to the Raritan works at Perth Amboy, N. J., to be melted into wire bars, the same as electrolytic cathode copper. Additional value attaches to this in view of the fact that copper refineries latterly have been crowded to the limit and there is consideration also of an interest saving of at least 60 days, the time required to realize upon ordinary bessemer copper from the Southwest. It is shipped in cathodes of 165 lb., a limit set merely for ease in handling, as the growth in the sulphuric acid bath is at the rate of 10 lb. a day. Production has been about 75,000 lb. a day. The extraction percentage from the ore has averaged 81.6%. The ore, estimated at 1.5% copper, also has been better than expected, averaging 1 7. Production costs are expected to aggregate about 8c. a pound, among the lowest in the Southwest. It is reported that the construction of a new 5000-ton concentrator, with flotation annex, has been decided upon for the treatment of sulphide ore; also that a reverberatory smelting plant will be built to treat the concentrates in the district, this being deemed more economical than shipping to the Calumet & Arizona smeltery at Douglas.

WASHINGTON—Aug. 17

Recovery of Sulphur from sulphur dioxide in waste smelting gases can be carried out successfully in some localities by the wet Thiogen process, it is announced by A E Wells in a report just issued by the Bureau of Mines. Sulphur can be produced in this manner at a cost of $12 a ton, the report states. The process is described as follows: "In carrying out the Thiogen process the gases are first cooled and cleared of all dust and fumes. They are passed through an absorption tower in which the sulphur dioxide is absorbed in water or mother liquor. To the solution of sulphur dioxide is added powdered barium sulphide, when there is precipitated barium sulphite, thiosulphite and sulphur; the precipitate is settled and the mother liquor is returned to the absorption tower The settled precipitate is then filtered and dried. The elemental sulphur and one-half the sulphur from the thiosulphite is distilled and the sulphur vapors condensed. The residue, consisting of barium sulphite and sulphate is then reduced to sulphide, which is returned to the operation as a precipitate."

The Mining News

ALASKA

PLATINUM DISCOVERY is reported by Dr Herschel C Parker along Kahiltna River Platinum has been previously reported from several sections in Alaska but no important commercial production has been developed to date

ALASKA COPPER SHIPMENTS to United States for July amounted to 13,281 gross tons, containing 8,116,538 lb. copper.

ARIZONA

Greenlee County

ARIZONA COPPER CO. (Clifton)—June production of copper was 4,800,000 lb.

CONSOLIDATED MINING (Tucson)—Suit brought by William Bayly of Los Angeles against the Consolidated Mining Co., W R. Ramsdell and J D Dotson for recovery of notes amounting to $67,600 settled in favor of plaintiff Defendants immediately appealed Involves ownership of 10,080 shares of Compania Minero de Casados, S A., a property located in Jalisco, Mexico

Pinal County

GILA DEVELOPMENT (Kelvin)—Pending arrival of larger pumping unit sinking in main shaft suspended and crosscut being driven to vein from point 100 ft. below the collar. Some drifting will be done on this level but planned to resume sinking shortly

FORTUNA (Superior)—Situated near Magma mine, five miles north of Superior which is nearest railroad station Principal development by shaft, 430 ft deep on main north and south vein, and tunnel on largest east and west vein Recently equipped with air drills and driving 750-ft tunnel to intersect principal east and west vein; now in 150 ft According to telegraphic report 2-ft streak high-grade ore encountered in tunnel Expects to begin shipping immediately

CALIFORNIA

Calaveras County

COMET (Railroad Flat)—Ore vein disclosed 20 in wide followed for distance of 35 ft The 10-stamp mill running on ore from old ledge and reported to be recovering $15 a ton Joseph King, superintendent

LARKIN (Diamond Springs)—Brush fire starting in vicinity of Griffith mine almost destroyed mine and mill buildings. Fences, timber and vegetation destroyed in neighborhood Griffith mine saved by change in wind to the southeast, driving fire into Diamond Springs

FIFTEEN CHROME CLAIMS in Crescent City district have been located on line between Low Divide and North Fork of Smith River by George Hyde

LOW DIVIDE (Crescent City)—Chrome ore being shipped to Crescent City, then via steamer to San Francisco; 3000 tons ready for shipping The 88 tons of chrome on steamer "Del Norte" when beached was from this property E. P. Moore, Berkeley, manager.

Kern County

TUNGSTEN development reported at Glennville, also antimony Glennville is situated between Poso and Cedar Creeks about six miles west of Greenhorn Mountains and about 40 miles northeast of Bakersfield Stated that development of tungsten and antimony ores progressing with permanent prospects Ores said to be ordinary grade but extensive in possible tonnage of profitable extraction.

Placer County

CHROME ORE spotted with gold reported by Garrison Brothers at Bath in Forest Hill district. They have taken out several tons of this ore, running high in gold. Association of gold-bearing ore with chrome is common in this and other districts and also chrome ore frequently discloses gold content. First report of occurrence of free gold in chrome ore probably in the state. Found in serpentine belt, carrying no quartz.

BEAR RIVER WATER & POWER CO. (Auburn)—Permit to issue 9997 shares of capital stock to J. W. Morgan, J. L. Rollins and Daniel Kirby, trustees, in exchange for Monte Rio placer claim situated in Bear River above the dam of the Bear River and Auburn ditch. Water will be diverted through open cut and tunnel. If prospecting warrants the ground may be worked by dredging.

Plumas County

IRON DIKE (Taylorsville) — Reported U. S. S. R. & M. Co. abandoned development upon refusal of owners to grant extension of time for further exploration and development.

ENGELS COPPER (Engelmine)—William E. Roeder, killed July 10 by fall from top of forms used in constructing tube-mill foundation. Distance was only 5 ft., but his head struck concrete foundation and neck was broken.

DIVING APPARATUS will be used by San Francisco and Quincy men for recovery of gold from hed of Feather River above Quincy. This method has been used at different times on the Bear and American Rivers, also on the Sacramento River near Redding.

GRUSS MINING CO. (San Francisco)—Secured permit to issue 510,000 shares capital stock, par value 25c., to owners of Genesee and Mohawk mining claims in Genesee district. Also permitted to sell 200,000 shares for cash to be used in equipment and development.

PILOT (Genesee)—Six-foot vein disclosed by J. W. and A. P. Goodhue of Quincy. Reported that returns from 10-ton sample sent to Utah showed favorable content of copper, gold and silver. Tunnel being driven 550 ft. to tap ledge at 280-ft. vertical depth. Property adjoins Gruss mine on north and Five Bears on south.

Shasta County

AFTERTHOUGHT (Ingot)—Trial run of new reduction plant expected about Sept. 1. Completion of plant delayed by tardy shipments of machinery and material from East.

SHARP GROUP (Buckeye)—William T. Morgan of Denver optioned this property, situated near Churntown. Claims are Copper King, Copper Queen, Hilltop, Jarvis. Development will begin on or before Sept. 1. Price said to be $15,000.

MIDAS (Knob) — Unwatering shaft in progress. Two gas engines installed for generating electricity when water supply fails, electric power plant having been installed to replace the old steam plant. Improvements in the mill contemplated.

BULLY HILL (Winthrop)—Reported 50 tons of high-grade ore a day being shipped to Mammoth smeltery at Kennett. Also that operators contemplate installation of flotation plant if ore is found amenable to this treatment. The 900-ft. shaft on the Rising Star has been unwatered. The ores of Bully Hill contain silver and gold in addition to the copper and zinc.

COLORADO

Boulder County

ROYAL GEM MINING CO. (Boulder)—This New Orleans company preparing to equip 41-acre gold-silver-copper property for early production. William B. Baker, engineer. Head office, 409 Godchaux Building, New Orleans, Louisiana.

Clear Creek County

ONONDEGA (Georgetown) — Capital raise completed and regular shipments made. Crew will be increased and larger production made.

VIRGINIA GULCH MINES, east of Idaho Springs, showing considerable activity. Mines working are Trio Tunnel, Two Brothers, Windsor Castle and Lake; latter worked by lessees through Big Five Tunnel.

Dolores County

ALUNITE DEPOSIT, near Rico, acquired recently by Pueblo, Colo., men. Tests being made to determine possibility of extracting potash economically.

Gilpin County

FAIRFIELD (Russell Gulch)—Old lead producer being reopened.

HAMPTON (Central City) — Shipping good-grade gold-lead ore.

IRON (Central City)—Stated will be unwatered and reopened. Part of Pewabic property.

MOHAWK (Central City)—Being worked by Big Six Leasing Co. Tunnel will be driven further on vein.

WOOD (Russell Gulch) — Unwatering progressing rapidly. Noted producer of pitchblende ore in past.

RODERICK DHU (Central City)—Will be reopened. Mine located on famous "Patch," of Quartz Hill, a highly mineralized area, and large producer of good-grade gold ore in past.

SARATOGA (Central City) — Lessees treating dump ore in milling plant. Operations possible for only few months in spring and summer on account of water supply. Will take several years to treat entire tonnage of dumps.

Hinsdale County

VARDEN BELLE (Lake City)—Sold recently to Denver men. Vein opened by 200 ft. crosscut tunnel and 300 ft.-drift, shows good-grade ore. Extensive development work planned.

GOLDEN FLEECE (Lake City)—Flotation machines being installed; plant will be ready for operation in a short time. Much ore blocked out in mine. Was famous high-grade gold producer of Lake City's early days.

Lake County

HIGHLAND MARY (Leadville)—Lessees have reopened this old-time gold-silver producer in Stray Horse Gulch, and making regular shipments of good-grade ore.

Mesa County

CARNOTITE ORE being shipped from Gateway. Hauled by wagons to Whitewater, shipping point on Denver & Rio Grande railroad.

IDAHO

Shoshone County

NATIONAL (Mullan) — Since cutting vein on 1500-ft. level few weeks ago drifts have been run both east and west about 40 ft., ore in east drift showing decided improvement and the west holding its own. Repairs to tramway completed and bins at mill, a mile away, will be filled preparatory to starting up about Sept. 1. Large amount low grade ore available.

HIGHLAND-SURPRISE (Kellogg)—Construction soon to commence on aerial tramway, about two miles long, to connect mill with railroad up Pine Creek. Now shipping a carload a day, hauling 10 miles. Shaft from main tunnel now down 125 ft., following the vein. Ore, lead and zinc, is of better grade than in upper workings. Large settling tank recently added to mill.

NABOB CONSOLIDATED (Kellogg)—Leased the Federal's mammoth mill at Wallace. Now shipping ore from Denver claim, hauling to railroad. Will use leased mill when Pine Creek railroad is operating, until completion of new mill at mine. Considerable high-grade lead and zinc ore being shipped now. Shoot has been proved 500 ft. in length and from 1 to 6 ft. wide.

REX CONSOLIDATED (Wallace)—Fire in mine resulted in loss of several thousand tons ore in stope, and of 40,000-ft. stump pile which was first fired by I. W. W.'s, flames having been drawn down intake shaft burning out all timbering and then extending into stope. Mill running at half capacity—100 tons per day—due to lack of ore. Expect to have full supply shortly.

ILLINOIS

ALUNITE CO. OF AMERICA (East St. Louis)—This new Kansas City, Mo., company has purchased 40-acre tract in Washington Park district, near Caseyville, for plant to treat western alunite for potash

MICHIGAN

Copper

HANCOCK (Hancock) — July production, 323,000 lb. copper, as against 393,000 for June; decrease due to labor shortage.

BEAR LAKE "POOL" (Hancock)—Reopening old pit; St. Clair Drilling Co. starting hole for unidentified conglomerate.

WINONA (Winona)—Has stopped testing quality of rock underground by diamond drilling; some good stretches found in 2500 ft. drilled.

COPPER RANGE (Painesdale)—Working three diamond drills on optioned tract south of Globe; overburden over 400 ft.; one good lode indicated so far.

CALUMET & HECLA (Calumet)—Improving considerably in daily tonnage, being 9040, with Tamarack's rock, about 9850 tons.

NEW ARCADIAN (Houghton)—Crosscutting at 1500-ft. level west for old Arcadian lode found good. No. 2 shaft down 120 feet.

- WAUKULLA (Houghton)—Owner W. J. Landon, banker of Winona, Minn., died July 28; his son, F. C. Landon, administrator, will sell or give option.

WOLVERINE (Kearsarge)—July yield lowest of the year, being 14.12 lb. per ton; from 27,557 tons obtained, 363,888 lb. of copper, in January, 33,170 tons and 501,478 lb. of copper.

MOHAWK (Mohawk)—Highest yield in July for sometime, 23.27 lb. a ton, but lowest tonnage and production, 41,678 tons ore and 970,538 lb. copper, as against January, 60,478 tons, and 1,195,940 pounds.

OSCEOLA (Osceola)—Maintaining labor supply; will decline in tonnage slightly, as N. Kearsarge No. 4 electric motor will replace shaft-house engine. Farrell crusher installed.

NEW BALTIC (Houghton)—Drifting on 250-ft. level of New Arcadian and crosscutting east and west; the western seeking No. 8 conglomerate, found well mineralized rock in some places.

MINNESOTA

Cuyuna Range

STRIKE OF MINERS called by I. W. W. Aug. 6, still on. Demands presented to mine operators refused. Feigh, Merritt, Mangan Nos. 1 and 2 mines idle. Sultana, Cuyuna Mille Lacs, Cuyuna-Duluth, Armour No. 2, Meachem and Croft working 50% normal force. Striking miners practically all Finnish. Austrian miners remained at work. No disorder or demonstrations.

HOCH (Manganese)—Installing new electric and gasolene pumps.

KLONDIKE MINING CO. (Superior)—Operating diamond drill on SW¼, SE¼, Sec. 32-48-29.

CUYUNA MILLE LACS (Ironton)—Shipped, with Sultana, stockpiles of manganiferous ore aggregating 67,860 tons.

Mesabi Range

MADRID MINE (Virginia)—Caves over the mined portion of this orebody ordered filled by city council, are to be filled with dirt from the Oliver company's stripping.

LEETONIA (Carson Lake)—One shovel working in the pit and one in the stockpile loading ore. Also shipping directly from the mine pocket. Jones & Laughlin operation.

MADEIRA (Hibbing)—This mine, a state lease operated by local capital is tramming out a few pillars of high-grade ore left by former leasers. This ore is being stocked close to the Pool pit. R. Remer, superintendent.

BENNETT (Keewatin) — Butler Bros have one 350-ton shovel stripping, one lighter shovel engaged in cleaning, and two in loading ore. Contractors Challberg & Baum, of Grand Rapids, are well along with their contracts on the new mine buildings. Property of Pickands Mather Co.; R Downing, superintendent

MESABI RANGE PRODUCTION practically normal. The specter of labor trouble which hung over this district for the last two weeks has vanished. It is understood that all the men at the mines around Gilbert and Biwabik are returning to work and that in all parts of the range the work of getting out ore is now going on unobstructed

HELMAR MINE (Buhl)—Swallow Hopkins Lumber Co. property. Has finished incline shaft down side of pit and will abandon former method of loading directly by steam shovel into large cars; will load into small dump cars which will be trammed to shaft, then hoisted to surface and dumped into railroad cars. This saves a hard pull over steep grades from bottom of pit to ore yards.

MISSOURI

Joplin District

NIANGUA (Miami, Okla.)—Building 250-ton mill on lease west of Picher, Okla Expect to complete by Oct. 15.

BILLIKEN (St. Louis, Okla.)—About to start construction on 350-ton mill. Lease northeast of St. Louis proved by 17 drill holes, all showing good ore.

L. J. STEVENSON (Neck City)—With associates will reopen Cockelburr mine, which was good producer few years ago Mill to be overhauled.

LIVE WIRE (Joplin)—Employing double shift in sinking new shaft on Renzenhausen land, southwest of Joplin in new territory Drilling shows ore at 140 ft. May open new field

PLAYTER BROS. (Joplin)—Sinking two shafts on lease about one mile west of Blue Mound, west of Baxter, Kan. Have put down 35 drill holes on 135-acre tract, most of them showing good ore.

PICHER LEAD (Joplin)—Has about completed framework for new mill to be known as Goodeagle, situated west of Tar River, Okla. Is seventh of company's mills in Oklahoma field

TENNESSEE (Zincite)—Has become one of best soft-ground producers in local field, making three carloads weekly of high-grade blende concentrates. Situated on old Yellow Jacket lease which was big producer few years ago. R. H. Allen, Joplin, manager.

GEORGE T STILLMAN (Joplin)—An oil man of Oklahoma recently took lease on tract at Waco and first drill hole is one of best put down in that section. For 20 ft., average assay of cuttings was over 25% blende. More drilling will be done at once.

MONTANA

Jefferson County

OLD GREGORY MINE slag dump being hauled to Wickes for shipment to smeltery.

NEW STRIKE made on Alta Mountain, Corbin district. Silver-lead vein 6 ft. wide.

DAN TUCKER (Clancy)—Incorporated for $150,000, and will be worked by Lackie company.

MT. WASHINGTON (Wickes) — This mine shipping. Ore 14 ft. wide encountered in tunnel at 700-ft. depth. Silver-lead ore.

Lewis and Clark County

PEERLESS QUEEN (Rimini)—Work resumed Aug. 8. Opened to 300 feet.

NILE (Marysville)—High-grade galena ore to smeltery from this mine in Towsley gulch.

HELENA MINE (Helena)—Three carloads ore shipped from 300-ft. level. New 75-hp. boiler in place.

CRUSE CONSOLIDATED (Helena)—Drifting in ore at 150-ft. level and crosscutting.

SCRATCH GRAVEL GOLD (Helena)—Two carloads of ore sent to smeltery during recent week. Returns from first car, net, $3100 gold.

PORPHYRY DIKE (Rimini)—Crew at work remodeling mill for treating the low-grade ore. Tails to be pumped over ridge to Boulder watershed.

BACHELOR (Stemple)—Mine and mill closed on account of alleged excessive mining cost. Developed by 1400-ft. crosscut tunnel. Lane mill. Free gold.

Park County

JARDINE GOLD MINING AND MILLING CO (Jardine)—Several old producers, six miles from Gardiner, Mont., being exploited for tungsten ores, under management of H. C. Bacorn of Butte. Shipment recently made. Equipped with stamp mill, cyanide and hydro-electric power plant, Company owns townsite of Jardine with electric light plant and water-works and recently purchased adjoining property of Bear Gulch Placer Mining Co. together with important water rights.

NEBRASKA

ALLIANCE POTASH CO (Antioch)—Has purchased 40-acre tract for plant to extract potash from bitterns near Alliance, where citizens are endeavoring to induce company to erect plant

NEVADA

Esmeralda County

ATLANTA (Goldfield)—Ore coming from northern workings on 1750-ft. level of good grade. Development progressing and adding to reserves of flotation ore.

JUMBO JUNIOR (Goldfield)—Good grade ore encountered in winze sunk from north drift on 880-ft. level in territory leased from Reorganized Kewanas Co. Ore being broken for shipment to smeltery.

Humboldt County

HONEY BEE (Winnemucca)—Development work to be started shortly on this property near Willard. Equipment installed to sink shaft from 50 to 250-ft. level and contract let. Ore previously shipped from shallow shaft T. J. D. Salter interested; also Charles S. Sprague of Goldfield.

Nye County

TONOPAH ORE PRODUCTION for week ended Aug 11 was 8543 tons valued at $153,-774. Producers were: Tonopah Belmont, 2634 tons; Tonopah Mining, 1150 tons; Tonopah Extension, 2380 tons, Jim Butler, 800 tons; West End, 829 tons; Rescue, 255 tons; Monarch Pittsburg, 32 tons Midway, 78 tons Montana, 30 tons, Cash Boy, 55 tons.

OREGON

Josephine County

ROBERT GRIMMETT, who located chrome deposits near Holland is now shipping to Grants Pass.

CHROME DEPOSITS near Wolf Creek are being developed by Dr. J. F. Reddy, of Grants Pass.

TEXAS

Llano County

WAKEFIELD IRON AND COAL LAND CO. (Llano)—Developing graphite deposit situated across Llano River. Shafts 20 to 55 ft. deep, have indicated eight or nine lenses, 50 to 130 ft. wide. Series of test pits now being put down across formation 1500 ft. wide; graphite also found beyond this width. Ceylon E. Lyman, 813 Lumber Exchange, Minneapolis, Minn., president.

UTAH

Beaver County

MILFORD COPPER (Milford)—Shipping regularly from small portion of property, and ore reserves increasing. Development on large scale planned for other parts of property, looking to development of good bodies of milling ore. Purchase of another property in contemplation.

Grand County

FORTUNA INDEPENDENCE MINES (Green River)—New gold property reported with considerable ore in sight; 85 miles from Green River Five stamp mill being built. Opened to 100-ft. level.

Juab County

MAMMOTH (Mammoth)—During first half of 1917, shipped 399 cars of ore estimated at 20,000 tons.

VICTORIA (Eureka)—Property acquired not long ago by Eagle & Blue Bell, indebtedness of about $45,000 cleared, and $50,000 paid in dividends, with $50,000 in treasury. Property operated through Eagle & Blue Bell at low cost. July earnings said to have amounted to $35,000.

Salt Lake County

EMMA CONSOLIDATED (Alta)—Stated to be shipping about 70 tons a day, and to be able to increase this rate considerably. Wagons and trucks being used for hauling.

UTAH APEX (Bingham)—Receipts for quarter ended May 31, were $174,256, expenses, $125,622, and net earnings, $48,634. Directors have authorized $50,000 disbursement for Liberty bonds, since that date. Cash on hand, May 31, was $351,220, with $100,000 American and foreign bonds in addition.

MICHIGAN-UTAH (Alta) — After embargo of week by smelters, ore accumulation being brought down canyon as rapidly as possible—about 80 tons a day. Development continues in the Copper Prince tunnel, from which a shipment of iron ore was made recently, valued at about $10 a ton.

SHIPMENTS FROM ALTA being increased, as railroad from Wasatch to Midvale is improving its trackage. On July 29, there were hauled nine cars—seven from Michigan-Utah, one from Emma Consolidated, and one from the South Hecla. Railroad expects to haul from now on 8 to 10 cars daily. Michigan Utah expects to send out 100 to 150 tons daily, using its aërial tramway, teams, and the railroad. The Sells is said to have 150 to 200 tons awaiting shipment. South Hecla shipping at the rate of car a day, and expects to double output soon.

Tooele County

GARRISON MONSTER (Gold Hill)—This lead-silver mine, eight miles north of Gold Hill, employing 11 men Has 20 carloads of ore on dump and expects to begin regular shipments shortly J P. Gardner, Salt Lake City, interested.

WISCONSIN

Zinc-Lead District

VINEGAR HILL ZINC (Platteville)—New Jefferson mill at Hazel Green completed and plans made to open and equip the New Rundell at Livingston.

MUD RANGE (Potosi)—H S Klein and associates of Milwaukee completed 2-jig mill at Potosi.

LAURENCE MINES CO. (Dubuque, Ia.)—Holzer tract of 400 acres, four miles southwest of Platteville, under development and zinc ore found in first drill hole

UTT-THORNE (Platteville) — The old Harris mine, at Mineral Point, again producing under new management

CANADA

British Columbia

TRUE FISSURE MINING AND MILLING (Trout Lake)—Development work last year obtained good results. Purchased property in 1906, but did little until August, 1916, when cuts were made along outcrop exposing ore for about 800 ft. in each instance. Now driving two tunnels, one to the North at 400-ft. and to south at 200-ft. depth below outcrop. South drift after cutting vein continued along hanging wall side for 165 ft. with four intermediate cuts disclosing about 12 ft. high-grade concentrating ore of complex nature. Average samples show following: Silver, 19.6 oz.; gold, 0.08 oz; copper, 1.1%; zinc, 9%; iron, 23%. Vein is banded, metals occurring in bands 2 in. to 2 ft. wide. Ore, hand sorted from these cuts and sacked for shipment. Also have considerable tonnage lower grade ore and expect to erect mill. A. L. Houston, resident director

Manitoba

REX (Herb Lake)—One shaft down 117 ft. and drifting commenced at 110-ft. level, vein averaging 49 in. wide. A 40-ton mill and other equipment ordered.

MANDY (Schist Lake)—Modern mining machinery has been installed. Large power house nearly completed Shaft down 90 ft. and drifting will be started when the 100-ft. level is reached. It is proposed to take out ore again during the winter for shipment on the opening of navigation.

Ontario

UNITED KIRKLAND—This company recently organized, acquired Ellis-Dodge claims southwest of Teck Hughes, and will begin development.

McKINLEY-DARRAGH (Cobalt)—Building for flotation plant completed, machinery being installed and expected to be in operation within a few weeks, giving total capacity of 500 tons per day. Improvements made in hoisting equipment for handling increased tonnage. Owing to increased price of silver, several bodies of milling rock, not profitable two years ago, may now be exploited.

WASAPIKA GOLD MINES, LTD. (West Shining Tree, via Ruel)—Has group of Ribble claims in Sudbury division. Vein uncovered for 2000 ft., average width of 4 ft. of quartz. Employing 10 miners in sinking double-compartment shaft to 200-ft. point and will develop to that depth. Decided to erect small steam plant on property to be completed in February, to facilitate shaft sinking. George R. Rogers, president and manager. R S Manwell, foreman. Head office, 904-905 Bank of Hamilton Building, Toronto.

KIRKLAND LAKE GOLD MINING (Kirkland Lake)—First annual report for year ended May 31, by F L. Culver, president, shows development work amounted to 3072 ft., divided as follows: Drifting, 1534 ft; crosscutting, 796 ft.; station cutting, 215; sinking, 526. No stoping done on property, ore extracted being from development work only. Estimated to have on surface 6000 tons, $10 ore Intend to erect 150-ton mill near new shaft to be sunk Present shaft near eastern boundary and developed tonnage is toward the west making necessary new shaft All work financed by Beaver Consolidated Mines, Ltd, of Cobalt.

MEXICO

ESTABLISHING A MINING CHAMBER is the purpose of an announcement sent out by Attorney Alberto Terrones Benitez, Apartado 156, Durango, to the mining communities of the State of Durango. Mine owners and managers of registered properties are invited to attend personally or to be represented at the first general assembly to be held Sept 15, at 9 a m., at the "Salon de Actos" of the "Instituto Juarez" The following information is requested from all mine operators: Name of proprietor; name of properties, exact location, number of dependencies, metals exploited; state if reduction works or foundry established, possessions being exploited and virgin properties; name of representative in the assembly (a signed letter giving such power certified by a public official and two witnesses will be sufficient)

FRANCE

LARGEST IRON BLAST FURNACES in France just started near Caen, Department of Calvados, according to cablegrams of Aug 20. German interests formerly controlled holdings and were preparing to erect reduction plants, including steel mills

BELGIAN CONGO

UNION MINIERE DU HAUT KATANGA (Elizabethville)—July copper production was 4,850,120 pounds.

AFRICA

GOLD OUTPUT of West Africa in June was 27,517 oz. For half-year ended June 30, total was 181,720 oz. in 1917, a decrease of 17,261 oz from last year.

The Market Report

Metal Markets

SILVER AND STERLING EXCHANGE

Aug.	Sterling Exchange	Silver New York, Cents	Silver London, Pence	Aug.	Sterling Exchange	Silver New York, Cents	Silver London, Pence
16	4.7556	86¾	44	20	4.7556	87¾	44½
17	4.7556	86¾	44	21	4.7556	88¼	44¾
18	4.7556	86¾	44	22	4.7550	88¼	44¾

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

DAILY PRICES OF METALS IN NEW YORK

Aug.	Copper Electrolytic	Tin Spot.	Lead N. Y.	Lead St. L.	Zinc St. L.
16	24½ @25	63	10.40 @10.80	10¼ @10¾	8.35 @8.40
17	24½ @25	62½	10.30 @10.70	10¼ @10.70	8¼ @8⅜
18	24¾ @25¼	62½	10.30 @10.70	10¼ @10⅜	8.15 @8.35
20	24¾ @25¼	62⅜	10.30 @10.70	10¼ @10⅝	8 @8⅜
21	24¾ @25¼	62¼	10.30 @10.70	10¼ @10⅜	8 @8¼
22	24¾ @25¼	62	10.30 @10.70	10¼ @10⅝	7⅞ @8

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

The quotations for electrolytic copper are for cakes; ingots and wirebars. Electrolytic copper is commonly sold on "regular terms" (r.t.), including freight to the buyer's works and is subject to a discount for cash. The difference between the price delivered and the New York cash equivalent is at present about 0.25c. on domestic business. The price of electrolytic cathodes is 0.05 to 0.10c. below that of electrolytic. Quotations for spelter are for ordinary Prime Western brands. We quote New York price at 17c. per 100 lb. above St. Louis.

Some current freight rates on metals per 100 lb. are: St. Louis-New York 17c.; St. Louis-Chicago, 6.3c.; St. Louis-Pittsburgh, 13.1 cents.

LONDON

Aug.	Copper Standard Spot	Copper Standard 3 Mos.	Copper Electrolytic	Tin Spot	Tin 3 Mos.	Lead Spot	Zinc Spot
16	120	119½	137	244¾	241¼	30½	54
17	120	119½	137	244	241	30½	54
18							
20	120	119½	137	243	240	30½	54
21	120	119½	137	242½	239¾	30½	54
22	120	119½	137	242	239	30½	54

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2,240 lb. For convenience in comparison of London prices, in pounds sterling per 2,240 lb., with American prices in cents per pound the following approximate ratios are given, reckoning exchange at 4.80. £15 = 3.21c.; £20 = 4.29c.; £30 = 6.43c.; £40 = 8.57c.; £60 = 12.85c. Variations, £1 = 0.21⅜c.

NEW YORK—Aug. 22

The markets were again very dull and unsettled, owing to the continued uncertainty respecting the attitude of Washington. The fixing of a price for bituminous coal, announced on Aug. 22, which price was lower than the producers expected, did not add anything on the side of optimism.

Copper, Tin, Lead and Zinc

Copper—A little business was done from day to day, chiefly for September-December and October-December delivery, and chiefly with speculators. This business was done mainly at prices from 24½@25c., cash, New York. Small lots of spot copper were reported sold at 27@27½c., but the amount of such business was insignificant.

The copper market is tied up by the uncertainty centering in Washington. Manufacturers hold off, and will continue to do so, as long as they think that the Government is going to fix arbitrarily a price for copper much lower than the prevailing price and is going to compel producers to supply everybody at that price. A large part of our copper supply comes from foreign producers and how the Government is going to compel them to sell at an arbitrary price, unless they want to, has not been explained. In the meanwhile, there is considerable confidence in the report that the price of 22½c. has been agreed between the Government and the producers, with 2½c. additional left pending for further adjustment. Respecting this matter, nothing new developed during the week. The delay in these negotiations is not interfering with the Government getting its supply of raw material, for the Government requisitions what it wants and producers supply it. The Government, in requisitioning, pays no attention to the position of producers, which creates embarrassments that frequently are relieved only by consumers relinquishing their contractual claims.

The statistical position of copper is becoming very strong, for domestic consumers are undoubtedly using up the supplies in their yards, while on the other hand production is diminishing. The Great Falls refinery is idle. Raritan, which was the next to exhaust its stock of crude, is now running only at two-thirds capacity and shortly will have to reduce to a 50% basis. Another large refinery is down to three-fourths normal production and expects a further reduction in September. The other works are still supplied with crude, but their stocks are getting low.

Copper Sheets are quoted at 37c. per lb. for hot rolled, and 1c. higher for cold rolled. Wire is quoted nominally at 33c. per lb., f.o.b. mill.

Tin—This market was very dull, especially in Straits. There were a few transactions in Banka and Chinese tins, but the total turnover of the week was probably not more than 125 tons. Banka tin fell as low as 58½c., but recovered to 59c. at the close.

Lead—Some business pending at the close of last week and the early part of this week developed that there was considerable lead in the hands of consumers, which they were willing to sell. On the other hand, the demand from domestic consumers was light. Canada, which was expected to be a buyer in this market, has not come forward. The strike situation in Missouri is improving, and the principal producer is back to nearly normal production, although things are not yet going smoothly. These several factors combined to produce an easier tone in the lead market, and at the close, while nearly 10⅜c. might have to be paid for August lead. September could be had at 10½c. and October-December was offered at 10c.

Zinc—This metal was dull and toward the close became distinctly weak under pressure from producers who were not disposed to accumulate any more stock. Sales were reported at 8c., there were sellers over that price, and there was strong reason to believe that any consumer who wanted a round lot of the metal could do better.

Zinc Sheets—Price of zinc sheets has not been changed. Market is still at $19 per 100 lb. f.o.b. Peru, Ill., less 8% discount.

Other Metals

Aluminum—This market which has been featureless for months livened up and several sales were made at 50c. per lb. for No. 1 ingot, New York.

Antimony—Very dull Quoted unchanged at 15@15¼c. for spot. Futures quoted at 14¼@14¾c., c.i.f. in bond.

Bismuth—Unchanged at $3.50 per pound.

Cadmium—Unchanged at $1.40@1.60 per pound.

Nickel—Steady at 50c. per lb., premium of 5c. per lb. for electrolytic.

Quicksilver—Unchanged at $115, with moderate activity. Stocks in this market reported light. San Francisco reports, by telegraph, $110, market steady.

Gold, Silver and Platinum

Gold—Some further shipments of gold to Japan were made this week, reaching a total of $3,000,000, and about $1,000,000 in all was sent to South America. Shipments to Japan this year have been in settlement for exports. A moderate amount of gold has been sent to British India in the same way.

Silver—London market continues firm on very moderate supplies. Considerable silver has been sold ahead for the balance of the year, and this will limit cash offerings when time of delivery arrives.

Mexican dollars at New York: Aug. 15, 67⅜c.; 16, 67⅜c.; 17, 67⅝c.; 18, 67⅞c.; 20, 68⅜c.; 21, 68½c.

Coined silver in the United States Aug. 1 is estimated by the Treasury Department as follows: Standard dollars, $568,270,061; subsidiary coins, $199,470,157; total face value, $767,740,218. Of the standard dollars $473,488,048 are held in the Treasury against silver certificates outstanding.

Platinum—Sales reported at $103@105, with the market fairly active.

Palladium—Strong at $120.

Zinc and Lead Ore Markets

Joplin, Mo., Aug. 18—Blende, per ton, high, $78.80; basis 60% Zn, premium, $75, medium to low, $70@65; calamine per ton, basis 40% Zn, $40@38; average selling price, all grades of zinc, $67.55 per ton.

Lead, high, $123.70; basis 80% Pb, $120@100; average selling price all grades of lead, $111.10 per ton.

Shipments—Blende, 9748 tons; calamine, 681 tons; total value, $704,580.

A stronger market for zinc ore is shown in the increased average price, brought about by an advancing price on some of the intermediate grades with no quotable change in the base range. Sending away the soldiers and preparing to send away the first call of the draft is reducing the working force to an extent that is perceptible in a lowering production. On the other hand the car situation is most vexatious, with each buyer putting in more time securing cars than he does in buying ore.

Platteville, Wis., Aug. 18—Blende, basis 60% Zn, $70 for premium ore down to $65 for medium grade. Lead ore, basis 80% Pb, $110 per ton. Shipments reported for the week are 2559 tons of zinc ore, 144 tons of lead ore, and 449 tons of sulphur ore. For the year to date the figures are: 89,036 tons of zinc ore, 4264 tons of lead ore, and 18,272 tons of sulphur ore. Shipped during the week to separating plants, 3611 tons of zinc ore.

Other Ores

Manganese Ore.—Unchanged at $1 for high-grade metallurgical ore.

Molybdenum Ore.—For molybdenite assaying 90% molybdenum sulphide, $2.20 was asked, $2.10 was reported bid. No business was reported done, but $2.15 doubtless would have been accepted.

Tungsten Ore—Scheelite sold at $28 per unit. High-grade wolframite realized $25, while for ordinary grades $20 was quoted. The turnover amounted to several hundred tons.

Pyrites—Spanish lump quoted at 15½c. per unit on basis of 10s. ocean freight, buyer to pay war risk, excess freight and any duty. Ocean freights are slightly easier, several charters having been made at 32s. 6d. for northern ports, about 3s. less than heretofore.

Iron Ore—Prices, delivered lower Lake ports are for old-range bessemer, $5.95, old-range nonbessemer, $5.20; Mesabi bessemer, $5.70; and Mesabi nonbessemer, $5.05.

In connection with the recent allotment of 150,000 tons of rails to various rail mills by the Government, at the standard price of $40, the Bethlehem Steel Co shows a cost of production of about $55. This is due to the difficulty in importing ore, and the high ocean freights. Last year's ore production was 75,167,672 tons, shipments from mines being 77,870,553 tons. Imports were 1,325,621 tons. The supplies were about 80% from Lake Superior, 18% from other districts and less than 2% through imports.

Iron Trade Review

NEW YORK—Aug. 22

While the steel trade waits for the Government to decide what it will pay for munition and ship steel, and expects that decision soon, the situation as to prices of steel for the Allies and the public is in no respect clearer, says "Iron Age." The President's announcement of a $2 base on bituminous coal instead of the concession of a $3 price made by the operators is no surprise, and it does not furnish the key to the vastly more complicated problem of steel prices. Coke prices, it is to be expected, will be fixed in line with coal, but as the fixing of a low price for coke will not increase the supply and may lessen it, the effect on the pig-iron market is yet to be determined.

Cheaper coal, however, will mean lower cost in melting and heating operations at steel works and hence some revision of cost sheets now in the hands of the Government.

PITTSBURGH—Aug. 21

The turnover in steel products is still lighter, the stagnation existing for several weeks being intensified. Purchases are entirely of material for earlier delivery and aggregate an extremely small tonnage. Specifications on contracts are lighter and on the whole are averaging less than the shipments. Buyers are awaiting lower prices and seem to be fortified for a long wait. While there has been little prospect at any time that the Government would undertake to fix steel prices for the general trade, the report of the Federal Trade Commission on costs is to the effect that costs vary greatly, giving the Government no definite basis on which to proceed. With this situation developed, the steel makers will probably be in more accommodating mood with the Government as to its purchases and the purchases of the European Allies. Most of the steel required for 6000 freight cars to operate on the American road in France is placed.

The general price readjustment in the iron and steel market is proceeding slowly, but not more slowly than is common in the early stages of such a movement. It is expected that the Government will shortly fix prices on coke, under authority granted by the Lever Food-Control law, and this will doubtless soften pig iron, reacting eventually on unfinished and finished steel.

Production of steel is increasing, with more favorable weather. Production of steel ingots since the first of this year has averaged a rate of about 43,000,000 tons a year, but has lately been a trifle heavier. Capacity is about 19,000,000 tons.

Pig Iron—Market continues stagnant and there is little being done even in resale iron. Furnace quotations are unchanged, but are largely nominal: Bessemer, $55; basic, $52; foundry and malleable, $53@55, f.o.b. valley furnaces, 95c. higher delivered Pittsburgh.

Steel—There continue to be offerings of billets at $85, occasionally at a shade less. A little business in sheet bars is reported at $85 but the usual asking price is $90. Rods are easier, there being little difficulty in buying at $90. On an average the unfinished-steel market is down about $10 from the top level.

Ferroalloys

Ferromanganese—Market continues quiet and rather easy with prompt and second half at $375@400 and first half at $350@375 per ton delivered.

Coke

Connellsville—The market experienced a further advance Friday and Saturday of last week, but this week has been easing off and is a shade lower than a week ago, at $13@14.50 for spot furnace and $14@15 for spot foundry. Car supply is somewhat improved. Cost sheets for the Federal Trade Commission are being completed and show an average slightly under $1 a ton. The Government is expected to fix a price within a few weeks, probably not far from $5.

STOCK QUOTATIONS

N. Y. EXCH.†	Aug. 20
Alaska Gold M.	5½
Alaska Juneau	4½
Am.Sm.& Ref.,com.	102½
Am. Sm. & Ref., pf.	113½
Am. Sm. Sec., pf., A	99½
Am. Sm. Sec., pf. B	93
Am. Zinc	23½
Am. Zinc, pf.	60
Anaconda	76½
Batopilas Min.	1½
Bethlehem Steel	114
Bethlehem Steel, pf.	115½
Butte & Superior.	36½
Cerro de Pasco	33½
Chile Cop.	19
Chino	55½
Colo.Fuel & Iron	48
Crucible Steel.	80½
Dome Mines	10
Federal M. & S.	23
Federal M. & S., pf.	50
Great Nor., ore ctf.	35
Greene Cananea	42½
Gulf States Steel	109½
Homestake	108
Inspiration Con.	55½
International Nickel	37½
Kennecott.	42½
Lackawanna Steel	88½
Miami Copper	37½
Nat'l Lead, com.	54
National Lead, pf.	‡105
Nev. Consol.	22½
Ontario Min.	6½
Quicksilver	1½
Quicksilver, pf.	‡ 1½
Ray Con.	27½
RepublicI.&S.,com.	89½
Republic I. & S., pf.	‡104
Sloss-Sheffield.	53½
Tennessee C. & C.	17½
U. S. Steel, com.	123½
U. S. Steel, pf.	117½
Utah Copper	104
Va. Iron C. & C.	‡69

N. Y. CURB†	Aug. 20
Big Ledge.	1½
Butte & N. Y.	1½
Butte C. & Z.	9½
Caledonia	71
Calumet & Jerome.	1 68½
Can. Cop. Corpn.	2 56½
Carlisle	4½
Cashboy	09½
Con. Ariz. Sm.	2.66½
Con. Coppermines.	11½
Con. Nev.-Utah	.06½
Emma Con.	‡1⅛
Ferber	‡ 60
First Nat. Cop.	3
Goldfield Con.	55
Goldfield Merger.	05
Greenmonster.	75
Hecla Min.	9⅛
Howe Sound	5½
Jerome Verde	1½
Kerr Lake	5½
Magma	61
Majestic	‡ 40
McKinley-Dar-Sa.	58
Milford	2
Mohican	75
Mother Lode	37
N. Y. & Hond.	16
Nipissing Mines.	8½
Ohio Cop.	1 31½
Ray Hercules	3½
Richmond	55
Rochester Mines	55
St. Joseph Lead	20½
Standard S. L.	65½
Stewart	½
Success	28
Tonopah	6½
Tonopah Ex.	2 43½
Tribullion	31½
Troy Arizona	19
United Cop.	½
United Verde Ext.	36½
United Zinc	4½
Utica Mines	23
White Knob, pf.	‡1½
Yukon Gold	2½

SAN FRAN.*	Aug. 21
Alta	03
Andes	10
Best & Belcher	02
Bullion	01
Caledonia	10
Challenge Con.	01
Confidence	05
Con. Virginia	18
Gould & Curry	‡ 02
Hale & Norcross	03
Jacket-Cr. Pt.	11
Mexican	12
Occidental	60
Ophir	09
Overman	01
Savage	02
Seg. Belcher	‡ 01
Sierra Nevada	09
Union Con.	29
Utah Con.	01
Belmont	4 75
Jim Butler	97
MacNamara	14
Midway	12
Mont.-Tonopah	20
North Star	10
Rescue Eula	21
West End Con.	75
Atlanta	10
Booth	07
Comb. Frac.	04
D'field Daisy	03
Florence	04
Jumbo Extension	25
Kewanas	12
Nevada Hills	15
Nevada Packard	31
Round Mountain	27
Silver Pick	10
White Caps	‡ 37½
Big Jim	‡ 69
United Eastern	4 17½

BOSTON EXCH.*	Aug. 21
Adventure	2½
Ahmeek	100
Algomah	50
Allouez	65
Ariz. Com., ctfs.	11½
Arnold	25
Bonanza	21
Butte-Balaklava.	55
Calumet & Ariz.	78½
Calumet & Hecla.	550
Centennial	17½
Copper Range	61½
Daly West	1½
Davis-Daly	5½
East Butte	11
Franklin	6
Granby	79
Hancock	13½
Hedley	15
Helvetia	25
Indiana	2
Isle Royale	30
Keweenaw.	2
Lake	9½
La Salle	3½
Mason Valley	7½
Mass	11
Mayflower.	2
Michigan	1½
Mohawk	81
New Arcadian	3
New Idria	14
North Butte	17½
North Lake	1
Ojibway	1½
Old Dominion	55½
Osceola	85½
Quincy	86
St. Mary's M. L.	76
Santa Fe	1⅛
Seneca	7½
Shannon	7½
Shattuck-Ariz.	24
So. Lake	3
So. Utah	16
Superior	7½
Superior & Bost.	4
Trinity	6½
Tuolumne	4½
U. S. Smelting	61½
U. S. Smelt'g, pf.	50
Utah Apex	2½
Utah Con.	16
Utah Metal.	4½
Victoria	3½
Winona	3
Wolverine	16½
Wyandot.	25

BOSTON CURB*	Aug. 20
Alaska Mines Corp.	50
Bingham Mines.	12½
Boston Ely	.75
Boston & Mont.	73
Butte & Lon'n Dev.	.16
Calaveras	3½
Calumet-Corbin.	.01
Chief Con.	2½
Cortez	15
Crown Reserve.	25
Crystal Cop.	80
Eagle & Blue Bell	2½
Houghton Copper	‡ 90
Intermountain	1⅛
Iron Cap, Com.	16½
Iron Cap Cop., pf.	16
Mexican Metals	30
Mines of America	1½
Mojave Tungsten	47
Nat. Zinc & Lead.	37
Nevada-Douglas	1⅛
New Baltic	1½
New Cornelia	17½
Oneco.	‡ 45
Pacific Mines	‡ 30
Rex Cons.	18

SALT LAKE*	Aug. 20
Bannack	55
Big Four	03
Black Jack	‡ 08
Cardiff	4 00
Colorado Mining	17
Daly-Judge	8 60
Empire Copper.	1 30
Gold Chain	18
Grand Central	50
Grand Gulch	‡ 19
Iron Blossom	89
Lower Mammoth.	03
May Day	07
Moscow	15
Prince Con.	98
Silver-King Coal'n	2 95
Silver King Con.	4 15
Sioux Con.	11
So. Hecla	1 35
Uncle Sam	04
Wilbert	25
Yankee	07½

TORONTO*	Aug. 20
Bailey	‡ 04
Beaver Con.	36
Buffalo Mines	1 00
Chambers Ferland	13½
Coniagas	1 00
Hargraves	11
La Rose	50
Peterson Lake	11
Right of Way	05
Temiskaming	32½
Wettlaufer-Lor.	05
Dome Exten.	16
Dome Lake	17
Foley O'Brien	60
Hollinger	4 40
McIntyre	1 52
Newray	68
Porcu. Crown	38
Schumacher	42
Teck-Hughes	48
Vipond	32
West Dome	17½

STOCK QUOTATIONS—Continued

COLO. SPRINGS	Aug. 21
Cresson Con.	5.75
Doctor Jack Pot	.04
Elkton Con.	.04½
El Paso	26
Gold Sovereign.	.04½
Golden Cycle	2 08
Granite	45
Isabella	10
Mary McKinney	11
Portland	1 40
United Gold M.	18½
Vindicator	55

LONDON	Aug. 6		
Alaska Mexican	£0	10s	0d
Alaska Tre'dwell	1	2	6
Burma Dorp.	3	18	9
Cam & Motor	0	10	0
Camp Bird	0	6	6
El Oro	0	9	0
Esperanza	0	9	0
Mexican Mines	4	15	0
Nechi, pfd.	0	12	6
Oroville	0	15	9
Santa Gert'dis.	0	10	0
Tomboy.	0	18	6

* Bid prices. † Closing prices. ‡ Last Quotations.

MONTHLY AVERAGE PRICES OF METALS

Silver	New York			London		
	1915	1916	1917	1915	1916	1917
January	48.855	56.775	75.630	22.731	26.960	36.682
February	48.477	56.755	77.585	22.753	26.975	37.742
March	50.241	57.935	73.861	23.708	27.597	36.410
April	50.250	64.415	73.875	23.709	30.662	36.963
May	49.915	74.269	74.745	23.670	35.477	37.940
June	49.034	65.024	76.971	23.267	31.060	39.065
July	47.519	62.940	79.010	22.597	30.000	40.110
August	47.163	66.083	....	22.780	31.498	...
September	48.680	68.515	....	23.591	32.584	
October	49.385	67.855		23.925	32.361	
November	51.714	71.604		25.094	34.192	
December	54.971	75.765		26.373	36.410	
Year	49.684	65.661		23.675	31.315	

New York quotations cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Copper	New York		London			
	Electrolytic		Standard		Electrolytic	
	1916	1917	1916	1917	1916	1917
Jan	24.008	28.673	88.083	131.921	116.167	142.895
Feb	26.440	31.750	102.667	137.895	133.167	148.100
Mar	26.310	31.481	107.714	136.750	136.000	151.000
April	27.895	27.935	124.319	133.842	137.389	147.158
May	28.625	28.788	135.457	130.000	152.522	142.000
June	26.601	29.062	112.432	130.000	137.455	142.000
July	23.865	26.620	95.119	128.409	125.500	140.409
Aug	26.120		110.283		126.304	
Sept	26.855		113.905		134.071	
Oct	27.193		122.750		142.523	
Nov	30.625		134.659		155.432	
Dec	31.890		145.316		162.842	
Year	27.202		116.059		138.281	

Tin	New York		London	
	1916	1917	1916	1917
January	41.825	44.175	175.548	185.813
February	42.717	51.420	181.107	198.974
March	50.741	54.388	193.609	207.443
April	51.230	55.910	199.736	220.171
May	49.125	63.173	196.511	245.114
June	42.231	62.053	179.466	242.083
July	38.510	62.570	168.357	242.181
August	38.565		169.870	
September	38.830		171.345	
October	41.241		179.307	
November	44.109		186.932	
December	42.635		183.368	
Av. year	43.480		182.096	

Lead	New York		St. Louis		London	
	1916	1917	1916	1917	1916	1917
January	5.921	7.626	5.826	7.530	31.167	30.500
February	6.246	8.636	6.164	8.595	31.988	30.500
March	7.136	9.199	7.375	9.120	34.440	30.500
April	7.630	9.288	7.655	9.158	34.368	30.500
May	7.463	10.207	7.332	10.202	32.967	30.500
June	6.936	11.171	6.749	11.121	31.011	30.500
July	6.352	10.710	6.185	10.644	28.137	30.500
August	6.244		6.088		29.734	
September	6.810		6.699		30.786	
October	7.000		6.898		30.716	
November	7.042		6.945		30.500	
December	7.513		7.405		30.500	
Year	6.853		6.777		31.359	

Spelter	New York		St. Louis		London	
	1916	1917	1916	1917	1916	1917
Jan	16.915	9.619	16.745	9.449	89.810	48.329
Feb	18.420	10.045	18.260	9.875	97.762	47.000
Mar	16.846	10.300	16.676	10.130	95.048	47.000
April	16.695	9.459	16.525	9.289	99.056	54.632
May	14.276	9.362	14.106	9.192	94.217	54.000
June	11.752	9.371	11.582	9.201	88.591	54.000
July	8.925	8.643	8.755	8.473	50.750	54.000
Aug	8.730		8.560		51.587	
Sept	8.990		8.820		52.095	
Oct	9.829		9.659		54.159	
Nov	11.592		11.422		56.023	
Dec	10.665		10.495		55.842	
Year	12.804		12.634		72.071	

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton.

Pig Iron, Pitts.	Bessemer‡		Basic‡		No. 2 Foundry	
	1916	1917	1916	1917	1916	1917
January	$21.60	$35.95	$18.78	$30.95	$19.70	$30.95
February	21.16	36.37	18.93	30.95	19.81	30.95
March	21.81	37.37	19.20	33.49	19.45	35.91
April	21.85	42.23	18.95	38.90	19.45	40.06
May	21.78	46.94	19.11	42.84	19.68	43.60
June	21.95	54.22	18.95	50.05	19.34	50.14
July	21.95	57.45	18.95	53.80	19.20	53.95
August	21.95		18.95		19.22	
September	22.88		19.58		19.53	
October	24.61		21.28		21.81	
November	30.07		28.18		26.65	
December	35.16		30.95		30.79	
Year	$23.88		$20.98		$21.18	

‡ As reported by W. P. Snyder & Co.

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Mining in the Argentine Andes

BY A. W. ALLEN

Metallurgical Engineer, 309 Broadway, New York

Mining in the Argentine is a discredited industry, due to the many swindles that have been perpetrated in that country. The climate of the mining region is not good and the labor is discouraging to one accustomed to ordinary efficiency. The industry has lacked competent technical direction, which has been one cause of the consistent failures.

IF THERE is any one country in the world where mining is thoroughly discredited, it is the Argentine Republic. Two factors are mainly responsible—the success (from the promoters' point of view) of systematic swindles with which the industry has been associated in the past, in conjunction with a lack of experienced technical assistance in the inception and realization of mining and metallurgical projects.

A technical mining man going to the Argentine should prepare himself to be looked upon with something akin to suspicion, to see eyebrows raised slightly when he announces his profession, for, as W. E. Simpson aptly remarks, " . . . the mining engineer is classed as a sort of confidence-trick man who can hypnotize his listeners with entrancing reports of limitless wealth in some inaccessible region and get them to part with their cash while under the delusion that they are being enriched."

The work that has been carried out under the guise of mining operations has in many instances been of a kind to baffle convincing description. Operations of shaft sinking and tunneling seem to have been pursued for years for no other apparent reason than to prolong the life of the concern supplying the funds. The opening-up of orebodies in isolated mountain regions and the yearly expenditure of large sums for the purpose, without the controlling influence of elementary account keeping or systematic audit, has been of common occurrence with foreign companies and has usually coincided with the fact that no feasible or practical method was known to science or art for the extraction of any valuable metal the reserves might contain. Concentration practice has been decided upon and equipment purchased without even a preliminary test and apparently without a thought as to whether

A CYANIDE PLANT IN THE ARGENTINE ANDES

the ore could be successfully concentrated or the product marketed. Cyanide plants have been designed and erected with little regard to the actual suitability for Andean ores and with no reasonable hope for successful operation. Smelting equipment has been erected only to be almost immediately scrapped.

The fact that the decay of Argentine mining is attributable to the misguided efforts of inexperienced engineers has been duly recognized by the government authorities to the extent that the *jefe* of the mining section of the Ministry for Mines and Agriculture has drawn attention to the "*gravísimas consecuencias*" resulting from "*la insuficiencia frecuente de la dirección técnica de las explotaciones.*" It is a lamentable fact that foreigners, more than native engineers, are responsible.

Lack of technical skill in direction and exploitation has unhappily synchronized with a peculiar local tradition that sharp practice, if successful, is an indication of praiseworthy skill and by no means a matter for condemnation. The combination of ill-advised mining and metallurgical enterprise, coupled with the sentiment that a successful swindle is legitimate practice, has proved irresistible, and Argentine mining has collapsed under the strain.

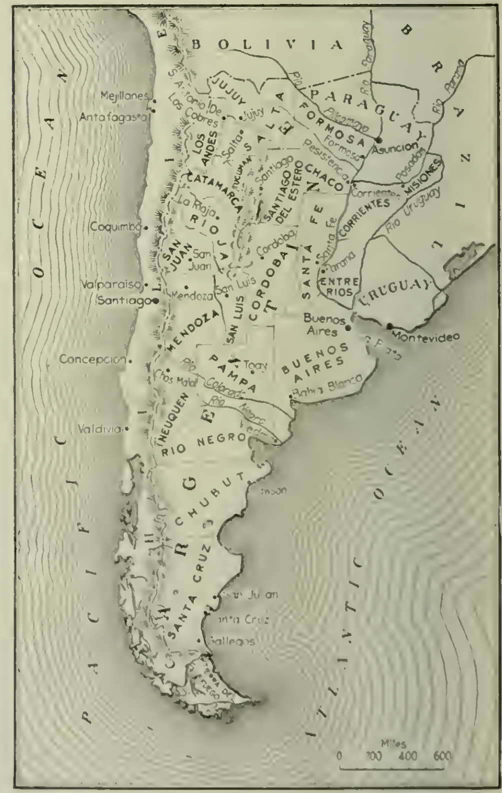
To eradicate the prevalent idea as to the position of mining as a business will doubtless take time, but a reaction is inevitable as soon as it is demonstrated that the methods employed may be commercially and morally sound. The status of the mining engineer will then be restored and the industry will receive the attention it undoubtedly deserves.

OPERATING DIFFICULTIES ENCOUNTERED

Mining in isolated regions is invariably beset with difficulties, and engineers may vie with one another for a hearing as to the tribulations under which they have carried out their work in various localities. The labor question is always of primary importance, and there are many classes of so-called "cheap" labor. Where the supply is plentiful and where effective discipline is aided by government protection, the utilization of "cheap" labor may be advocated. In the Argentine Andes, however, no police are allotted to those isolated regions where mining is carried on. To invoke the law is not a proceeding which the foreign mine owner or his representative is inclined to favor, especially in the case where the nearest magistrate's court is far distant from the mine. The peon, therefore, has little fear of consequences whatever his delinquencies. An increasing vigilance on the part of the executive is necessary, but hasty judgment is fatal and must be tempered with a resignation to inevitable natural conditions and ethnological traits. It soon becomes apparent that an act of consideration that might be termed a kindness is analyzed as a sign of weakness and immediate advantage is taken of the attitude.

The labor situation almost baffles solution unless mine owners are prepared to import labor on a large and regular scale. Skilled miners are unobtainable in most regions, and the average Argentine peon of the Andean provinces is untrainable for any serious work. Labor involving any responsibility must necessarily be given to others. Chileans are largely in demand as miners, a work to which they are better adapted on account of their greater experience and general capability. Supervision is undertaken by men of all nationalities. In my own case a few months of unconscious effort in this direction resulted in the mustering of a cosmopolitan throng containing representatives of eight European and five American nationalities, in addition to the indispensable Chinese cooks. Differences of opinion were not uncommon, but bones were seldom broken on this account.

Wage rates vary in different localities, but foreign (Chilean) miners, timbermen or machine men usually earn from three to six pesos per day (about \$1.30 to \$2.60 U. S. Cy.) according as to whether they are employed by daywork or on contract. Peon labor underground is paid about 2½ pesos as compared with two pesos on the surface. Carpenters and masons earn six pesos per day and fitters from four to six pesos. Millmen are usually recruited from the shops.



MAP OF ARGENTINA, SHOWING PROVINCES

The bulk of the Argentine laborers wish to work at mining only when they are in need of a little extra money. They leave as soon as they have a few pesos to their credit, but generally before they have adapted themselves to their surroundings or made themselves of real use or independent of perpetual supervision. The exceptions are few and far between. Steady work and the chance of systematic saving of money have no attraction whatever to the average peon, although the foreigners are eager to take advantage of the opportunities offered and invariably open a bank account at the nearest town.

The labor supply is always in a state of exasperating fluctuation. The *cosecha* (harvest) claims practically all the peon labor during a considerable part of the year. During this time, which constitutes the best season in the mountains, they prefer to work in the lowlands for a pittance. When the *cosecha* is over, they return to the mines to earn a few pesos and to work under the worst possible climatic conditions.

Feast days and holidays are apparently limited only by the number of days in the year, and their observance constitutes a perpetual irritation to employers and a stumbling block to any really continuous effort. Voting for government officials is obligatory and nonattendance punishable with fine or imprisonment. When the booth is situated some distance from the mines, the journeys of the employees to and fro and the time necessary to recover from the effects of the visit occupy the best part of a week. Stragglers return at odd dates, and there must be no question as to their reinstatement. The interruption to the work must be viewed with as much complacency as possible, and it would seem that there is an axiom that industry must be regulated solely and entirely for the benefit of the employees, and that no other consideration whatsoever should be allowed to influence the management of affairs. No one who has ever heard the amazingly illogical requests periodically made by the peon would doubt for a moment that in his mind there is an entire dissociation of ideas as to cause and effect. He has no thought whatsoever beyond his own immediate well-being. Bribes and bonuses are alike ineffectual in an attempt to make him take an interest in the work. Contracts offering considerable advantages are made only to be broken at the first opportunity in those cases where the conditions cannot be evaded. Repeatedly I proved that the average peon would prefer to trick his employer out of 10c. rather than work to earn twice the amount with the same expenditure of labor.

In the smaller towns connected with the railways the ubiquitous Ford is much in evidence, but its area of usefulness is generally confined to those districts where transport is easy. As a general rule the roads are in a shocking condition and no attempt is made to keep them in repair—in marked contrast with the conditions in Chile, across the mountains.

Large sums have been spent in trying to adapt motor lorries in the haulage of mining machinery and supplies, but they have invariably met their Waterloo in the rivers and quicksands. Freighting is done, for the most part, by mule teams and two-wheeled carts capable of carrying from one to two tons. Five mules are usually harnessed to the cart, and sufficient compressed feed (*pasto*) for the animals is carried to last five or six days. Burros are also used extensively for light loads in the mountains.

THE TRANSMISSION LINE TAKING ELECTRIC POWER TO THE MINES IN THE MOUNTAINS

Railroad communication is scanty and inadequate, and the extension of mining is not likely to be realized until additional provision exists in this direction. The mineral belt from Mendoza to Bolivia lacks any high-grade or really valuable products. Lead with low silver content, manganese, wolfram, copper ores and many other products might be profitably exploited if the cost of transport to the centers were not prohibitive as it is at the present time. Freighting will always be an important problem and must be considered on a concentrated but not a high-valued product. The mineral belt badly needs a geological survey to justify extensions of the railroads in various localities. Without such means of communication the cost of exploitation and operation must invariably be in excess of any probable return.

The San Juan province, with an extensive and unproved mineral belt, possesses only one-quarter of a mile of railroad per 100 square miles of territory. Other provinces, such as Los Andes, have none. In the province of Rioja an ambitious aërial tramway scheme was entered into and a Bleichert ropeway erected at government expense to connect the mines in the Famatina district with the township of Chilecito, a distance of over 20 miles. The undertaking involved a considerable outlay which benefited only the immediate locality. Subsequent events have demonstrated that, had skilled mining and metallurgical assistance been available to estimate the reserves and probable extraction of copper from the mines, the result of these investigations would have been such that this tramway would never have been built. The Argentine government must be credited with a practical proof of its desire to keep mining in this district, and it is a lamentable fact that the expenditure was for the principal benefit of a company so near to liquidation.

The tramway is in sections, each equipped with a power station in spite of the fact that the cars would drop a vertical distance of over 11,000 ft. in the journey between the Famatina loading station and Chilecito.

ANDEAN CLIMATE IS DIFFICULT

Workers in high altitudes must expect intense cold at times. In parts of the Andes this condition is aggravated during several months, often the greater part of the year, by hurricane winds. The eddies seem to form in the mountains and the wind passes through certain *quebradas*, or gullies, and invariably in the west to east direction. These hurricane gusts alternate with periods of calm, each for about a minute or so. Conditions often persist for weeks on end with no intermission, day or night. In the open the force of the wind is sufficient to make human or animal progress impossible for the time being. Inside a building the noise made by the scurrying gravel and sudden gusts is such that one is in a constant state of wonderment as to how long anything made by human hands can withstand the strain. Exposed glass is "frosted" in a short time by the flying sand blast and needs to be well protected with wire netting, otherwise it becomes pitted with neat holes or blown in. Roofing timbers must be tied to the building with unusual precautions, and roofs are generally coated with a thick layer of a mortar made with sand and clay, which adds to the weight of the roof and, when dry, forms an effective protection against leaks.

Snow falls from April to July, and the higher peaks retain their mantle throughout the year. A combination of wind and snow in what is locally known as a *blanco viento* produces intense cold and a phenomenal drop in temperature. Traveling across the Andes is a perilous proceeding, and several passes through the mountains are not negotiable during certain seasons of the year on this account. The winds invariably prevent the snow from lying on the ground to any considerable extent. It is either blown away down the valleys or evaporates in the air or on the ground without leaving a suspicion of moisture.

Rain is almost unknown in the higher altitudes. From November to February cloudbursts are apt to occur in isolated spots, especially in the vicinity of heavily mineralized outcroppings. A mass of water falls in one place and gathers an irresistible momentum as it rushes down the mountain sides. Wholesale destruction accompanies its progress. In a few moments roads may be completely obliterated, river courses changed, and tens of thousands of tons of sand, earth and stones shifted from one place to another. The lack of any warning other than an ominous roar and the impossibility of estimating where the next cataclysm may occur make adequate provision against damage almost impossible.

EFFECT OF AN ARGENTINE CLOUDBURST

Fuel is scarce in the mountains and firewood for cooking and heating almost unobtainable. A small gnarled shrub (*jarilla* or *yareta?*) is usually available in small quantities for domestic purposes. This contains a great deal of resinous material, produces much smoke and deposits a quantity of semi-volatilized tar in the chimneys.

In the isolated districts the only mine timber available is a variety of poplar, which has to be hauled from the lowlands at considerable expense. As with many other materials, the expense of freighting is in excess of first cost. This timber is of the poorest quality and has a short life in the mine, where the water is usually far from pure. Steel construction has been proved to be preferable for mill work, and this material, combined with concrete, galvanized iron and asbestos sheeting, results in neatness and minimum cost for erection.

The rivers, of which there are few, vary in size from torrents of exceedingly muddy water toward the end of the year to small streams during the dry seasons. The steady all-year supply of water is from springs, and the excess during flood time from melting snow or *crecientes* (cloudbursts). The principal rivers are the San Juan and the Jáchal, both in the San Juan province. Neither is navigable at any time, but both are valuable for irrigation purposes and serve to change the appearance of spots in the valleys from barren sandy deserts to stretches of bright and welcome vegetation. Much of the water is available for power supply, but little of it is utilized for this purpose. The high proportion of solids carried during the flood season and for some months afterward constitutes a problem in ordinary hydraulic-equipment operation.

Toward the northern provinces (Los Andes, Jujuy and Rioja) quartz veins are common, but toward the south they are seldom seen. Several gold mines have been worked in various parts of the Argentine Andes. In the San Juan province the principal mines are found in the Guachi, Castaño and Gualilan groups. The Guachi mine never merited its name (mountain of gold) and is now abandoned, although its possibilities may have been neglected on account of its isolated position. The Gualilan mines, near Iglesia, were discovered in the middle of the Eighteenth Century and produced much gold by an amalgamation process, subsequently supplemented by roasting. The property consists of about 18 mines, and the expenditure some 30 years ago was in the usual lavish scale of English mining companies of the period, the equipment and buildings being unusually substantial. Whether the expenses for any single month were ever met by the returns may be doubted, but the property passed from hand to hand until its final collapse, attributed, according to local tradition, to the elopement of the manager with an accumulated yield of bullion. Such happenings were apparently by no means uncommon.

A TYPICAL ANDEAN FORMATION

Actual mining work at Gualilan is suspended at the present time, but a cyanide plant is in operation treating the tailings from the old amalgamation process. The bullion produced assays high in silver. A large tonnage of arsenical iron pyritic ore is at dump carrying a considerable amount of gold. The encountering of this combination in the lower levels of the mine was doubtless a potent cause for the discontinuance of operations at a time when little was known about the treatment of sulphide gold ores. Copper-silver ores also occur at Gualilan and should repay investigation. The mines are pleasantly situated at an altitude of only a few thousand feet. The drawbacks to success are inaccessibility and shortage of water and fuel. The Castaño mines are nearer to the capital of the San Juan province and have been intermittently worked for some time as gold-silver propositions. A mill and cyanide plant has recently been operated by a small syndicate. Argentiferous copper ore is also met with in this district, together with deposits of galena, oxide of manganese and zinc blende.

The bulk of the silver in this part of the Andes occurs in combination with lead as galena, of which there are extensive deposits. The Salado mines are in San Juan province in the same latitude with Coquimbo and near the Chilean border. These mines were rediscovered in 1844 and have been worked for silver at intervals since that date. The usual *antigua* methods of mining were followed by the Chileans, resulting in a honeycombing of the ground in the search for narrow stringers of high-grade ore. A considerable amount of work has since been done by two English companies. Wire silver occurs in places, but the bulk of the metal is associated with galena, in conjunction with iron and manganese. A small smelting plant, operated at the foot of the hills on the banks of the Jáchal River, was destroyed in the earthquake of 1894. No further attempt was made to repair the damage. "*La mano de Dios*" was sufficient excuse for lack of further effort.

Lead, copper, manganese, zinc and iron are met with in quantity in almost every locality. Galena deposits are perhaps the commonest, and the mineral usually carries an appreciable amount of silver. A silver content of 30 oz. per ton in extensive deposits is not unusual, but transportation costs are high and shortage of fuel prohibits the concentration to bullion form. The principal copper mine of the Argentine is the Famatina, in the province of La Rioja. This company has been reconstructed several times, fresh life has been infused into it at intervals by the application of more capital, but its fate was the same as many other Argentine mining concerns. Since the discussion of the apportioning of blame for the last fiasco, the company's affairs have been allowed to sink into oblivion and the corporation is now in liquidation.

The present copper production from the republic is trifling and the exports are nil. It needs only the successful operation of one mine for a length of time, coupled with a forgetfulness of past fiascos, to give the necessary impetus to a resumption of work.

Wolfram ores occur in several localities, and valuable deposits of the mineral possibly only await development and exploitation. In addition to the question of freighting costs, two factors are tending to delay development. One arises from the local idea that assumes that parties interested in the acquisition of mineral land are out to make vast fortunes. The result is that prices asked for land where wolfram ores are indicated are fabulous and absurd. It is useless to attempt to explain that there is nothing developed and practically nothing "in sight." The owner of the land is invariably deaf to all arguments and suave in his determination to part with the right, if he does so at all, only at a staggering price. The second drawback to wolfram mining lies in the fact that the mineral has been classed by the authors of the mining laws in the "*segunda categoria*" and distinct from gold, silver, lead, copper, etc. Land that contains minerals in the "*segunda categoria*" can be worked only by the owners of the land or upon their express permission. Cases have occurred where parties in ignorance of the law covering the classification of minerals have taken out mining rights for a certain area and have proceeded to develop a wolfram claim, to find that the first output was legally claimed by the owner of the land.

The principal company interested in wolfram-ore production has been the Hansa Sociedad de Minas, operating in the San Luis province. Exports from the republic are decreasing in arithmetical sequence, being 536 tons in 1913, 394 tons in 1914 and only 158 tons in 1915. Encouragement of the output in the Andean provinces should result in considerably improved returns.

BORATE MINING

Another branch of mining that is almost dormant on account of the lack of transportation facilities is that for borate. The deposit occurs in the Atacama desert in the Argentine provinces of Las Andes and Jujuy. This area is an extension on the Atlantic side of the Andes of the nitrate fields in Chile and resembles them in barrenness and aridity.

Some little work in Jujuy is still being carried on. In this province the deposits are worked for a few months of the year, being completely submerged in the rainy season. The borate, occurring as the double salt of calcium and sodium, is found in much the same manner as the nitrate on the Chilean *pampa*, and close to the surface of the ground. The large lumps removed with pick and shovel are dried to a degree permitting the screening of the adhering sand and earth. The clean crystals are then sacked for shipment and carry about 30 to 40% of B_2O_3.

The borate deposits are extensive, but inaccessible when comparison is made with similar deposits in Peru. Exports dropped from 933 tons in 1913 to 613 in 1914 and 192 in 1915.

All registration of mining claims must be carried out in the provincial centers of government and not in the federal capital. Application for mineral rights must be presented in writing to the office of mines in the capital of the province in which the discovery has been made. The application must be accompanied by full details as to location and a specimen of the mineral. Rights are issued as soon as an official signed survey plan of its position is available. The latter is usually obtainable with little trouble provided an agreeable method of persuasion is adopted with the mine's engineer. Mines are not supposed to be taxed, nevertheless levies are periodically made by the local authorities who are "laws unto themselves." Power plants operating mining equipment are also subject to local tax assessment for uncertain amounts. The mining law insists that a property, or *pertenecia* as it is called, must be worked by at least four miners during 230 days of the year. The balance of time may be presumed to have been allowed for "normal" interruptions caused by general elections, holidays and the more important *fiestas*.

At the present time measures are being continually introduced limiting the export of metals. Silver is practically unsalable in the republic and must be exported at considerable cost. The domestic consumption is small in the absence of a silver coinage. Gold is salable in small quantities and at a discount. Banks are not inclined to deal with the precious metals as in other countries, and the most elementary ideas exist among technical advisers and assayers to trading companies as to how shipments of metal should be valued.

Insurance of bullion on the railroads can be effected only at a prohibitive rate, and from mine to railroad it is impossible to come to any arrangement with the insurance companies. It is therefore necessary to conduct personally bullion from the mine to the ship at considerable expense and loss of time, the journey often taking a fortnight from outlying districts.

Research Corporation Fellowship

The Research Corporation, of New York, offers a fellowship of an annual value of $2500 to encourage scientific research directed to developing the industrial arts. It is to be awarded on competition consisting of the submission of evidence of scientific attainments, discoveries or inventions, and of special fitness for advanced work.

All persons desiring to compete must fill in a form of application, which will be furnished by the secretary of the corporation upon request, and file the same before Oct. 1, 1917, together with such letters of reference, scientific publications or other documents or evidence as they may wish to submit. A specific statement must be included of the particular field or object of investigation which the competitor proposes to conduct and a pledge that he will devote himself faithfully to the prosecution of such research if awarded the fellowship.

Foreign Trade in Copper

Exports of copper from the United States in May, 1917, are reported by the Department of Commerce as follows, the figures for April being given for comparison:

	April Lb	May Lb
Ore and concentrates, contents	516,958	583,662
Unrefined, in bars, pigs, etc	1,738,430	737,210
Refined, bars, etc	102,733,039	105,337,317
Old and scrap	1,236	168,909
Plates and sheets	3,834,546	1,241,761
Wire	2,651,964	3,194,365
Total	111,476,173	111,465,244

The weight of ore exported in May was 5835 tons; of concentrates, 337 tons.

Imports of copper into the United States in April and May, 1917, are reported by the Department of Commerce as follows:

	April Lb	May Lb
Ore and concentrates, contents	14,632,621	11,878,237
Matte and regulus, etc	3,617,594	4,941,783
Unrefined, in bars, pigs, etc	29,600,136	31,573,727
Refined, in bars, etc	224,005	453,128
Old, etc., for manufacture	1,853,157	1,065,695
Composition metal, copper chief value	11,330	23,310
Total	49,938,843	49,935,880

Material imported in May was 36,304 tons ore, 10,574 tons concentrates and 4858 tons matte and regulus, etc., mainly from Canada, Mexico, Cuba and Chile.

Observations on Attracting Capital

BY J. F. KELLOCK BROWN
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A dissertation on the natural depravity of incompetent promoters and irresponsible boosters, with some good advice for those seekers after capital who are willing to be rational.

THESE remarks are addressed to the man with a mine to sell, be he prospector, promoter or engineer. Perhaps it is strange that the latter should be included in such a lecture; but at times even an engineer, according to his character, becomes subject to an attack of "imagination run riot." In many quarters attention should be paid to an oft-told tale, for the grand old subject of the unscrupulous company promoter—that hardy annual of the technical press—is due another revival from a fresh source. Some recent and past experiences form the background of the story.

SQUARE DEALS AND OTHER KINDS

The process that the development of a mineral property has to go through before it becomes an actively producing mine looks simple and is simple—in fact so simple that it becomes difficult for some men to realize it, more particularly that suspicious class which must always see around the corner and up the back of any word said to them, searching for some hidden motive. The class which never gives a fair deal, and therefore cannot conceive such a thing to exist, has far too great a say in mining affairs.

Unless there is equity in any transaction there will be no continuance of business. That is the first maxim to bear in mind. If you buy a horse and the seller of the animal "does you," you do not exactly pine to buy another horse from the same man; but if you got satisfaction on the first deal, you would probably give the owner the preference on the second transaction.

The promoter and prospector vote *en bloc* for the common sense of that remark, but take the subject a little nearer home and the fishing becomes bad. The moral is that in mining far too many men never consider a second deal as a possibility; which means that they are in the business to make a cleanup on one transaction and to do so they rely upon every form of misrepresentation, or worse, that it is possible to employ. If we could persuade all who are directly or indirectly interested in this work that it is a business just like any other business, such as selling furniture or buying a house, in which the reputation of the manufacturing or building concern has something to do with its sales, and in which the business goes to the representative who, first of all, knows what he has to sell and all about it, and, second, meets competition by the production of a better article at a lower price, and, third, pays attention to small business details, such as proper presentation of the subject; if we could persuade mineral property dealers on both sides universally to accept these statements, perhaps the millennium might arrive.

Exaggeration and indefinite statements are fatal errors in the search for mining capital. This is another maxim to keep in view. Consider that capital is not just engaged in a mad scramble to develop mining lands. Consider that there are just as many people selling mines as there are farmers selling milk in a suburban locality. The milk supply may be scarce in these days and mines, also, may be relatively so, but under ordinary conditions this is not the case. Hundreds of proposed developments are placed before capital every day; and through much of this experience capital, or those who make the preliminary investigations for capital, naturally soon gets to know the hall-marks of the exaggerator and the characteristics of the reliable statement. The interceder for capital who concludes his remarks thus: "God didn't make this country for farming, and the timber is all cut off it, so he must have made minerals down below" does not acquire much standing in the halls of finance. Nor does the local engineer or owner acquire much of a reputation for veracity by trailing capital's representative three days in the bush, baiting the way with tales of 10-ft. veins, and winding up by pointing to a rice-paper string of quartz, saying: "There, sir, that always broadens out as it goes down, and there is millions beneath your feet for the asking." The "asking," by the way, is often only a small matter of half a million dollars or so.

LOCAL CAPITAL SELDOM SUFFICIENT

In the beginning of things there are always the prospector and the ancient partnership "grubstaking" to consider; but since these men cannot go far themselves, local capital generally takes a hand. Since it cannot within reason be expected that the struggling merchants and traders of a developing district can take upon their shoulders the entire development of a mining area, there is reached, sooner or later, a stage when an appeal has to be made to regular financial mining channels. It is in making this step that the handling of a property most frequently takes the wrong turning. Owing to conflicting views leading to legal entanglements, exaggerated ideas of the work accomplished, or poor valuation of the work to be done, mining progress languishes. This is a common state of affairs in most mining districts. The prospects are legion that have had local capital put into them, carrying them onward part of the way, and then failed to connect with outside capital. In many cases this is due to the fact that the early investigators never had a prospect at all, but there is an equally large number of prospects that never passed babyhood because the buyer and the seller could not get on common ground.

It is well to recognize the fact that, just as it takes two to make a quarrel, so also it takes two to make a business transaction, and both have to be satisfied. Let us forget the stupid and often prevalent idea that the question of selling a mineral property is a duel between the local man and a shark from the city, wherein each tries to get the better of the other, based on the general principle of trying to get something for nothing. Instead, get around a table and remember that each side to the transaction has to have a reasonably equal division of the deal. Both have rights. The one has the property and the other the capital. Simple—oh, so simple that it can't be done. Instead of the first man demanding a sum of money, large or small, but mostly huge, or the second man demanding a discount of the cost of production of the property to that stage, a much more equitable proceeding, and one that would lead to quicker and more satisfactory results, would be to concede the suggestion that a share-and-share basis might be conceived. The game of grab may be fascinating, but it is also responsible for much loss of capital in a district.

A suggestion worth some consideration might be the formation of a vigilance committee on mining affairs and promotions in each district. It would be a good thing if the local interests hung a motto upon their walls, and read it three times a day, to the effect that "there is such a thing as reputation, and reputation is as applicable to a country and to a district as to a man." A few individuals working along certain disreputable lines can destroy the entire reputation of a country in the financial center to which it must make its appeal, making conditions such that, no matter how reasonable or how good a prospect appears, it cannot be financed because it is in a district that bears a bad name. Instances of this can be multiplied the world over, and it is the cause of the change of fashion in mining investment that has taken place in certain lands.

When Local "Boosting" Is Harmful

Another equally stupid and most harmful proceeding is the irrational local boosting that takes place whenever there is a discovery of supposed importance, a boosting that consists solely of written words without any backing or knowledge of the true situation. A typical example of this "bull" is a story of an Alberta manganese discovery, that has been going the round of the Canadian press within the last few weeks. On reading it with any understanding one is inclined to wonder if all the press news measures up to the same standard of exaggeration and inexactitude. Surely most papers could ring up a reliable engineer on the telephone and get the proper presentation of the data in half an hour.

Another illustration of unfortunate exaggeration is found in the "hurry-up" stock-subscription literature of almost any "Buncombe Asphalt and Oil Co., Ltd., fearful and wonderful examples of the promoter's art. The authors of such specimens must have taken some college prizes for plausibility. Really the promoters who visit a district for the purpose of picking up mineral property should be licensed before being allowed to proceed about their business. The situation calls for such a proposal, just as it is considered necessary to grant a certificate to the manager of a mine after it has commenced operation. Why not do the same thing to the man who proposes to start a mine?

One of the most exasperating features of such ventures, constituting another reason why these affairs should be strongly handled and investigated before public presentation, is the partial and intentional use of well-known names in such a way as to give the impression that they are more or less connected with the enterprise. As matters stand at present the making of proper excerpts from reports by good men is a quite well-established art—the art consisting of the ability to get the "juice" and apply it to another picture.

I have a friend who tells me that he can find anything I want in raw materials in this part of Canada. So insistent is he that I have a sort of sneaking notion that one day he will wave a wand and show a platinum discovery at my feet. The country, in his estimation, has never been properly exploited; capital has missed, and continues to miss, many golden opportunities. By design I asked if he could find me a deposit from which a common every-day product could be manufactured. He vanished, returning after three days with the statement that what I required was easy; and with that he placed upon the table a small and doubtful sample, not any larger than a small-sized egg. In his ignorance, my friend expected his sample to be sufficient to decide an expenditure of half a million dollars. An option of purchase, running well into three figures, was tabled. I visited the spot myself, and viewed a worthless deposit whose only claim to fame lay in the chemical analysis. There was neither quantity, nor any sign of quantity: the situation was bad, and the price absurd.

Common Case of Self Deception

Individuals of this type are common and as dangerous as they are common. They have the idea irrevocably fixed in their minds that if any material is inquired for it must be in instant demand, wanted in a terrific hurry, and worth millions; and so scarce that only their particular spot on the earth has it. A possible purchaser has therefore, in their minds, to buy it regardless of price. Years of failure and weary waiting have failed to alter their opinion. Hope springs eternal in the promoter's breast—there is no truer proverb than that. Having got this idea into their heads, they proceed to indulge in the process (called, by the ignorant, one of the attributes of a good citizen) known as "boosting" the property and district, and not infrequently get themselves advertised extensively as enterprising citizens of their particular neighborhood; while all they are accomplishing is much harm, harm that takes years to overcome. The irresponsible booster whom the local papers are fond of backing up, without the ghost of an idea as to whether the booster is right or wrong, is a trouble to his district. Multiply him by a thousand and he becomes a menace to proper progress. "Boosting" just because "boosting" is a habit, a virtue, is bad policy because it forgets that the stupid booster administers the greatest knock a country can receive. The idea seems to be that if one shouts loud enough, a man with money will hear. Unfortunately, this type of shouting drowns the voice of the holder and promoter of areas where reasonable production could be commenced.

One Born Every Minute

I live in a town of 50,000 inhabitants, let us say, and, with the exception of infants in arms, every citizen holds stock in some industrial or mining venture calculated in some glowing day of past regrets to bring riches within the reach of all. A latent sense of past foolishness makes most of us hold our tongues about such investments; but nevertheless they were made, as now and again the declared wills of some of the most prominent citizens disclose to our astonished eyes heaps of worthless stock certificates bought by men we have all come to look upon as the embodiment of cautious investment. These things are memories of long ago.

Notwithstanding that this is a good business district, where we flatter ourselves we do know something about business, it is rather weird to discover how close is the connection in the mind of the promoter between proper business and the other sort of enterprise. They soulfully call it "bringing capital into the country" or "developing their own neighborhood and deserving a patriot's crown." We have had gold companies, oil companies, steel companies, hosiery companies and many another of varied hue and species; the only common feature being the money they were to bring to their fortunate owners. How many millions of capital have gone in this one district on enterprises founded on a wrong basis, started before the market was there, or begun upon a deposit of material inadequate to meet the demands of the plant. And if millions have gone from this one small section of the country, what must be the amount of money poured out in other parts of the land? Truly romance cannot yet be dead—the foot of the rainbow still glamors.

There can be only one meaning taken out of these examples of our extraordinary methods of attracting capital. They have been inadequate, disorganized and haphazard in the past; we have no sense of the usefulness of any of these proposals to the country; and there is no balance in our judgment of the rights of capital in making new investments. Would we not then have taken a big step forward to increased development, if we had two things done: a method or a program whereby the natural possibilities of each deposit, district, place, could be properly valued; and further censorship over any project proposed for the investment of capital?

A History of the Detinning Industry*

The quantity of tin recovered from tin-plate scrap in the process known as detinning makes this industry a factor of considerable importance. The Goldschmidt Detinning Co. handles in excess of 100,000 tons of tin scrap per year. The Welsh tin-plate industry absolutely controlled the world up to about 1890, disposing of over 70% of its production in the United States. The McKinley act of 1890, placing a high protective tariff on tin plate, established the industry in this country, and before the outbreak of the war over 1,000,000 tons of tin plate was produced, and at the present time production is estimated at 1,300,000 tons.

Naturally, the increased production of tin plate to large proportions brought forward the problem of utilizing the scrap and clippings which accumulated in large quantities. The modern process is a development of many decades of study and experimentation. All the processes may be divided into three general classes—the mechanical process, the chemical process and the electrochemical process.

The mechanical process consisted in attempting to separate the iron and tin by means of heat and more recently by refrigeration. These methods were impractical, mainly because it was not possible to obtain thorough separation of the tin from the iron.

The chemical and electrochemical processes also failed, because the acids used attacked the iron as well as the tin, or did not dissolve the tin sufficiently and left considerable adhering to the iron. Also the chemicals used were too expensive to make the process an economical one.

Three processes have operated successfully during the last forty years, during which time one or another has alternately obtained superiority, due to refinements in that process over the others. These three processes are the electrolytic-alkali, the chlorine process, and the alkali-chemical process.

ELECTROLYSIS IN AN ALKALI SOLUTION

In 1876 Keith[1] recommended the electrolysis of tin scrap in an alkali solution, and in 1882, Th. Goldschmidt, in Germany, conducted experiments with a warm solution of caustic soda using the tin plate as the anode and the iron plate as the cathode. One trouble with the process was that the electrolyte had to be watched constantly and great care exercised to separate thoroughly the tin from the iron. The tin recovered at the cathode is spongy or finely granulated precipitate, which can be easily removed and melted, a considerable advantage, as it obtains in a single operation a serviceable iron that can be compressed into solid billets and readily marketed. The tin sludge can also be easily melted into pig tin. This fact caused the process to come into general use, and it dominated the field up to about 1907.

THE CHLORINE PROCESS

The chlorine process was first proposed by Higgins[2] in England in 1854, and later by Parmalee[3], Seely[4] and Panton[5] in this country. It was known that only dry chlorine gas could be used, which will combine with tin under development of considerable heat to form anhydrous tetrachloride of tin, a heavy liquid which fumes strongly in the air. As chlorine does not attack iron at low temperatures, the process seems apparently simple. Considerable improvements and modifications were necessary however in order to make use of this property of iron.

A chlorine detinning plant was established in New York City in 1873, operating under the Seely patent, but failed because of the financial panic in that year. Lambotte, in Brussels, in 1885, started to operate the chlorine process on a large scale with a shaft furnace filled with tin scrap from the top, while chlorine gas strongly diluted with air was introduced at the bottom. This chlorine was combined with the tin from the scrap, and the air would carry away the tetrachloride to condensers, where it was condensed. The detinned clippings were then removed from the furnace bottom and compressed into billets. However, the control of the chlorine gas is difficult and the workmen were greatly annoyed. Furthermore, the detinned clippings were not entirely detinned and were covered to some extent with tetrachloride of tin.

In 1907 Th. Goldschmidt abandoned the electrolytic method in favor of the chlorine process with the result that more tonnage is detinned today by chlorine than all other processes combined. One basic condition of chlorine detinning is the exclusion of all humidity to avoid a destroying effect on the iron. The material must also be free from all organic substances such as paper, straw, varnish, etc. The dry tin scrap is put into large cylindrical containers in more or less loose form or compressed into billets. The containers are closed tight and dry chlorine is introduced. As considerable heat is formed, means are taken to cool the apparatus. High pressure is used to cause the chlorine to penetrate every part of the tinned scrap. This process can be carried on in larger units than in the electrolytic process, and labor charges are therefore materially reduced. The tetrachloride of tin produced is largely used in the silk-dyeing industry.

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*Abstract of an article entitled "A Short History of the Detinning Industry," in "Reactions," second quarter, 1917.

[1] U. S. Patent, 176,658; [2] English Patent, 1766, 1854; [3] U. S. Patent, 102,148; [4] U. S. Patent, 127,375; [5] U. S. Patent, 135,578.

ALKALIES IN COMBINATION WITH OXIDIZERS

Another process, detinning by alkalies either alone or in combination with oxidizers, has been developed in recent years to a point where results compare in every respect with the chlorine process. The scrap is placed in a hot solution containing excess of free alkali and saltpeter or other oxidizer. The mass is then boiled for several hours, during which time the tin accumulates in the form of crystals of stannate of soda. The crystals are drawn off, subjected to centrifugal action and remaining mother liquor diluted with necessary caustic soda and saltpeter to enable it to be used again. The stannate of soda is afterward dissolved in water and oxide of tin precipitated by means of bicarbonate of sodium. Only a small loss of alkali occurs, as the solution is used over and over again. The saltpeter is also recovered at the end of the operation with the exception of the amount required to oxidize the tin. The tin oxide obtained in this process is used extensively as a coloring matter in the enamel industry or is smelted to form pig tin of high quality.

The Goldschmidt Detinning Co. uses this process as well as the chlorine process, and its output comprises large amounts of tetrachloride of tin and pig tin of a purity which in every respect is the equal of Straits tin. The company recovers every year about 2000 gross tons of metallic tin.

Increase in Quicksilver Production

Final statistics of the domestic production of quicksilver in 1916, compiled by H. D. McCaskey, of the United States Geological Survey, show an output of 29,932 flasks of 75 lb. each, at the average sales price of $86.08 per flask reported by producers. This represents an increase in quantity of 8899 flasks and in value of $749,635 compared with the yield of 1915. In the New Year's preliminary figures given out by the Survey on Jan. 3, 1917, the production of 1916 was estimated at 28,942 flasks from best information available, and the value was given at $3,643,800.

The production of California in 1916 was 21,045 flasks, against 14,283 flasks in 1915. The production from shaft furnaces was 19,197 flasks, and the remainder came from retorts. The principal producers were the New Idria, New Almaden, New Guadalupe, Oceanic, Helen, St. Johns, Cloverdale, Culver-Baer, Patriquin, King, Oat Hill, and Great Eastern mines. A new producer began operations at Tehachapi, in Kern County—a new locality of interest. There was general activity in all the old-established quicksilver mines and districts and some experimentation in concentrating low-grade ores and old dumps and in furnace improvement, and there was increase in recovery of metal formerly lost at plants now dismantled.

The output of Texas was 6306 flasks, all from shaft furnaces, and the producers were the Chisos, Big Bend, Texas-Almaden, "38," and Mariposa mines, all but the first of which were reopened in 1916, some under new management, to take advantage of the higher prices then prevailing. The Chisos has been in steady operation since the early development of the Terlingua district, in Brewster County, where all the producing properties lie in a comparatively small area.

The production from Nevada was 2198 flasks, of which 1593 flasks came from shaft furnaces and 605 flasks from retorts. The principal producers were the Goldbanks, Mercury, Nevada-Cinnabar, Red Devils and Lost Steers, the last two being in the new district near Mina. Prospecting was active in Humboldt and Elko Counties. In Arizona, Oregon and Washington there was a combined output of 383 flasks. There was but one small producer each in Arizona and Washington. In Oregon the Black Butte mine, reopened in 1916, was the principal producer. Considerable activity was shown in prospecting and development work near Gold Hill.

The exports of quicksilver during 1916 were 8880 flasks, of which much the greater part went to England and Japan in nearly equal quantities, smaller exports going to Canada, Hongkong, Scotland, and many other countries. The quicksilver imported for consumption in 1916 amounted to 5659 flasks, the largest part of which came from the mines of Spain and Italy, chiefly through New York.

Foreign Iron and Steel Trade

Exports of iron and steel from the United States in June and the fiscal year ended June 30 are valued as below by the Department of Commerce. The first line gives the total value of iron and steel exports; the second line the value of machinery; the third line the total tonnage, in gross tons of those articles which are reported by weight:

	June		Year	
	1916	1917	1916	1917
Iron and steel, values	$76,257,884	$119,141,836	$621,209,453	$1,129,341,616
Machinery, values	20,541,139	27,946,036	182,077,065	262,241,278
Tonnage exports, tons	527,542	631,712	4,862,154	6,885,543

The value of June exports was the highest ever recorded in a single month. The total values for the fiscal showed an increase of 81.8% over the previous year, and were by far the largest ever reported. The largest increases in tonnage were in pig iron, in billets, ingots and blooms, in steel bars and in plates.

Imports of iron and steel reported by weight were as follows, in gross tons: In June, 26,888 tons in 1916 and 28,421 tons in 1917; for the fiscal year, 309,051 tons in 1916, and 395,161 tons in 1917. The only notable increase was in scrap. There was an important decrease in steel rails, chiefly from Canada.

Iron ore imports into the United States in June were 134,154 gross tons in 1916 and 54,846 tons in 1917. For the fiscal year ended June 30 the total imports were 1,425,717 tons in 1916 and 1,149,958 tons in 1917; a decrease of 175,759 tons, or 19.3%. Of the imports in 1917 Cuba furnished 613,308 tons; Spain, 216,046; Sweden, 147,610; Newfoundland and Canada 142,570 tons. There was a large increase in the imports from Spain and a heavy decrease in those from Sweden.

Stoping Methods at the Franklin Mines

By H. H. HODGKINSON
Mine Superintendent, Wharton Steel Co., Wharton, N. J.

Method of shrinkage stoping at the Franklin mines of the New Jersey Zinc Co. Details of operations, consumption of materials, tonnages handled per man and costs per ton are shown in detail.

THE orebody at Franklin, N. J., consists principally of a granular mixture of willemite, franklinite and zincite, the gangue being a highly crystalized white limestone. It has a maximum vertical depth of 1150 ft., dipping southeast 40 to 60 degrees.

The greater part of the ore is mined by means of shrinkage stopes 17 ft. wide, the orebody being so mapped out that there is a pillar of solid ore 35 ft. in width left in place between each stope slice. The stope slices are carried transversely across the orebody according to line (each stope is laid out on a coördinate and numbered, starting with a line through the old Parker Shaft as 00). Each stope varies in length according to the variation in the horizontal distance from foot to hanging wall, while the height is equa to the distance between levels, which is about 50 feet.

METHOD OF PROPPING BAD GROUND IN THE FRANKLIN MINE

Formerly the ore was mined entirely by means of large drifts on each level driven longitudinally with respect to the orebody, there being as many as five of these drifts on a single level, the pillars between varying from 10 to 25 ft. in thickness or more. Crosscuts at frequent intervals were also driven connecting these drifts. The ore was all shoveled by hand into cars. Owing to the equipment and capacity of the mill only the richest ore was mined, the leaner materia being left in the pillars. The ore chutes delivered the ore to the main level, and it was hauled by mules to the shaft or slope to be hoisted.

CHANGE OF MINING METHODS

When the method of mining was changed, a new shaft was sunk and haulage drifts were driven in the foot wall on the main levels 300, 750, 950 and 1150 thus they are outside and away from the orebody a sufficient distance to be protected from any injury due to mining operations, it being unnecessary to have large pillars of ore in place to support them. From these haulage drifts, which are equipped with 6-ton electric locomotives hauling cars of five tons' capacity a number of raises were driven to serve as ore chutes connecting the foot-wall drifts of each level. These ore chutes are placed in the pillars between the stopes and hence receive no interference from stoping operations.

Besides these raises, others were driven for the purpose of bringing down rock mined in the quarries and mill rejections, with which to fill the stopes after the removal of the broken ore.

In beginning stoping operations a crosscut 5½ x 7 ft is driven on the lowest level of the ore from foo to hanging wall, which is widened later to 17 ft. with a height of 12 ft. A temporary track is laid in the small drift, consisting of 20-lb. rails of 2-ft. gage, the ore being loaded into 1½-ton cars and trammed to the ore chutes by two men.

After the ore is removed, sills are placed and the track graded to 1½% from the foot wall, so that the grade will be in favor of the load in tramming the ore. Set timbers, which consist of 4-ft. 3-in. cap inside and 8-ft. legs, are next erected and loaded with rock filling packed in behind to support them; about 18 in. of 6-in. lagging is placed on the caps of the set timbers, which are braced and equipped with plank chutes by means of which the ore is loaded in cars instead o being shoveled. From on top of the set timbers a raise 4 x 4 ft. is driven in the foot wall up to the level above, which serves as an entrance and exit to the stope after the chutes in the set timbers are full of broken ore and no longer available for that purpose.

At the intersection of the stopes with the numerous drifts on each level it is necessary, before beginning stoping operations, to build cribbings of 8-in. oak timber on each side of the stope to give additiona support to the pillars and also to hold in the stope the broken ore which would otherwise flow out on the level. The cribbings are filled with broken ore, obtained from the stope to which they belong, to make them more substantial.

The work of mining the ore in the stope slices is done from on top of the set timbers. Holes 8 ft. in depth are drilled in the back or roof at an inclination of from 45° to 60° by means of hammer drills using [illegible]-in. quarter-octagon drill steel sharpened with a cross-bit. These holes are loaded with six sticks of 50% 1 x 8-in. low-freezing gelatin and blasted at the close of each shift. The miners begin mining operations at the hanging-wall end of the stope, retreating toward the foot wall, standing on the broken ore as the operations proceed upward. The work of stoping is performed by two men in each stope, who not only do their own drilling and blasting, but also clean down their loose ground, place props and blockhole the chunks that are too large to pass through the chutes. These men break from 100 to 250 tons per drill shift, drilling from ten to eighteen 8-ft. holes, the amount of ore broken per foot of hole drilled varying from one to two tons.

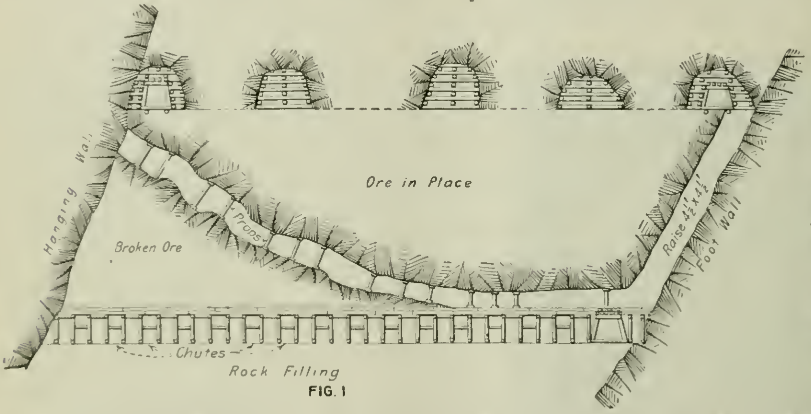


FIG. 1

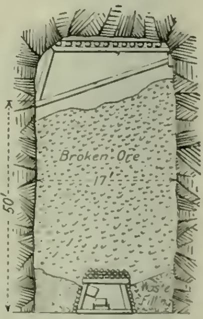


FIG. 2

LONGITUDINAL AND CROSS SECTIONS OF STOPE IN FRANKLIN, N. J., MINE

The surplus ore in the stope is drawn out through the chutes in the set timbers so as to permit a space of about 6 ft. from the surface of the broken ore to the solid back of the stope to permit good working space. In this manner the stope is mined 12 ft. above the next higher level, thus permitting space to erect set timbers again in order to continue stoping operations from this level.

MINE OPERATING SUMMARY

Results for Active Shrinkage Stopes (Average)

Tons broken per man in stope	48.5	Tons trammed per man, tramming, handling and electric haulage	15.3
Tons broken per drill shift	145.3	Tramming explosives cost, per ton	$0.001
Tons broken per foot of hole drilled	1.14	Fill trammed per man tramming, cu yd	14.1
Breaking explosives, cost per ton	$0.036	Fill trammed per man, electric haulage, cu yd	96.0
Timber charges, cost per ton	$0.15	Fill placed per man tramming, handling and electric haulage, cu yd	10.1
Tons trammed per man tramming	20.4		
Tons trammed per man electric haulage	69.0		

The above results are based on a shift of 8 hours

The stope, which is now filled with broken ore, is ready to be drawn as soon as the back is timbered. It is usually found necessary to protect the miners working in the stope and engaged in cleaning the sides and pulling the ore down into the chutes, from any falls of ground; for, as the ore is drawn down, these men are continually getting farther away from the ground over their heads.

The operation of drawing the broken ore out of a stope is begun at the hanging-wall end of the stope, the miners working on a sloping pile. As the chutes become empty, the car is moved back to the next chute, retreating toward the foot wall and protected by the broken ore on the set timbers from any falls of ground which would otherwise crash through the exposed set timbers.

After the stope is drawn, the set timbers and lagging are removed to be used again elsewhere and the stope filled with waste rock. The fill is dumped from the foot-wall end of the stope by means of the regular tram-cars, the car advancing out into the stope on a track laid on the fill. When the stope becomes filled, set timbers are again erected and the whole operation is repeated.

The largest amount mined in a single stope for one month was 7310 tons of ore. The largest amount of ore trammed from a single stope in one month was 5250 tons, while 4490 cu.yd. of rock filling is the maximum amount of rock placed in a single stope with hand tram-cars in a similar period.

DUTY ON METALS ENTERING NEW ZEALAND, according to "Commerce Reports," is as follows: Pig iron, fencing wire (plain and barbed), sheet lead, and plain sheet zinc enter free of duty from all countries; on nails the duty varies from free from all countries to 48c. per cwt. of 112 lb. from the United Kingdom and possessions, with 24c. additional from all other countries; iron bars, bolts, sheets and plates enter free from the United Kingdom and possessions, with 20% additional from all other countries; corrugated galvanized iron, 48c. per cwt. from the United Kingdom and possessions, with 9⅗c. additional from all other countries. In addition to these rates of duty, there is a special war tax of 1% ad valorem collected on all imports into New Zealand.

Tentative Safety Rules for Gold Dredges in California

Practical ideas, received from representatives of various interests, have been incorporated in rules pertaining to general welfare and safety of employees on the gold dredges of California. Public hearings are being held this week in San Francisco, by the Industrial Accident Commission of the State of California, for the consideration of these proposed regulations and for the reception and discussion of other pertinent suggestions.

THE Industrial Accident Commission of California was empowered by the Workmen's Compensation Insurance and Safety Act to make and enforce safety orders for various industries. In carrying out the provisions of this act the Commission requested the following men to formulate a set of safety rules for gold dredges: Harold Mestre (chairman), consulting engineer; F. L. Lowell (secretary), deputy mine inspector, Industrial Accident Commission; L. D. Hopfield, department manager, Natomas Co. of California; C. W. Gardner, representing Hammon Engineering Co.; A. L. Wilde, district representative, International Brotherhood of Steam Shovel and Dredge Men; Carl Brown, manager, California Casualty Indemnity Exchange; H. M. Wolflin, mining engineer, U. S. Bureau of Mines, chief mine inspector, Industrial Accident Commission; R. L. Eltringham, electrical engineer, Industrial Accident Commission.

The rules drafted have been divided into four sections: General Safety and Welfare; Guards Against Falling and Falling Objects; Machinery and Power Transmission; and Electrical. The "Electrical Utilization Safety Orders," "Air Pressure Tank Safety Orders," and Sec. 29, 30, 31 and Sec. E (appendix) of the "Quarry Safety Rules" shall apply, where applicable to gold dredges.

GENERAL SAFETY AND WELFARE

Rule 401. Reporting of Accidents.

(a) Report of Fatal Accidents—Whenever a fatal accident occurs on or about any gold dredge, notice thereof shall be given promptly, by telephone or telegraph if possible, to the chief mine inspector, by the superintendent or other person having immediate charge of the work at the time of the accident. Upon receiving such notice the chief mine inspector or a deputy shall, if feasible and if the nature of the accident shows it to be necessary, proceed to the scene of the accident as early as possible and investigate fully the cause of the accident, and shall file the result of such investigation as a report in the office of the chief mine inspector. Whenever the chief mine inspector or a deputy cannot proceed as above to the scene of the accident, the person in charge of the gold dredge shall be so informed, and such person in charge shall obtain signed statements, sworn to where practicable, of those who witnessed the accident, or, if no one was present at the time of such accident, he shall obtain the statements of those first arriving upon the scene. Such statements shall give, as far as possible, the details of the accident, the facts leading up to it, and its probable cause; such statements shall immediately thereafter be sent to the Industrial Accident Commission, which shall file the same in its office. A transcript of the evidence given at the coroner's inquest may be sent in place of these statements if the operator so desires.

(b) Report of Personal Accident—Every personal accident occurring on or about a gold dredge shall be promptly reported to the man in charge of the dredge by the person injured, or, if such person shall be unable to do so by reason of the injury, then by some person acting in behalf of the injured person; and such injury shall be promptly reported to the superintendent's office, where it shall be recorded. These records shall at all times be open to examination by the chief mine inspector or any deputy.

Where the injury disables through the day of injury, or requires skilled medical attention, a written report must be made to the Industrial Accident Commission on the blank form furnished by the Commission. This report must be forwarded within 35 days from date of injury.

Rule 402. Care of the Injured.

(a) Telephones—A telephone shall be installed on or near every gold dredge in order to provide quick communication with a doctor. Arrangements shall be made so that in case of an accident requiring medical treatment the doctor shall be brought to the injured man or the injured man to the medical aid as quickly as possible.

(b) First-Aid Equipment—It shall be the duty of operators, superintendents, or anyone in charge of any gold dredge or gold dredges to keep in the winch room, or other approved location on each boat, a stretcher of a type approved by the Commission, a woolen blanket, a waterproof blanket and such additional first-aid materials as are designated in the tables 1 and 2 or 1 and 3, in good condition for use in caring for any person who may be injured on or about the boat. Where satis-

TABLE I. MISCELLANEOUS

1 blunt end eye dropper.
1 U. S. army tourniquet.
1 small medicine glass.
1 pair scissors.
1 pair forceps suitable for extracting splinters, etc.
2 doz. applicators for iodine.
½ doz. paper drinking cups.
1 teaspoon.

Preparations

2 oz. tincture iodine, ½ U.S.P.
2 oz. 2% solution of Boric Acid.
2 oz. aromatic ammonia.
1 doz. ampoules, 1 c.c. aromatic ammonia.

TABLE II.

5 yd. 1-in. gauze roller bandage.
½ doz. triangular bandages.
1 doz. small-size bandage compresses (1-in. sq., tails ½ yd. long, center of compress being sewed to tails; folded upon itself about 20 times).
1 doz. medium-size bandage compresses (2½ in.sq., tails 1 yd. long; center of bandage compress sewed to tails; folded upon itself about 20 times).
½ doz. large-size bandage compresses (3½ in.sq., folded upon itself 18 times, tails 2 yd. long, center of bandage compress being sewed to tails).
2 1-yd pkgs. picric acid gauze. (An equivalent quantity of gauze in smaller packages may be substituted for one 1-yd. package).
½ doz. yucca splints.
5 yd. 2-in. gauze roller bandage.

TABLE III. BANDAGES

5 yd. 1-in. gauze roller bandage.
¼ doz. 1-in. x 10 yd. gauze.
½ doz. 2-in. x 10 yd. gauze.
2 compresses, U.S.A. style (large size).
2 triangular bandages.
5 yd 2-in. gauze roller bandage.
Handy-fold plain gauze (6 x 36-in.)—2 yd handy-fold or equal.
Plain gauze 1 yd.—2 packages.
½ doz. Z.O. adhesive plaster, ¾ in. x 4 yd
½ doz. Z.O. adhesive plaster, 1 in. x 5 yd
8 oz. Carron oil with 2% carbolic acid. This must be placed in four 2-oz bottles, sealed with paraffine or other suitable material.

factory arrangements have been made for the prompt bringing of medical assistance to the injured man on the boat, and there is more than one boat operated by the same company, and the boats are operated in reasonably close proximity to each other, one stretcher of approved type centrally located and easily accessible to the attending physician may be supplied instead of the one stretcher on each boat, as above required.

Substitutes for the above materials may be permitted by the Industrial Accident Commission on request.

(c) First-Aid Training—The superintendent shall see that at least one man on each shift on each dredge is thoroughly trained in first aid. For the purposes of these rules, men shall be considered to be thoroughly trained when they are able to administer first-aid treatment for shock, bleeding, burns, cuts, bruises, sprains, fractures and dislocations; they shall be able to administer artificial respiration by the prone-pressure (or Schaefer) method and understand the proper methods of transporting the injured.

All employees shall receive first-aid training and classes for their instruction shall be provided not less than once in each calendar month.

Rule 403. Intoxicating Liquor.

No employee shall, while under the influence of intoxicating liquor, go aboard a gold dredge, nor shall any employee carry intoxicating liquor aboard the same. It shall be the duty of the dredge master, or the man in charge, to enforce this rule.

Rule 404. Sanitary Requirements.

(a) Drinking Water—(An excerpt from the statutes and amendments of the codes of the State of California: An act to require employers of labor to furnish, without charge, pure drinking water to their employees during working hours. Approved May 24, 1915. In effect Aug. 8, 1915.)

> Every employer of labor in this state shall, without making a charge therefor, provide fresh and pure drinking water to his employees during working hours. Access to such drinking water shall be permitted at reasonable and convenient times and places.
>
> Any violation of the provisions of this act shall be deemed a misdemeanor and punishable for each offense by a fine of not less than twenty-five dollars ($25), nor more than one hundred dollars ($100), or by imprisonment for not more than thirty (30) days, or by both such fine and imprisonment.

(b) Toilets—It shall be the duty of the operators of every gold dredge to provide a suitable enclosed toilet on the dredge.

Rule 405. Illumination.

All parts of the dredge where men are required to be or go when the dredge is in operation shall be provided with adequate light at all times.

Rule 406. Fire Protection.

A box containing at least 2 cu.ft. of clean, dry sand and a scoop shall be kept at each of the following places on all gold dredges: Winch room, each oil switch or auto starter or each group of oil switches or auto starters, oil and grease store room, provided that one approved extinguisher of the one-quart carbon-tetrachloride type may be substituted for each 2 cu.ft. of sand required.

Rule 407. Protection Against Drowning.

(a) Safety Ladders for Hulls—Safety ladders must be fastened to each side of the hull of the boat to extend from the main deck to 3 ft. below water line. One ladder must be placed on the forward end of each pontoon and one on each outer side forward of the main house.

(b) Life Line—A wire hand rope shall be run along both sides of the boat and so hung that it shall be at all times at or near the water line; an additional line shall be used where necessary to meet this provision.

(c) Life Buoy—A standard-size circular cork life buoy, with sufficient length of rope attached, must be placed on the main deck of each boat on each side, just inside of forward end of main house, in a convenient place, and maintained in serviceable condition. The life buoys shall be secured with seals, which are to be broken only in case a man has fallen into the pond.

(d) Grappling Hook—A grappling hook with sufficient rope attached to reach the bottom of the pond shall be placed in a convenient place on the main deck of every dredge and secured by a seal. This seal is to be broken only in case a man has sunk in the pond and it is necessary to grapple for his body.

Rule 408. Goggles.

A suitable pair of goggles shall be issued to each individual worker who is exposed to any serious eye hazard through the nature of his work.

Rule 409. Hand Tools.

Hand tools shall be regularly inspected and the heads annealed and dressed as often as necessary.

GUARDS AGAINST FALLING AND FALLING OBJECTS

Rule 421. Gantry Platforms.

Platforms shall be provided on bow and stern gantries at a convenient distance below all sheaves, so that such sheaves shall be safely accessible for greasing or other purposes. These platforms shall be of close planking, not less than 2 in. in thickness and suitably supported. Openings not larger than necessary to admit free passage of ladder, spud and stacker lines shall be left and protected by toe-board, and such sections of the flooring as necessary to permit the working of the head lines shall be made removable. Gantry platform railings shall be of substantial construction and securely fastened. If pipe railings are used, floor flanges will not be considered a secure method of fastening, unless stanchions are extended through platform and flanges placed on under side and bolted through.

Rule 422. Railings and Toe-boards.

(a) Railings—The outside edges of all decks, elevated walks, runways or platforms except the roof of the winch house and the main deck, if 4 ft. or more from the water or deck below, must be provided with a railing not less than 3½ ft. high.

Note: Thirty-six inch railings will be permitted where at present in existence.

(b) Toe-boards—If the height exceeds 6 ft. above water or deck below, a toe-board must be provided to prevent material from rolling or falling off, except that no toe-boards shall be required on the stacker runways, roof of the winch house or the main deck walk across the stacker belt at the lower end.

(c) Deck Openings—All deck openings must be guarded with a railing not less than 3½ ft. high, have a toe-board not less than 6 in. high and an additional railing midway between the toe-board and top rail. Railings are to be constructed in a safe and substantial manner of either pipe, metal work or wood. One or more sides may be on hinges, or, if hinges are impracticable, sockets may be used. The screen well shall be considered as a deck opening. All deck openings which can not be guarded as required in this manner must be guarded with a cover, preferably hinged.

(d) Doorways—Doorways used as landings shall be guarded with a single rail which may be more than 42 in. but not more than 60 in. above the deck, or else vertical hand rails shall be provided on each side of doorway.

(e) Access to Elevated Platforms—Permanent elevated platforms must be equipped with a permanent stairway or stationary ladder. Where a stationary ladder or stairway passes through any elevated platform, the opening shall be of sufficient size to permit of easy passage in a normal position by any one using the ladder or stairway.

Rule 423. Ladders.

(a) Substantial Construction. All ladders shall be of substantial construction throughout and shall be maintained in a safe condition, with the rungs tightly fastened and free from seriously weakening cracks or wear.

(b) Spacing of Rungs—Rungs shall be spaced uniformly and be not less than 12 in. or more than 15 in. from center to center.

Fixed Ladders: (c) Construction of Rungs—Rungs, if of wood, shall be clear lumber, free from checks and knots, of a minimum size of 1¼ x 3 in., and set in stringers at least ⅝ in. at the bottom. (d) Clearance—There shall not be less than 6 in. clearance from each rung to the nearest permanent object back of ladder. (e) Protection of Rungs—If ladder is made by nailing rungs to a vertical or inclined post or upright, the ends of rungs shall project at least 6 in. beyond post or upright at each end. (f) Width of Ladders—Stringers shall be spaced not less than 15 in. apart. (g) Projection above platform—Ladders shall project at least 3 ft. 6 in. above any platform to which the ladder leads, unless convenient and secure hand-holds are fixed at such places.

Portable Ladders: (h) Precautions against Slipping—All portable ladders (except substantial stepladders) must be provided with either sharp points at the foot, or wide, rough-surface feet, or other effective means to prevent slipping. Ladders for use in oiling overhead shafting, where necessary to rest same on the shafting, must be arranged to hook over the shafting.

(i) Width of Ladders—All portable ladders are not to be less than 15 in. wide at the top. (Note: It is suggested that the width of ladder be increased ½ in. per ft. of length from top to bottom.)

Rule 424. Stairways.

(a) Handrails—All stairways must be equipped with handrails, the top of which shall be 30 in. vertically from the nose of the tread, as follows: 1. Where the stairway is not built next to a wall or partition, rails must be placed on both sides. 2. If stairway is closed on both sides, at least one handrail must be provided. 3. If width is greater than 4 ft., rails must be provided on each side.

(b) Illumination—All stairways must be properly lighted, either by natural or artificial light.

(c) Risers and Treads—All risers and treads on any stairway shall be uniform, except that on existing installations a shorter riser may be permitted at the bottom. (Note: Stairways should not be built at a sharper angle than 50 deg. For sharper angles, ladders should be used instead.

Rule 425. Stacker Runways.

Evenly spaced cleats shall be provided on stacker runways and maintained in good condition and tightly fastened. No toe-board is required on these runways but an intermediate rail shall be provided half-way between the top rail and runway; this rail may be of wire rope, if preferred. A safe approach shall be provided to the inner end of both stacker runways.

Rule 426. Stacker-Crossings.

A cross-over walk from the port-stacker runway to the starboard-stacker runway at or near their outer ends shall be provided and equipped with a railing.

Rule 427. Stacker Rock Stops.

Rock stops to prevent rock from rolling back on stacker belt shall be placed over the belt not more than 50 ft. apart, the lower stop to be not more than 25 ft. from the end of the delivery chute.

Rule 428. Stacker-Belt Side Guards.

Side guards of substantial construction and at least 6 in. high shall be provided on both sides of the stacker belt.

MACHINERY AND POWER TRANSMISSION

Rule 441. Gears.

All gear wheels must be protected with a closed guard of metal wood or wire mesh of such dimensions and construction that the point of mesh of the gears cannot be reached from outside the guard and that no shear will exist between the spokes of the gear wheel and any portion of the guard or adjacent structures. A suitable trap or opening shall be provided at a point well away from the point of mesh so that the gears can be safely greased while running.

Rule 442. Belts.

Belts Must Be Guarded—All belts, ropes or chains driving machinery or shafting, where exposed to contact, must be guarded. In all cases the point where the belt, rope or chain runs on to the pulley, sheave or sprocket, if within 7 ft. of the deck or platform, must be guarded.

Exception: Belts which are so small or so slow-moving that they are not in any way a source of danger.

(b) Horizontal Belts—All horizontal belts, ropes or chains driving machinery or shafting, 7 ft. or less above the deck or platform, where exposed to contact, must be guarded. All overhead belts 6 in. or more in width and over 7 ft. from deck or platform, must be guarded underneath and on sides, unless so guarded that persons can not pass under them. All chain or rope drives over 7 ft. from deck or platform must be guarded in like manner as belts over 6 in. in width are guarded. In all cases the guard must cover the outer faces of the two pulleys or sheaves and extend upward to such a point and be attached in such a way that in case the belt, chain or rope breaks, the guard will withstand the whipping force.

(c) Vertical and Inclined Belts—Vertical and inclined belts must be substantially guarded as follows: 1. If the guard must be less than 15 in. from the belt, with a complete enclosure of wood or metal to a height of 6 ft. above the deck. 2. If the guard can be placed with at least 15 in. clearance from the belt, with a two-rail railing at least 3½ ft. high.

Rule 443. Pulleys.

All pulleys or parts of pulleys within 7 ft. of a deck or platform must be guarded where exposed to contact.

Rule 444. Stacker Drum.

Point of contact of stacker belt with the upper side of the drum at the outer end of stacker shall be guarded in such a manner as to prevent possibility of injury between belt and drum.

Rule 445. Sprockets.

All sprockets must be guarded, if exposed.

Rule 446. Clutches.

All clutches must be completely guarded when exposed. (Note: Practically all clutches have protruding parts which make them as dangerous as projecting setscrews on shafting.)

Rule 447. Screen Rollers.

(a) Tread Rollers—Tread rollers shall be covered with a closed guard and the guard must extend over the contact of the roller with the tread ring on the revolving screen and up at least 2 ft. on said tread ring above point of contact. The housing may be of wood, metal or wire mesh.

(b) Thrust Rollers and Guide Rollers—The point of contact of thrust rollers and guide rollers with tread ring shall be completely guarded.

Rule 448. Shafting.

All transmission shafting, either horizontal or vertical, and all dead ends of shafts wherever exposed to contact must be guarded.

Rule 449. Setscrews.

All projecting setscrews on moving parts must be removed, countersunk or protected by a solid collar, or a headless setscrew must be used. No part of the setscrew must project above the surface.

Rule 450. Keys and Keyseats.

All projecting keys in shafting, where exposed, must be cut off or guarded, and all keyseats in ends of shafts, where exposed, must be filled flush or guarded.

Exception: Keys in the upper tumbler shaft and swing winch drum shafts shall be excepted.

Rule 451. Flywheels.

All flywheels shall be guarded with a closed guard to the height of 6 ft. or to the top of the flywheel.

Rule 452. Grease Cups.

All grease cups with the exception of self-feeding cups must be piped out to a safe and convenient place for the oiler to reach.

Rule 453. Sheaves.

All sheaves shall be guarded so as to eliminate any shear between the spokes or web of sheave and any part of frame or housing and also to prevent possibility of being drawn into sheave by a line or of being jammed between line and housing or guard.

Rule 454. Bow-Line Fair-Lead Track Rollers.

Bow-line fair-lead track rollers shall be guarded with a suitable fender traveling ahead of roller on track and so adjusted and constructed as to prevent a man's hand or foot from passing beneath the fender or being jammed between the fender and track.

Rule 455. Spud Lines.

Spud lines shall be completely housed with metal or wood from the aftermost deck sheave to a point 6 ft. above the top deck.

Rule 456. Grinding Wheels.

(a) Protection Hoods—Straight grinding wheels must be provided with a complete protection hood of sufficient strength to retain broken parts in case the wheel should break. This hood must be adjusted close to the wheel and extend forward over the top of the wheel to a point at least 30° beyond a vertical line drawn through the center of the wheel.

(b) Flanges—The sizes of straight flanges used with straight wheels and protection hoods shall not be less than shown in the accompanying table. (Note: Wheels should be handled with the greatest care in unpacking, storing, delivering, etc., and should never be left standing on the ground or wet places. Great care should be used in mounting wheels; never force a wheel on the arbor. It is advisable to use thin, compressible washers between wheel and flange to obtain a perfect bearing at the outer edge of the flange; both flanges should be of the same diameter and the arbor nut should not be tightened more than is necessary to hold the wheel securely. Vibration should be avoided at all times.)

STRAIGHT FLANGES AND STRAIGHT GRINDING WHEELS USED WITH PROTECTION HOODS

Diameter of Wheel in Inches	Minimum Outside Diameter of Flange	Minimum Diameter of Recess	Minimum Thickness of Flange at Bore
6	2	1	[illegible]
8	3	2	[illegible]
10	3½	2¼	[illegible]
12	4	2½	[illegible]
14	4½	3	[illegible]
16	5½	3½	[illegible]
18	6	4	[illegible]
20	7	4½	[illegible]
22	7½	5	[illegible]
24	8	5½	[illegible]
26	8½	6	[illegible]
28	10	7	[illegible]
30	10	7	[illegible]

(c) Safety Wheels—Where protection hoods are not used, safety wheels fitted with safety flanges must be provided.

(d) Arbor Ends—Arbor ends must be guarded.

(e) Speed of Wheels—Speed of wheels must not exceed the speed guaranteed by the manufacturer.

TABLE OF GRINDING WHEEL SPEEDS

Diameter of Wheel in Inches	Revolutions per Minute for Surface Speed of 4,000 Ft.	Revolutions per Minute for Surface Speed of 5,000 Ft.	Revolutions per Minute for Surface Speed of 6,000 Ft
1	15,279	19,099	22,918
2	7,639	9,549	11,459
3	5,093	6,366	7,639
4	3,820	4,775	5,730
5	3,056	3,820	4,584
6	2,546	3,183	3,820
7	2,183	2,728	3,274
8	1,910	2,387	2,865
10	1,528	1,910	2,292
12	1,273	1,592	1,910
14	1,091	1,364	1,637
16	955	1,194	1,432
18	849	1,061	1,273
20	764	955	1,146
22	694	868	1,042
24	637	796	955
26	586	733	879
28	546	683	819
30	509	637	764
32	477	596	716
34	449	561	674
36	424	531	637

(f) Eye Protection—Unless an individual pair of goggles is furnished to every man who has occasion to use the grinding wheel, each wheel shall be guarded with a fixed eye guard of plate glass, so placed as to prevent possible injury to the eye from flying particles. The glass shall be maintained in a clean and serviceable condition.

(g) Tool Rests—If tool rests are used, they shall be at all times kept within ⅛ in. or less of surface of the wheel. (Note: It is recommended that tool rests be removed where possible.)

ELECTRICAL RULES

Rule 461. Danger Signs.

All machines and apparatus operating at above 650 volts shall be marked by the use of the word "danger" followed by an indication of the voltage carried.

Rule 462. Grounding of Dredge and Electrical Equipment.

(a) Electrical Apparatus—The noncurrent-carrying metal parts of all electrical apparatus on the dredge shall be effectively grounded. Effective grounding on a wooden boat shall consist of linking the frames of the main and swing winches together with a suitable metallic connecter and effective metallic connection of the part to be grounded to the frame of either winch. On steel boats, grounding to the frame of the boat by bolting to it or otherwise shall be considered effective grounding.

(b) Power Cable—The armor of the power cable leading from the bank to the boat shall be grounded by attaching a clamp to the cable at or near the shore pole and fastening an "O" 19-strand copper cable to it and connecting this copper cable to an iron pin driven into the damp ground.

Rule 463. Insulation of Conductors.

(a) Overhead Lines—Overhead transmission lines between the generating station or substation and the dredge shall be supported upon insulators, which shall be adequate in quality, size and design for the voltage transmitted. Such line shall be maintained not less than 14 ft. above the ground or any structure used as a passageway.

(b) High-voltage Wires—All high-voltage wires installed on gold dredges between shore pole and the dredge, as well as on the dredge, shall be in the form of properly insulated cables, which shall be armored or effectively protected against abrasion, but the armor shall be electrically continuous throughout, and shall be effectively grounded. The installation of efficiently insulated wires in metal conduit to transmit power shall be considered to meet this requirement.

(c) Support of Cables and Wires—All cables and wires unless provided with grounded metallic covering shall be effectively insulated and shall be supported by efficient insulators. The conductors connecting lamps to the power supply shall in all cases be insulated.

(d) Cables Entering Fittings—Where unarmored cables or wires pass through metal frames or into boxes or motor casings, the holes shall be substantially lined with insulating bushings.

(e) Joints in Conductors—All joints in conductors shall be mechanically and electrically efficient, and shall be soldered wherever necessary. All joints in insulated wire shall, after the joint is complete, be re-insulated to the same extent as the remainder of the wire.

Rule 464—Transformers.

(a) Circuits Entering or Leaving all Transformers Protected by Circuit-Breakers—Circuits leaving transformers shall be protected by automatic circuit breakers to interrupt the current, but fuses and a disconnecting switch may be substituted for a circuit-breaker.

(b) Primary Disconnecting Switch—Primary fuses and disconnecting switches shall be placed on shore in the primary circuit ahead of the transformers, but in no case shall the switches be opened or closed under load.

(c) Oil Switch—A main oil switch of sufficient capacity to interrupt the circuit must be installed on the primary circuit.

(d) Transformer Rooms—Transformer rooms shall be properly lighted and shall be of fireproof construction.

Rule 465. Switchboards.

(a) Construction—Main and distribution switch and fuseboards shall be made of noncombustible, nonabsorbent, insulating material, which shall be free from metallic veins. The board shall be mounted upon supporting frameworks of iron or steel and fixed in a dry place. If insulated conductors are used in the wiring of the board, the insulation of such conductors shall be flameproof.

(b) Inclosing Switchboard—All switchboards and panel boards having exposed current-carrying parts operating at over 150 volts to ground, and not isolated by elevation, shall be suitably inclosed in cabinets, screens, or rooms or other inclosures to make them inaccessible to others than the authorized operator.

(c) Insulating Platforms—Conducting floors around switchboards shall be provided with a suitable insulating platform or mat so placed that no person can inadvertently touch live parts unless standing on the insulating platform or mat.

Rule 466. Switches, Fuses, Automatic Circuit Breakers, etc.

(a) Switches Shall be Provided—All points at which a circuit has to be made or broken shall be provided with proper switches, which shall be so installed that they can not be closed by gravity.

(b) Guarding Live Parts of Switches—All manual switches shall have suitable casings or guards protecting the operator from danger of contact with current-carrying parts, effective during ordinary operation.

(c) Mounting of Switches, Fuses, Circuit Breakers, etc.—All switches, circuit breakers, rheostats, fuses, and all instruments used in connection with motor generators, rotary converters, transformers, and motors shall be mounted on standard bases of noncombustible and insulating material. This provision shall not apply to compensators for induction motors. The above mentioned switches, circuit breakers, rheostats, fuses, and instruments may be mounted on a common base, provided such base is of noncombustible, insulating material, and insulated platforms or mats shall be provided in front of all electrical-control devices.

(d) Disconnecting Switch Ahead of Fuses—An individual switch shall be installed directly ahead of every fusible cut-out in order that the fuses may be completely disconnected from all sources of electrical energy when the cut-out is being re-fused. Fuses shall be adjusted or replaced only by an authorized person.

(e) Fuses in Insulated Box—Fuses shall be located in a metal or insulating box. A legible warning against removing fuses before the switch controlling same is opened shall be placed on the outside of the cover of said metal or insulating box. This does not apply to fuses mounted on a switchboard. (Note: It is recommended that where fused switches of the externally operated type are used, the cover of the switch cabinet be so interlocked in relation to the switch handle as to prevent opening the cover until the switch has been opened, and to prevent the closing of the switch while the cover is open.)

(f) Capacity of Fuses—Fuses and automatic circuit breakers shall be constructed so as effectually to interrupt the current when a short circuit occurs or when the current through them exceeds a predetermined value. The capacity of fuses used to protect feeders shall not exceed the current capacity of the feeder by more than 25 per cent.

(g) Capacity Shall Be Marked—Fuses shall be stamped or marked, or shall have a label attached, indicating the maximum current that they are intended to carry.

(h) Primary Meters. In no case shall primary meters be used.

Rule 467. Motors.

(a) Circuit Breakers and Cut-Outs—Every stationary motor and every portable motor, together with its starting device, shall be protected by a circuit-breaking device or by fuses on each line and switches arranged to cut off entirely the power from the motor.

(b) Guards for Moving Parts—Suitable guards for inclosures shall be arranged at each motor when necessary to prevent persons or objects from inadvertently coming in harmful contact with moving parts.

Rule 468. Electric Lighting.

(a) Lamp Sockets—The exterior of the sockets of all incandescent lamps, installed after these rules go into effect, shall be entirely nonmetallic.

(b) Flexible Lamp Cord—The use of flexible lamp cord for lighting connection is prohibited except where its use is necessary on account of excessive vibration or for portable incandescent lights, to be used in connection with the inspection and repair of machinery and equipment; and in that case the cord shall be especially insulated or armored. Such portable lights shall be protected by a wire cage large enough to inclose both lamp and socket, unless a socket with nonmetallic exterior is used. A handle shall be provided to which the light and socket shall be firmly attached and through which the leading-in wires shall be carried, except that where the insulation of the leading-in wires is throughly reinforced by taping, the handle may be omitted.

Croesus, Ontario's High-Grade Mine

The history of the Crœsus mine, situated in the Munro district of Ontario, records an unusual occurrence of a high-grade gold deposit it being one of the few high-grade mines in that province.

The property consists of two claims, known as the Walsh and the Dobie, which were purchased in June, 1915, by the Crœsus Gold Mines, Ltd., the stock of which is owned by the Dominion Reduction Co., of Cobalt, Ont. Eugene L. Steindler, general manager of the holding company, has supplied the following interesting information regarding the property.

On the Dobie claim there existed a spectacular high-grade outcrop, which the owners of the claim had covered with a steel plate, which they kept bolted down and locked, to prevent "high-grading." The initial operations consisted of sinking a prospecting shaft on the vein, and about 30 ft. from the high-grade showing. After sinking 14 ft., ore was encountered equally as rich as the surface showing; this continued down to the 200-ft. level, the shaft alone producing approximately $1000 to the foot. The vein is a quartz vein with an average width of 2½ ft., and lies comparatively flat, the dip being only about 20° from the horizontal.

The gold in the vein is free and coarse. In the first 200 ft. of the mine, no gold occurs that is not visible to the naked eye. Unless free gold can be seen, the vein rock is practically barren. The gold occurs like plums in a pudding, but in sufficient quantity to make the average grade extremely high.

During the time the mine was being opened, the high-grade ore was picked out by hand and crushed in a mortar, and the resulting gold amalgamated directly and melted. This produced bullion 910 fine in gold, with about 60 points in silver. The richness of the ore can be best described by saying that of 746 lb. of rock hoisted at one particular time, approximately $47,000 in gold was produced. All the ore is practically specimen ore. For example, one piece weighing 1 lb. 15 oz., avoirdupois, contained $292.68 worth of gold, the value having been determined by submersion in water, taking account of the differences in specific gravity. The Ontario Government purchased five pieces of this ore which contained $10,000 in gold.

Geologically, the high concentration of the gold seems to have been influenced by a shear zone. Aside from this property, none of the surrounding claims has as yet shown any likelihood of being productive. Development has now been carried to the 300-ft. level, at which point the vein has dipped under the shaft, and a crosscut to the vein is being driven. The length of the oreshoot is approximately 80 ft. A small mill has just been completed, consisting only of a picking belt, a 4½-ft. Hardinge mill and amalgamating plates. The high-grade and oversize waste is picked off the belt, the fines being crushed and passed over the amalgamating plates. On the dumps are several thousand tons of rejects from the earlier development, which will undoubtedly run $40 per ton.

The occurrence of this high-grade ore has been misstated in previous descriptions, when described as nuggets, as it is really free-gold in the quartz, but highly concentrated as herein described.

Nevada Consolidated Report

The thirty-first quarterly report of the Nevada Consolidated Copper Co. for the quarter ended June 30, 1917, shows 20,817,356 lb. copper produced, as compared with 18,852,321 lb. for the preceding quarter. The following shows the production for the last quarter by months: April, 6,727,192 lb.; May, 7,239,978 lb.; June, 6,850,186 lb.; an average monthly production of 6,939,119 pounds.

During the quarter 1,021,990 dry tons of Nevada Consolidated ore, averaging 1.46% copper, was milled, as compared with 949,916 dry tons averaging 1.48% copper for the previous quarter. Of the tonnage milled, 75% was supplied from the pits and 25% from underground workings of Ruth mine. In addition, 18,145 dry tons of the Consolidated Coppermines Co. ore was milled. During the quarter the company paid a dividend of 50c. per share and a capital distribution of 50c. per share.

Iron Ore in Missouri

St. Louis Correspondence

The Iron Mountain mine in Missouri has again been sold and is being reopened by the new owners. An attempt is being made to work the low-grade thin veins by crushing and jigging, which the old company tried and failed to do profitably, as the veins were too small and the cost of crushing the enclosing hard porphyry too high. There is considerable lean ore of this type both there and at Pilot Knob. Perhaps it could be worked at a profit under prevailing high prices but would probably be a "war bride" at best. The old rich orebodies as well as those at Pilot Knob are exhausted as far as known.

In the southern part of Missouri there are numerous, small residual deposits of brown iron ore which are rather uncertain and frequently high in sulphur. In the aggregate the tonnage is large but so uncertain and scattered are the deposits that they are largely a farmer's proposition, to be worked on the surface when there is nothing else to do. More ambitious efforts have been made by using steam shovels and washers but unsuccessfully. The washed product runs 40-48% iron.

The "basin" or "sink-hole" type of deposit, of varying size, found in the central part of the state, may run 50-60% iron. The larger ones, however, have been exhausted. The lone charcoal furnace at Sligo, the last of six or eight formerly in operation, is running on these "banks."

The production of iron ore in Missouri in 1914 is given in the report of the State Geologist (as quoted by *Iron Age*) as 36,304 tons, which figure rose to 40,290 tons in 1915. The producers for 1915 were the Sligo Furnace Co., Salem; L. C. McSpadden, Salem; Iron Mountain Mining Co., Iron Mountain; Julian Pickes, Morrellton; A. J. Sanders, Steelville; and Kingsbury Mining Co., West Plains.

The proximity of Missouri iron ore to Illinois coal has doubtless suggested pig iron to some. But as shown above the iron ore is poor and cannot usually be worked at a profit, while Illinois coal, I am informed, does not coke satisfactorily. It is possible that with modern ovens, with their higher temperatures and pressures, a merchantable grade of coke can be made, especially from the washed coal.

The only blast furnace using coke as fuel, in Missouri, is at South St. Louis and is smelting Mesabi iron ores. It gets some Missouri brown ore but not enough to run on thus far. The Iowa ore it had figured on using is, for some reason, not coming to it; this is said to occur as a large body of low-grade brown ore requiring modularizing after preliminary washing.

Russian Platinum Output

The production of platinum in the Ural district in Russia in 1916 is estimated by a correspondent of the London *Mining Journal* at only 78,674 troy oz., against 107,774 oz. in 1915; 156,775 oz. in 1914; 173,642 oz. in 1913; and 185,381 oz. in 1912. The decrease last year extended to nearly all the districts but was most marked on the Demidov estates and the Shuvalov placers. The shortage of labor has been one of the causes of the decrease. The fact that all crude platinum is now requisitioned by the Government has led, it is believed, to the concealment of some quantities, so that the figures given are below the real output. A considerable quantity of crude platinum is understood to be held by Russian banks which advanced money to the producers before the metal was taken by the Government.

Judge Bourquin Decides

According to telegraphic dispatches from Butte, Judge Bourquin, on Aug. 27, rendered a decision in the case of Minerals Separation vs. Butte & Superior in favor of the plaintiff. This case hinged on the use of more than 1% of oil. Previous to the decision of the U. S. Sureme Court in the Hyde case, Butte & Superior had been using less than 1% of oil. After that decision, Butte & Superior adopted the use of a larger quantity of oil, considering that such was outside of the scope of the decision of the Supreme Court. Minerals Separation then claimed that such was still an infringement of its patents.

In rendering his present decision, Judge Bourquin is reported as using the following words:

> The defendant uses the patent process, uses the plaintiffs' invention, uses the same elements in the same combination in the same way with the same furniture to the same but poorer results and exceeds the patent claims in reference to oil uselessly, wastefully and injuriously, merely with intent to avoid infringement. To secure to patentees their invention the law looks quite through mere devices and forms to the substance of things, and if in substance the invention is taken, all devices to evade the letter of the patent avail nothing to escape the consequences of infringment.

We shall defer any comment upon this last decision until we have received the full text of it.

Bureau of Mines Appropriation

The following table shows the appropriations for the work of the Bureau of Mines for the fiscal year just closed (1917) and for the next fiscal year (1918):

BUREAU OF MINES APPROPRIATIONS

	1917	1918
General expenses, Bureau of Mines	$70,000	$73,300
Investigating mine accidents	347,000	353,800
Testing fuel	135,000	135,000
Mineral mining investigations	100,000	100,000
Investigations, petroleum and natural gas	70,000	100,000
Mining experiment stations	75.000	150,000
Improvement of grounds and removal and installation of machinery, etc., Pittsburgh and Bruceton		35,000
Repairs to mine-rescue cars	26,055	...
Care and maintenance new buildings, Pittsburgh	4,305	17,220
Purchase of three additional mine-rescue cars	53,000	81.750
Equipment of three additional mine-rescue cars	13,500	13,500
Operating new mine rescue cars	35,000	98,000
Inspecting mines in Alaska	7,000	7,000
Books and publications	1,500	1,500
Land leases, etc., for mine-rescue cars	1,000	1,000
Removing mining experiment station, Pittsburgh	42,700	....
Total	$981,060	$1,167 070

It is to be noted that $100,000 is appropriated in 1918 for petroleum and natural-gas investigations, against $70,000 in 1917. The appropriation for mining experiment stations is doubled.

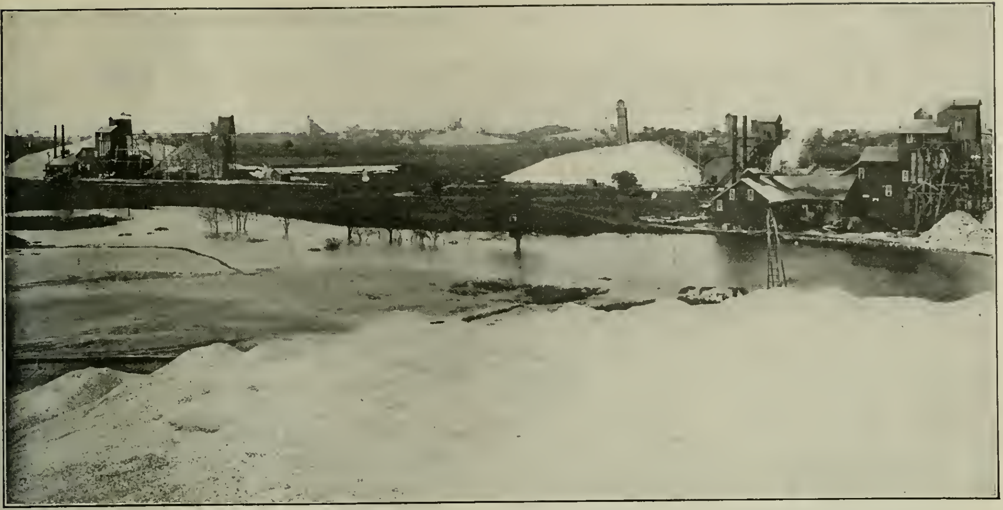
Milling Costs at the Inspiration and Bunker Hill Plants

In the article under the above caption, appearing in the July 21 issue of the *Engineering and Mining Journal*, a typographical error appeared in the tabulated "Cost of Copper at Inspiration." The item of concentrating and royalty should read 2.243c. per lb., instead of 0.243c., as published.

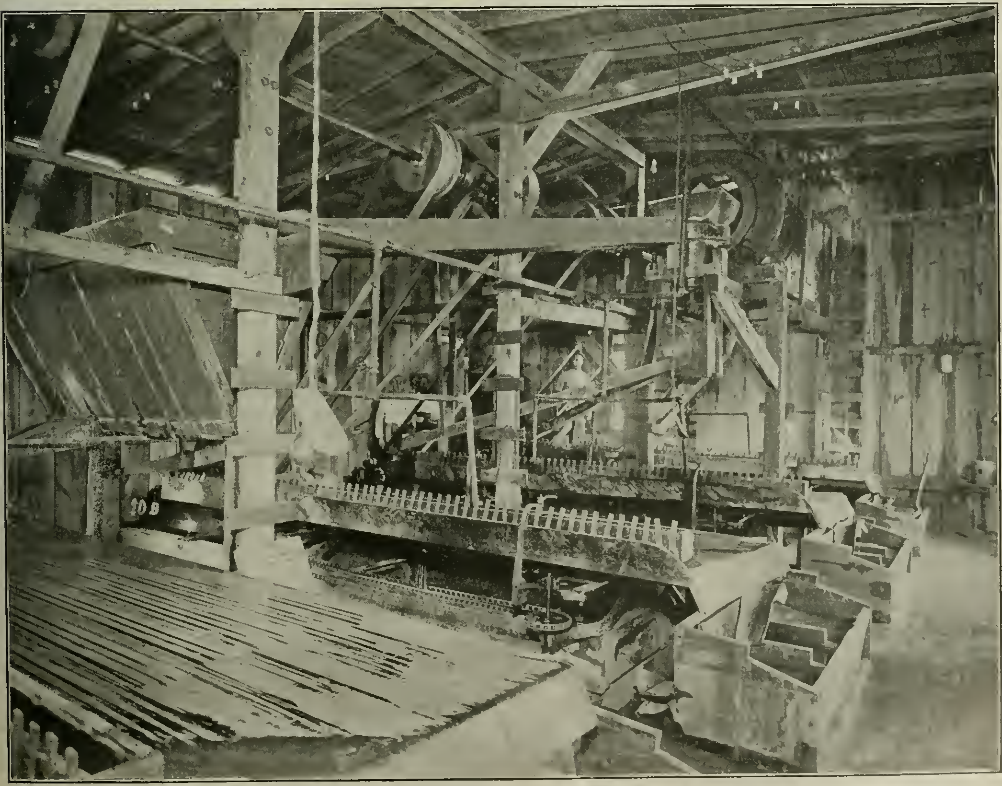
Photographs from the Field

FIRE ON JULY 7 DESTROYED SURFACE BUILDINGS AT LAST DOLLAR SHAFT, CRIPPLE CREEK, COLORADO

EL PASO CONSOLIDATED MINE ON BEACON HILL, CRIPPLE CREEK GOLD DISTRICT, COLORADO



GROUP OF MILLS AND TAILING PILES IN THE WEBB CITY SECTION OF JOPLIN DISTRICT IN SOUTHWESTERN MISSOURI



VIEW IN SLIME DEPARTMENT OF A TYPICAL ZINC MILL OF SOUTHWESTERN MISSOURI IN THE JOPLIN DISTRICT

Correspondence and Discussion

Tube Milling in Rhodesia

Permit me to explain, in reply to F. C. Brown's criticism in the *Journal* of July 28, that the object of the original article was not to make disparaging reference to the Komata lining, but to give an unbiased and impartial account of a series of tube-milling tests. Such tests seldom result in a "draw," and I leave it to the reader to judge whether such results should be published or suppressed. Mr. Brown has entirely dispelled my feeling of guilt in the matter by himself making disparaging reference to the work of El Oro lining in operation at one of the Western mines and by basing general conclusions in favor of the Komata as a result of tests on one class of feed only.

With regard to the Rhodesian experiments, the deciding factor was crushing per horsepower from coarse gravel (2- to 3-mesh) to —200-mesh. At the same time and in order to explain definitely the superiority of the higher-speed lining in this particular instance, a test was made with a much finer material (20-mesh). The results were more favorable to the Komata and agreed with the comparative analyses now published by Mr. Brown on a material carrying 18.5% of +28-mesh, and which it may be assumed, all passed 20-mesh. As clearly stated in the article under criticism, the decisive tests had to be made on a coarsely milled rock approximately 150 times this size, so that the screen analyses now published do not constitute a reasonable rebuttal of the South African results.

On referring again to the literature of the subject, I note in Mr. Brown's article describing the Komata lining[1] that a test on a ½-in. diameter feed resulted in the discharging of the quartz particles after the first passage only slightly rounded, and apparently not even fractured. This is precisely what happened at the Lonely Reef and led to an immediate congestion of the grinding circuit. By manipulating the feed tonnage so as to permit the returning of the unground particles to the mill an excessive number of times until they were gradually reduced to slime, the tonnage handled fell below the economic minimum. El Oro lining at normal speed with the same pebbles and using less horsepower, was able to reduce the coarse feed in a single passage to under 1% on 20-mesh, thus permitting table amalgamation of the tube-mill discharge pulp.

It was only by disregarding the gospel of the infallibility of the imported flint, or the substitution of mine rock, and by using a maximum-sized tough, heavy and artificially rounded felsite, that I found it was possible to slime effectively so coarse a feed in a tube mill of such comparatively small diameter.

It is to be hoped that Mr. Brown will come forward with the results of tests showing the superiority in tons slimed per horsepower with the Komata lining with a coarse feed, on which he bases his objections to the results of the tests under criticism. More information on this point will be welcomed by metallurgists who seldom have the opportunity of making such tests for themselves and who realize that the available information is scanty and often biased by the conservatism of local practice. The Komata lining merits a wider attention; and it is only by the frank discussion of the limits of application of such modifications that extended recognition will result.

CLASSIFIER EFFICIENCY

I would like the opportunity of correcting a typographical error in the article under discussion. With simple classifiers the efficiency of separation, dividing an undersize from an oversize, may be found from the formula,

$$\frac{100(a' + a'')}{A}$$

where A equals total tonnage to classifier, a' equals tonnage of undersize in the classifier overflow, and a'' equals tonnage of oversize in the classifier underflow (not *overflow* as stated).

Compound-classifier efficiency may be estimated by extending the formula thus:

$$\frac{100(a' + a'' + a''' \quad . \quad . \quad . \quad + O)}{A}$$

where a' equals tonnage of required grading in first product, a'' equals tonnage of required grading in second product, etc., O equals the tonnage of required undersize in overflow, and A equals the total-feed tonnage.

The same system may, of course, be used in connection with efficiency estimations of screening apparatus.

New York, Aug. 15, 1917. **A. W. ALLEN.**

Danger in Brass Carbide Lamps

The communication of John B. Stewart on "Danger in Brass Carbide Lamps," in the July 28 issue of the *Journal*, is interesting and records, as my memory serves, a novel observation. I have therefore forwarded it at once to *Chemical Abstracts* so that it may be brought to the attention of as many chemists as possible.

Apropos of this, it may be recalled that when "gas lighting" was introduced, iron pipe, except gun barrels, was not an article of commerce and therefore brass and copper tubes were used. The gas as sent through these service pipes was foul with tar, ammonia, and other materials whose removal was the subject of later developments. Among other troubles encountered in making public-service gas lighting acceptable were the mysterious explosions of these service pipes when heated or struck. On investigation Dr. Robert Hare discovered them to be due to copper acetylide formed in the pipes through the action of the acetylene in the gas with the ammoniacal solution of copper previously formed there.

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[1] Min. and Sci. Press, Feb. 3, 1912.

With the commercial introduction of acetylene this observation was recalled and many tests made, all of which tended to show that no explosive compound was formed between acetylene and copper if the ammonia was not present.

Mr. Stewart speaks of this flash as having occurred during the cleaning of the lamp. This recalls that various ammoniacal preparations, such as "Household Ammonia," are now quite commonly used in cleansing metals. Is it possible that one of them was used in cleansing these lamps prior to their re-use? If such should prove to be the case, some small residue of cuprous-ammonium compound may have been left in the lamp with which acetylene could react.

CHARLES E. MUNROE.

Washington, D. C., Aug. 21, 1917.

Area of Segments of Circles

Referring to Mr. Marquard's article, "Area of Segments of Circles," in the Aug. 11 issue of the *Journal*, why not the general formula?

Where altitude of segment alone is given,

$$\textit{Cosine } \tfrac{1}{2} \textit{ central angle} = \frac{R - A}{R}$$

Where A is less than R,

$$\textit{Area} = R^2\pi \frac{\angle}{360} - \tfrac{1}{2}(R^2 \textit{ sine } \angle)$$

Where A exceeds R,

$$\textit{Area} = R^2\pi \frac{360 - \angle}{360} + \tfrac{1}{2}(R^2 \textit{ sine } \angle)$$

$\angle$ = the central angle, and A the altitude of the minor segment.

U. W. HARWOOD.

Rochester, Nev., Aug. 17, 1917.

Ammonia Leaching Process

While here, on a Western trip, I happened to read in the Milling Number of the *Journal*, which I had not had an opportunity of looking over before, the statement that Mr. Benedict, of the Calumet & Hecla company, was the first to make ammonia leaching applicable on a large scale. As a point of information I may say that the Kennecott Copper Corporation, at the Bonanza mine, Alaska, was really the first company to operate ammonia leaching on a large scale, as it has been running a 400-ton plant there successfully on tailings since about April, 1915, as I recollect.

I worked out the treatment scheme on Kennecott tailings first on a small scale at Flat River, Mo., in 1912 or 1913, and in 1914 designed a one-ton plant for Kennecott which proved satisfactory, and the 400-ton plant followed. Most of the work in this connection in Alaska was done by E. T. Stannard, once mill superintendent at Flat River, Mo., then at Braden Copper, and now manager of Kennecott Copper Corporation in Alaska. The ammonia plant in Alaska is making a recovery of 75% or thereabout.

H. A. GUESS.

Spokane, Wash., Aug. 5, 1917.

[We were well aware of the ammonia process introduced at Kennecott. Indeed, we hoped to have a contribution from Mr. Stannard on that subject in the same number with Mr. Benedict's, but Mr. Stannard found himself unable to prepare it, delegated it to his assistant, Mr. Lawrence, and unfortunately Mr. Lawrence's manuscript arrived too late. We expect to publish it shortly. We supposed that the original work in the development of the ammonia process was more or less a nip-and-tuck matter, but we were under the impression that Mr. Benedict's was the earliest. However, we appreciate that it is always dangerous to say that anything is the first, the biggest, the deepest, etc., without careful investigation and thorough knowledge.—Editor.]

Daylight Saving in Portugal

On page 684 of the *Journal* for Apr. 14, 1917, is an editorial favoring the adoption of daylight saving in the United States. Possibly a few remarks on its use in Europe would be of interest.

Here in Portugal one hour of daylight saving is employed during the summer months. It is accomplished by setting the clock time one hour ahead of the astronomical time. It gives a longer evening by one hour with no noticeable effect in the morning. It is most advantageous in mining work, where the summers are often too short at best. It permits the maximum of overtime work and the minimum requirements on artificial lighting. It gives Portugal the same amount of available daylight as the northern part of England. It permits a 12-hour daylight day to be worked. If adopted in the United States universally, it would be a great boon to industry under the present trying circumstances.

Viseu, Portugal, May 16, 1917. F. W. FOOTE.

A War Service for Engineers

Knowing that the *Journal* must often come in contact with engineers who have not yet found their place of usefulness in the war and so seek its advice, I beg to draw attention to the fact that men are needed for the Engineering Division of the Signal Corps, as inspectors at the numerous factories producing aëroplanes and aëroplane engines.

I have just been appointed District Manager of Inspection, Aircraft Engineering Division, Signal Corps, for New York and vicinity, and should be glad to see any applicant for this service.

Graduate engineers or men with shop experience are preferred, but a school for inspectors is soon to be opened at the Curtiss aëroplane factory at Buffalo, where accepted applicants can be sent to learn their duties, after being enrolled, and while drawing their pay—$100 to $200 a month. At the school their real aptitude can be better determined and their pay and duties assigned accordingly.

Such being the case there are opportunities for all sorts, from an underpaid draftsman to the chief executive of a large concern, since not only are inspectors needed, but district managers and staff officers, and men in the executive positions will later be commissioned in the Signal Corps as Reserve Officers.

R. S. RAINSFORD.

Care of J. G. White & Co., 43 Exchange Place,
New York, Aug. 10, 1917.

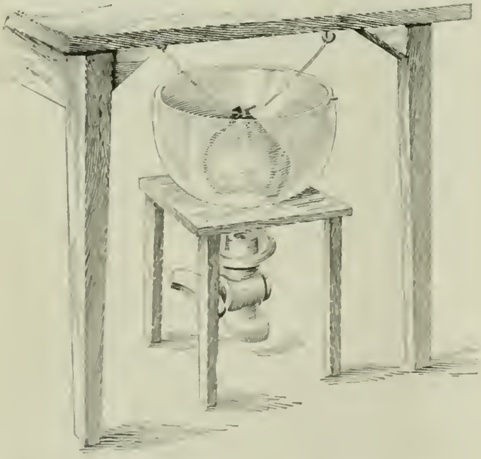
Details of Milling and Smelting

Container for Lead Acetate

By J. R. Tetlie*

At the Aurora Consolidated Mines Co., Aurora, Nev., trouble was experienced with the lead sponges in the assay of gold and silver cyanide solutions by the zinc-dust method. Since using the container herein described, the trouble has been overcome and good consistent sponges are obtained.

Cut the bottom out of a glass carboy and fit the mouth with a stoneware stop-cock. Invert the carboy and place it on a stand. It can then be placed under a table out of the way. A bag of sheeting or thin canvas is made to hold the lead acetate. Place about 10 lb. of lead acetate, crushed to ½ in., in the bag which should be suspended from the underside of the table so as not to rest on the bottom of the carboy. Fill the latter half full of water. At the end of 24 hours the solution will be strong enough for use. It will need no more attention until nearly used up, when the carboy and sack should be cleaned out and fresh acetate and water put in. Thus a supply of clear and saturated solution is always ready. With 30 solution-assays per day, replenishing is necessary about once a month.



LEAD ACETATE IS KEPT IN BAG HUNG IN CARBOY

Clear Water from Streams

One way to secure clear water, which has proved successful, according to James E. Noble in *Power*, Aug. 28, 1917, is shown in Fig. 1. A shaft well is sunk from 25 to 50 ft. from the stream, depending on the nature of the soil. The shaft will in some cases have to be made water-tight to a depth where gravel or sand is encountered. This will prevent mud from washing in during periods of high water. The bottom of the well should be several feet below low water in the stream to insure a sufficient supply at all times.

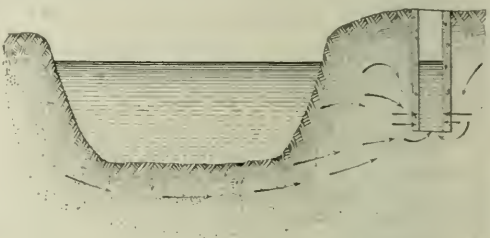


FIG. 1. WELL SUNK ALONGSIDE THE STREAM

Another plan is shown in Fig. 2, in which an iron or cement tank is lowered to near the bottom of the stream with an opening to admit water at the downstream end of the tank. Two pipes are shown connected to the tank. The one marked *D* is for the regular pump suction, and the one marked *E* is connected near the bottom to allow pressure to be admitted to flush out the tank when there is an accumulation of sediment.

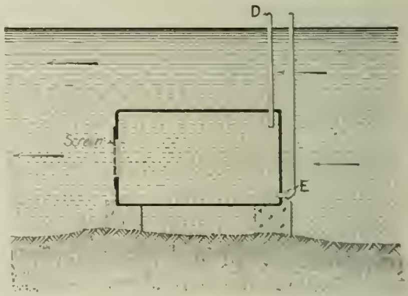


FIG. 2. TANK LOCATED NEAR BOTTOM OF STREAM

Cascade Flotation Machine

By D. H. Fairchild*

In the *Journal* of May 19, 1917, an article appeared on the "Cascade Flotation Machine," by Clifford R. Wilfley. It may be interesting to know in connection with this that about August, 1915, a flotation machine of the "cascade" type was built and used a short time by the Ray Consolidated Copper Co. to handle the tailings from the other flotation machines.

This machine was about 30 ft. high and was constructed in a series of steps with the sides and back boxed in by tongue-and-groove material. On each step was set two stave tubs about 3 or 4 ft. in height by

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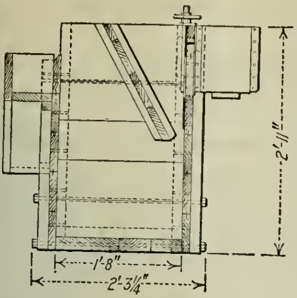
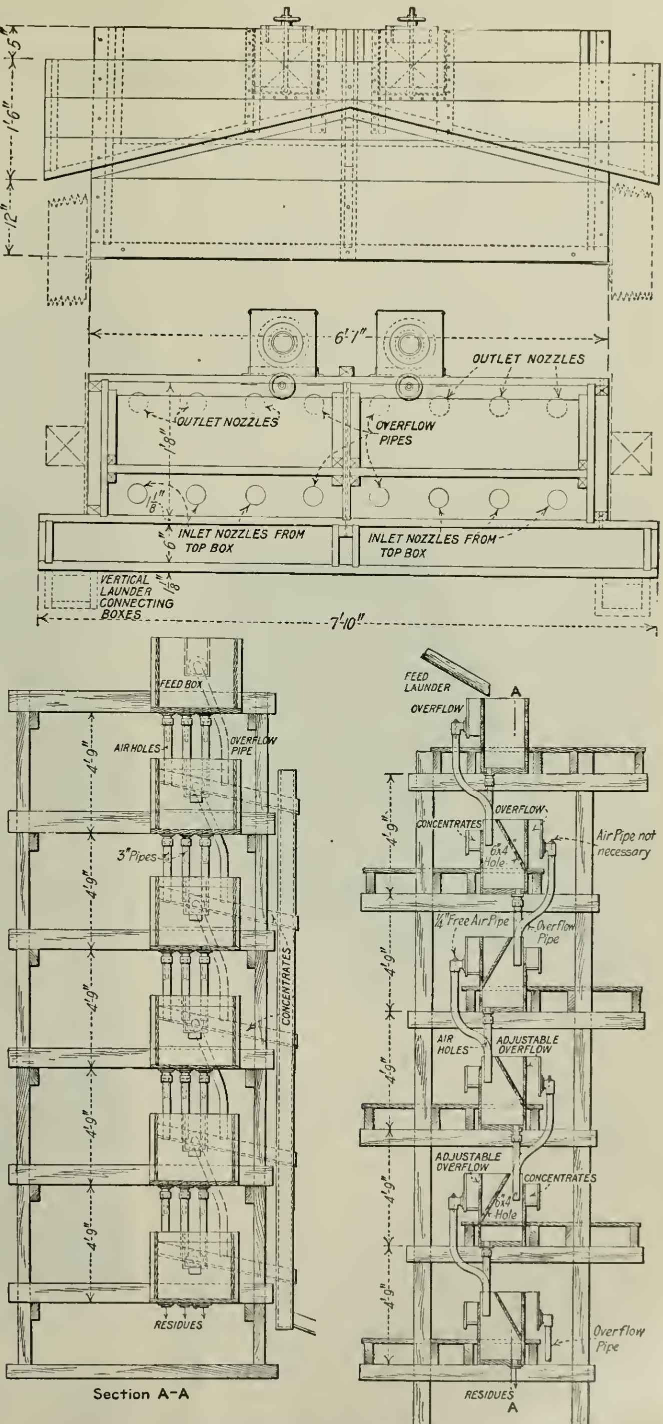
*Aurora, Nev

*Fairchild Engineering Co., 527 Seventeenth St., Denver, Colo



about 2½ ft. in diameter. Each two tubs on each step were set directly in line, respectively, with those on the next step, making two lines or series from top to bottom of the machine. In the front of each tub about 8 in. below the top was an outlet. This outlet was boxed in and the pipe or launder carried directly downward almost to the top and just above the center of the next tub below. As the feed entered the top, it was equally divided between the two upper tubs. As these two tubs filled and overflowed at the outlet the pulp, falling through the perpendicular pipe or launder to the next tubs, became aërated to a degree and a froth resulted in all tubs below the upper two. This froth that was formed overflowed around the edges of the tubs and fell to the floor of the "steps." From step to step it progressed downward by gravity to the bottom, where the concentrate formed was taken care of. The machine was removed after a test that showed it was inefficient. The heads fed to this machine were extremely low-grade, and the test for this reason could hardly be compared to one where original flotation feed was used. However, it was generally conceded by all concerned that this type of machine did not provide sufficient agitation for the best results. The agitation was too languid or anæmic to secure high efficiency.

In view of the articles published in the *Journal* of May 19, 1917, on the "Cascade Flotation Machine," and in the *Journal* of April 14, 1917, on "A Hydraulic Flotation Machine," the accompanying drawings will be of interest. They represent machines of the cascade type as installed at the Central Mine, Broken Hill, Australia. The drawings are published by courtesy of the *Mining and Engineering Review*, of Melbourne, Australia.



A CASCADE FLOTATION MACHINE TRIED IN AUSTRALIA

Mining and Metallurgical Machinery

Electric Truck with Dumping Body

The illustration shows the latest type of storage-battery truck to be placed on the market by the Orenstein-Arthur Koppel Co., Koppel, Penn. The body is of the self-clearing cradle-dump type, with a dumping angle of 40 deg., the dumping operation being accomplished from the platform. The truck proper has a steel channel frame and a metal-edged oak platform mâde in two parts and hinged. Wheels are of cast steel, 20 in. in diameter, with 3-in. solid rubber tires. Timken bearings are used on the wheels and power is furnished by a Wagner motor and control operating from an Exide battery. The wheelbase is 52 in. and the tread gage 34 in. The capacity is 3000 lb., which can be transported at a maximum speed of 7 miles per hour. Lifting hooks are provided at each end of the body in order that it may be easily removed for inspection of the batteries.

ELECTRIC DUMPING TRUCK

Radial-Flow Fans

In view of the modern tendency to simplify power-plant and mining machinery as much as possible, the Green Fuel Economizer Co. has spent several years of investigation and has developed a fan for direct connection to steam turbines or motors that at the same time gives high efficiency. This is called the Green Radial-Flow fan.

The design of the fan is much along centrifugal-pump lines and is such that the path of the air or gases through the fan has the least resistance consistent with ease of manufacture and results in an efficiency that is far above that usually met with in fans for forced- and induced-draft service. Furthermore, the use of direct-connected turbine drive, at speeds which give a reasonable turbine economy, enables its use in direct competition with the familiar steam-engine-driven fan.

RADIAL-FLOW FAN DRIVEN BY DIRECT CONNECTION FROM EITHER MOTOR OR TURBINE

The radial-flow fan lends itself to direct connection to alternating-current motors, at the higher synchronous speeds, which enables the use of small and compact driving units.

There are large numbers of this type of fan now in service in all classes of industry. It is a favorite for forced-draft service, particularly in connection with underfeed stokers. The illustration shows a small fan used as an individual forced-draft fan for an underfeed stoker in a large plant where they are using individual fans for each boiler unit. This is interesting in that two classes of drive are shown. On one side is a direct-connected steam turbine and on the other a direct-connected motor. The general conditions of the plant in question call for motor drive of the auxiliary units to produce the best over-all economy. There are times, however, in any plant when the steam balance will be so thrown out or when there are troubles on the electrical lines that demand a steam drive as well to produce the best results. Thus the unit shown is a very admirable compromise and does not require the duplication of units.

These fans are also applicable to induced draft and various types of exhaust service, particularly mine ventilation, where the higher pressures are desirable.

Pumping in the Joplin District

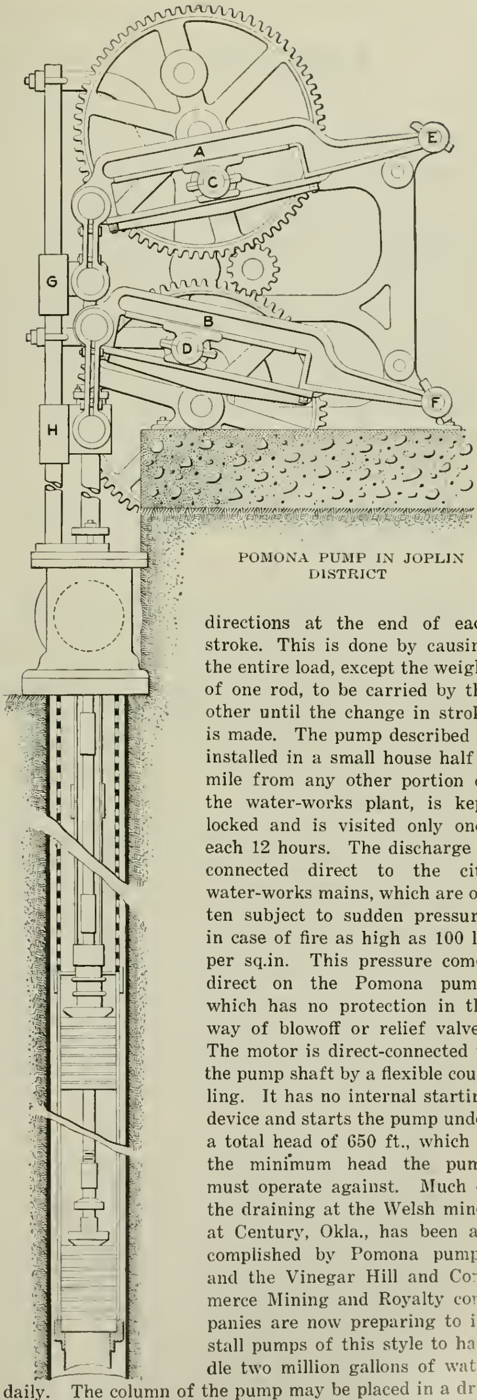
By P. R. Coldren*

With the extensive development of the Oklahoma section of the Joplin zinc and lead district there has, in the last two years, been marked improvement in ground-drainage work. This is in part due to the introduction of more modern machinery and methods but also to a more intelligent use of the machinery already at hand.

The success of the Pomona pump, manufactured by the Pomona Manufacturing Co., Pomona, Calif., and recently introduced into the field, seems to rest on a balancing feature so devised that balance wheels are unnecessary, the load being almost continuous at every position of the stroke. One of the pumps was installed about eight months ago at the water-works plant in Webb City, and satisfactory work there went far toward converting mine operators to its possibilities.

In this pump, shown in the illustration, the plunger rods are 500 ft. long and weigh 15 lb. to the foot, making a total of 15,000 lb. The weight of the water column in the well and the head above the well, which is 250 ft. additional, making a 750 ft. over-all lift, amounts to about 20,000 lb., not including the weight of the rods. This must be moved three feet and then delivered to the other plunger to be moved three feet, the over-all travel per revolution being six feet. The delivery of the load from one plunger to the other is about 34 times each minute, and the flow through the discharge pipe 600 ft. per min., this taking place under a load of about 322 lb. per sq.in. at the plunger.

The two rods, the two beams and the plungers, being of the same weight and balancing each other at all points in the stroke, permit of such substantial construction as to eliminate the danger of breaking the rods. Great weight of rods added to the weight of the column would only increase this menace, except for the careful provisions made to protect the rods while they are changing directions at the end of each stroke. This is done by causing the entire load, except the weight of one rod, to be carried by the other until the change in stroke is made. The pump described is installed in a small house half a mile from any other portion of the water-works plant, is kept locked and is visited only once each 12 hours. The discharge is connected direct to the city water-works mains, which are often subject to sudden pressure, in case of fire as high as 100 lb. per sq.in. This pressure comes direct on the Pomona pump, which has no protection in the way of blowoff or relief valves. The motor is direct-connected to the pump shaft by a flexible coupling. It has no internal starting device and starts the pump under a total head of 650 ft., which is the minimum head the pump must operate against. Much of the draining at the Welsh mines at Century, Okla., has been accomplished by Pomona pumps, and the Vinegar Hill and Commerce Mining and Royalty companies are now preparing to install pumps of this style to handle two million gallons of water daily. The column of the pump may be placed in a drill hole, and the Vinegar Hill company is putting down 1[illegible]-in. drill holes for this purpose.



POMONA PUMP IN JOPLIN DISTRICT

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*Joplin, Mo.

Industrial News from Washington

By Our Special Correspondent

Liquid Oxygen as an Explosive

If used within 10 minutes after the saturation of the cartridge, liquid oxygen is as effective as dynamite for blasting purposes, according to experiments of the Bureau of Mines. In view of the successful work done with this explosive, a large liquid-air manufacturing company has agreed to erect a test plant on a commercial scale. This will be at a large mine or quarry, to give opportunity for determining the extent of the value of liquid oxygen as a commercial explosive.

The Bureau of Mines is studying the best methods of handling the substance and the development of satisfactory containers. The cost of the carbonaceous material composing the stick, the liquid oxygen for one cartridge and the container is insignificant. The problem is largely that of reducing wastage and securing the requisite standardization.

Bureau of Mines' Experiment Work

All work on manganese being done by the Bureau of Mines will be centered at the new station at Minneapolis, hereafter to be known as the Lake Superior station. Since one of the chief problems presented in the Lake Superior iron region is the treatment of low-grade manganiferous ores, the effectiveness of other experimentation on manganese ores will be increased by conducting it at the new station.

While most of the Bureau's copper work is done at Tucson, the Lake Superior station will undertake such of it as may be peculiar to that region. No superintendent will be selected for the Lake Superior station until a civil-service examination can be held.

Mining men in certain sections of the country are urging that, instead of providing for three new experiment stations next year, the appropriation be used to strengthen such stations as those at Salt Lake City and at Berkeley, Calif. These minor stations are badly handicapped by their small working fund, and some mining men in these localities deem it wise to enlarge these stations rather than to establish the new ones authorized.

Russian Mining Commission

The Ministry of Commerce and Industry of Russia has sent a commission of mining men to this country to study the mining industry here. The commission, now sitting daily in the conference room of the Geological Survey, comprises the following members: Theodore Foss, head of the commission, mining engineer and director of several large mining and metallurgical enterprises, including iron-, copper- and platinum-producing companies operating in the Ural mountains; Ivan Goubkin, oil specialist of the Russian geological committee; Avenir Snietkoff, coal specialist of the same committee; and Alexander Stepanoff, secretary.

The purpose of the commission's visit, as stated by the Russian government, is to investigate the mining industry in the United States, so as to utilize the knowledge in the development of Russia's natural resources; to inspect the more important metallurgical works; to obtain information concerning mining legislation; to familiarize itself with geological and mining research as conducted by the Government; and to acquaint the people of the United States with the extent of Russia's natural resources. The commission will travel widely in the mining districts and visit many metallurgical plants.

Assessment Bill Held Up

In view of the continued opposition of Secretary Lane to the Shafroth Bill providing for the suspension of annual assessment work on mining claims during the war, there is considerable doubt that the bill will pass the House. It passed the Senate on July 9, has been reported favorably to the House by the Committee on Mines and Mining, and now is on the House calendar. Before calling up the bill, Representative Taylor, of Colorado, who is in charge of the measure, will make another attempt to convince Secretary Lane that the legislation in no way tends to increase the amount of public land being held for speculative purposes.

Reasons for the enactment of this legislation are given by Representative Taylor as follows: Inability to procure labor to do assessment work; enlistments and the drafting of many prospectors and miners in the army and navy; the high cost of powder, steel, and other materials making assessment work on undeveloped properties almost prohibitive; unproductive expenditure of labor, capital and materials, required in 90% of assessment work, is not advisable at this time.

War Industries Board Problem

Uncertainty exists as to whether the new War Industries Board solves the problem that has faced committee members of the Council of National Defense by reason of the prohibitions of section 3 of the Food Bill which reads:

> That no person acting either as a voluntary or paid agent or employee of the United States in any capacity, including an advisory capacity, shall solicit, induce or attempt to induce any person or officer authorized to execute or to direct the execution of contracts on behalf of the United States to make any contract or give any order for the furnishing to the United States of work, labor or services, or of materials, supplies or other property of any kind or character, if such agent or employee has any pecuniary interest in such contract or order, or if he or any firm of which he is a member, or corporation, joint-stock company or association of which he is an officer or stockholder, or in the pecuniary profits of which he is directly or indirectly interested, shall be a party thereto.

The matter has been referred to the Attorney-General whose interpretation, it is believed, will sustain the view held by many that the interposition of the War Industries Board between the Government purchasing agents and the committees of the Council of National Defense will make it possible to hold intact the present organization of the latter body.

A few resignations from committee positions have been received by Bernard M. Baruch, chairman of the Committee on Raw Materials, but for the most part, members are willing to await the opinion of legal authorities before taking final action.

Lead Imports Increase

Imports of lead from Mexico nearly doubled during the first half of 1917. During the same period the amount of lead exported decreased greatly while there was a marked increase in the consumption of it in this country. These facts are brought out in the United States Geological Survey's mid-year report on lead production which follows in full:

> For convenience of comparison half of the corresponding quantities for the 12 months of 1916 are inclosed in brackets. The output of domestic desilverized lead, excluding desilverized soft lead for the first six months of 1917, was 152,231 short tons (158,235), the output of domestic soft lead, including desilverized soft lead, was 124,292 tons (117,879), and the output of lead produced from foreign ores and bullion was 29,539 tons (9453).
>
> In view of the scarcity of lead, the increase in lead of foreign origin is very encouraging. The greater part came from Mexico. According to records of the Bureau of Domestic and Foreign Commerce, the total lead imported in the first six months of 1917 was 30,620 tons (17,665), of which 22,507 tons came from Mexico (12,099), and 4569 tons came from Canada (3153). The exports of domestic lead amounted to 29,241 tons (50,283) and of foreign lead 6066 tons (4940). The lead used in articles exported with benefit of drawback was 3270 tons (2585). Thus the total exports of lead were 38,577 tons (57,808). Disregarding stocks, the apparent consumption of lead in this country in the six months was 268,952 tons (230,587). The production of new antimonial lead was 7822 (12,019), and of secondary antimonial lead 1959 tons (2065). The output of secondary pig lead by regular ore smelters was 7578 tons (5548).

Explosives Bill Altered

When the Senate Committee on Mines and Mining completed its alterations of the explosives bill passed by the House, only a portion of one paragraph of the original bill remained. While the Senate bill places the administration of the bill entirely in the hands of the Director of the Bureau of Mines, it defines specifically how many features of the bill are to be administered. The bill as amended provides that

> the superintendent, foreman or other duly authorized employee at a mine, quarry or other work may, when licensed so to do, sell or issue, at the beginning of a shift, to any workman under him such an amount of explosives or ingredients as may be required by that workman in the performance of his duties for that shift only, and the workman may purchase or accept the explosives or ingredients so sold or issued but the person so selling or issuing same shall see that any unused explosives or ingredients are returned at the end of the shift, and that no explosives or ingredients are taken by the workman to any point not necessary to the carrying on of his duties for that shift.

All those dealing in explosives are required to keep an accurate record showing the name of each person to whom the explosives are sold. This record is to be sworn to and furnished to the director of the Bureau of Mines on request. The Director of the Bureau of Mines is authorized to issue licenses authorizing the manufacture, possession, sale and issuance of explosives and ingredients. To carry out the provisions of the bill, an inspector, who is to receive a salary of $2400, is to be appointed by the President in each state and in Alaska. The additional employees required are to be appointed by the Director of the Bureau of Mines.

One of the most important provisions of the bill is that the Director of the Bureau of Mines is authorized to investigate all explosions and fires that may occur or that have occurred since the beginning of the war in mines, quarries, magazines and all places in which explosives are manufactured, transported, stored or used. Employees of the bureau are given authority to enter the premises where the explosion or fire has occurred and are empowered to examine plans, books and papers. They are authorized to administer oaths and to examine all witnesses and persons concerned.

A penalty of imprisonment for not more than one year and of a fine of not more than $5000, or both, is provided for those who violate the act or the regulations that it authorizes.

Searching for Nitrate

Measures for insuring a nitrate supply are far enough advanced, it is believed, to make us independent of foreign supply in case of an emergency. A reserve of nitrate has been accumulated sufficient to tide over the short period that would intervene before the needs of the country could be supplied from domestic sources. Hoyt S. Gale, of the Geological Survey, does not attach great importance to the much talked of nitrate-bearing earths in the Western States, but looks to the fixation of atmospheric nitrogen and the oxidation of ammonia to nitrates as the chief reliance for our supply.

"The deposits of nitrate-bearing earths are of very doubtful importance," says Mr. Gale, "on account of the difficulty in recovering a small percentage of nitrates. These earths, or clays, which occur in several of the Western States, have been found to contain in places from 2 to perhaps 5 or 6% of sodium nitrate in conjunction with sodium sulphate and chloride. It is conceivable, of course, that these deposits might be worked by leaching and some method of crystallization to separate the salts. On the whole there is within the United States no known natural source of nitrates that can be counted on to furnish any considerable supply of the refined nitrate salts.

Since the beginning of the movement to develop domestic nitrate supplies, frequent mention has been made of the fact that during the Revolution and the War of 1812, the saltpeter needed for gunpowder was obtained from rich deposits found in many places in the East. Mr. Gale reveals the fact that this source of possible supply has been studied carefully in the hope of finding sufficient to justify exploitation, if only as a war-time emergency, but that the conclusions have been essentially negative. "The total amount obtained from these minor deposits was probably not very large," says Mr. Gale. "In comparison with the greatly increased rate of consumption of nitrates in explosives and industrial uses, the supply obtainable from those sources would be, at best, an almost negligible contribution for present needs, even on the assumption that these small deposits would be worth working again as they were in the past—an assumption which probably is not warranted."

Events and Economics of the War

The President has replied to Pope Benedict's peace proposals that no peace can be made with Germany's present rulers as their word cannot be taken.

The embargo on exports to European neutrals now covers all materials. The price has been fixed for anthracite and will soon be for wheat. Increase of war taxes is being debated in the Senate. The Shipping Board's program calls for 1270 vessels totaling 7,968,000 tons. A nation-wide shipyard strike has been averted. Thirty Dutch ships have been released from New York with Belgian supplies. Investigation of the I. W. W. has been asked of the President by the National Defense Council.

Abroad, the Allies are soon to answer the Pope. Lens remains partly taken. Le Mort Homme and Hill 304, key positions at Verdun, have fallen to the French. The Italians are advancing toward Trieste, having captured Monte Santo. Russia has received another loan from the United States and with it Wilson's message to stand firm for victory. The defense of Riga, which seemed crumbling, has stiffened. Kerensky opened the National Council at Moscow with a warning to malcontents.

Claude Nitrogen Fixation Patents to be Controlled by Big Merger

A combination of the National Carbon Co., the Union Carbide Co. and the Air Reduction Co. has been tentatively agreed upon. The new company will be capitalized at approximately $200,000,000, the three component companies having a combined capital of about $159,000,000. This will be raised approximately $40,000,000 when the new corporation is chartered. Of the three the National Carbon Co. is the largest.

In obtaining control of the Air Reduction Co., according to the New York *Sun*, the new corporation will gain control of the Claude process for extraction of nitrogen from air. The rights of this process were purchased from the French chemist, Georges Claude, by the Air Reduction Co., shortly after its organization in 1915. It also controls the rights to the process of making liquid air and liquid oxygen from air, also invented by Claude. These are said to be the same processes which Germany used in procuring basic products for explosives, which were cut off from Chile by the declaration of war. The company has eight plants, while seven others are in course of construction. Its largest stockholder is Percy A. Rockefeller, son of William Rockefeller. Ambrose I. Monell, president of the International Nickel Co., is another large stockholder. The Société de l'Air Liquide, the first company in France to apply Claude's inventions, is represented on the board of directors.

The National Carbon Co. is one of the largest of its kind in the country. It manufactures lighting carbons, carbon batteries, carbon brushes for generators and hundreds of other kindred products. It owns and operates many plants in the United States and a branch in Canada. James Parmelee is president and Myron T. Herrick, former Ambassador to France, vice president.

The Union Carbide Co. manufactures calcium carbide and other gas-producing materials, which have been used extensively in the European war, as well as machinery and fixtures associated with the production of calcium and acetylene gases. It controls the Union Carbide Co. of Canada, the Michigan Northern Power Co. and the Electro-Metallurgical Co., and also owns a large interest in the Linde Air Products Co. Its plants are located at Niagara Falls and Sault Ste. Marie, Mich. Alfred P. Sloan is president.

British Labor and War Production

The manner in which England has met labor problems is set forth, for its bearing on similar problems here, in a recent bulletin of the committee on coöperation of the Council of National Defense.

In England, according to the bulletin, those in specified lines of business may not employ men between the ages of 18 and 61. This indicates the extent to which England has gone after three years of war in taking men from less essential industries and in concentrating national effort on work of national importance.

Early in the war it became evident that, if the troops at the front were to be furnished with munitions and supplies, men at home must work in a manner different from that established by trade-union rules and practice. Restrictions upon labor made it impossible to produce the quantities needed. The labor unions assented to the temporary modification of these restrictions upon conditions agreed to by the government that the rules and practices were to be changed only for the period of the war; that no changes were to be made which unnecessarily affected established conditions; that capital was to receive no advantage in the struggle between capital and labor. For example, profits were to be limited and wages controlled by government tribunals. Upon these conditions labor agreed that there should be no stoppage upon work required for the war.

Three fundamental changes in labor conditions were brought about: In certain classes of plants, strikes are not lawful and increases in wages may be asked only to offset increased cost of living; restrictions by labor unions against the so-called "dilution of labor," by the employment of women and of unskilled labor, have been laid aside for the duration of the war, as well as restrictions upon an individual's output.

The procedure regarding the employment of women illustrates the situation. When men went to the front women wanted to take their places, but union rules forbade it on many kinds of work. These rules were relaxed upon the following conditions, and more than 1,500,000 women have been put upon men's work: No woman was to be employed if any man was available for the work; men were to be reëmployed when they returned; the standard of pay was not to be reduced; that is, the minimum rates for men would apply to women.

A record is kept of all departures from pre-war conditions. After the war, readjustments are to be made, in connection with new inventions and other similar matters, to create as nearly as possible the conditions which would have arisen on the basis of pre-war conditions. Furthermore, in general the government is pledged to use its influence to restore, after the war, the conditions affecting labor which existed before the war.

All persons are forbidden to employ men within six weeks after they have left work, unless the man has a "leaving certificate" from the last employer stating that he left with the employer's consent. If such a certificate is unreasonably refused, the Munitions Tribunal may issue one having the same effect and impose a fine upon the manufacturer who refused.

As further indicating what has been done to secure labor needed in connection with the war, there have been organized, under the army, battalions of dock laborers at the large ports. In London alone there are 10,000 dock workers in the army engaged in dock work. These are sent where needed, receiving the regular workers' pay in addition to their army pay.

A committee of seven, with more than 70 local committees, of labor men only, is empowered to receive complaints and has done much in preventing labor disputes. The Ministry of Munitions makes all final decisions. Hours of labor in plants are unlimited, but those usual in each business have been continued as far as possible. In some cases they have been excessive, to remedy which an effort is being made.

Iron Trade Organized for War

"The value of the various organizations built up in the iron trade in recent years has had fresh demonstration in the effective work they have done on various situations created by the war," says *Iron Age*. The American Iron and Steel Institute, the American Pig Iron Association, the Lake Superior Iron Ore Association and the ore and vessel interests represented in the Lake Carriers' Association have all coöperated to put the iron and steel industries at the disposal of the Government.

"With little publicity the Lake Superior Iron Ore Association has done an important work in determining within close limits the amount of Lake ore which must be delivered by the railroads from lower Lake docks to the blast-furnace yards within the season of navigation. The Council of National Defense has viewed with much concern the apparent inability of the railroads to carry to the furnaces as much ore as they delivered last year, that quantity seeming fairly to measure the furnace requirements as indicated by the requisitions furnished the association in the early canvass of the blast-furnace situation. The council through its subcommittees has brought this question home to the individual blast-furnace companies and the ore association. In consultations between the president of the Lake Superior Iron Ore Association and the blast-furnace managers the actual requirements of ore in each case have been analyzed so as to determine the amount of the various grades required up to June 1, 1918. This method promises to bring about exact results, avoiding any unnecessary ore movement and at the same time meeting the important requirement of providing each plant with enough ore of the proper grades to enable it to run to full capacity.

"The blast-furnace interests are making a gratifying response to the efforts made to have this matter worked out on the right basis and the Railroads' War Board is alive to the necessity of furnishing equipment—even to the subordination of other interests not so essential—after the ore requirement has been definitely fixed.

"It is not amiss to point out that the machinery for marshaling and acting upon the facts relative to the industry on which the country must chiefly depend in this time was ready to hand. The quick mobilization of that industry has been in contrast with much that has been done through strictly Government agencies. It may also be said without elaborating the point that there is much to gain from a closer coöperation between the Government and iron and steel manufacturers than Government representatives have invited thus far."

Purchasing Commission Appointed

A commission to handle the purchases of the Allies in this country has been created through agreement signed by representatives of the Allied governments. The members, as announced by the Secretary of the Treasury, are Bernard M. Baruch, Robert S. Lovett and Robert S. Brookings. These men are also members of the War Industries Board, which is to handle the purchases of supplies for this Government.

Thus far only Great Britain, France and Russia have signed the agreement, but the other Allies are expected to concur shortly. Hereafter the foreign representatives in this country will turn their orders over to the commission instead of placing them directly with manufacturers.

This commission, which will be informed as to the productive capacity of every industry, will assign priority to the different orders and thus make more effective use of the combined resources of this and the Allied countries in the prosecution of the war.

One effect of this plan will be to stabilize prices and eliminate competition among the foreign governments in ordering supplies in this country.

Road Building Behind the Lines

The building and maintenance of motor roads behind the fighting line in France and Belgium are described in a bulletin just issued by the American Highway Association.

In reconstructing roads for military purposes, where they have not been damaged by war operations, it is sometimes possible to afford considerable relief to traffic by widening them. In carrying on the work in mountainous sections subject to heavy rainfall, where it is necessary to have the surface dry out quickly, the roads are sometimes given considerable crown, to shed the water into the ditches. This crown causes much complaint from drivers, for it results in no little skidding; but the transportation authorities believe it is better to dry off the road promptly, even at the loss of a few trucks by accident, than to have it stay soft, damp and easily cut up for some time after each rainfall.

Narrow streets through some hamlets prevent the widening of the roads there. At such places detours are frequently built. It has also been necessary, where narrow bridges would cause congestion on a wide road, to widen the bridge or build another beside it. Some of these are not as strong as might be desired for concentrated military traffic, and the ways in which they are cribbed and braced include every expedient engineering ingenuity can suggest.

The refinements of road building receive scant attention along the battle line itself. In the early days of the war attempts were made to use Telford foundations in damp places. Wedging the stones upright proved a failure under the conditions, so the road builders tried laying them down flat. The traffic pressed the flat stones, and, as this was done, more were placed on top. with broken bricks and stones to fill in. In this way many miles of road have been built.

Railroads Plan Troop Movement

Transportation for 687,000 men must be provided to the various cantonments that the Government is building to house the new National Army. The movement will start Sept. 5. Between then and Sept. 9 the railroads will complete the entrainment of 200,000 men, or approximately 30% of the total number scheduled to be moved to the various training camps.

It is expected that a second movement of approximately 200,000 men will begin on Sept. 19, continuing four days thereafter, and a third movement of the same size on Oct. 3. The Provost Marshal General has designated 4531 points throughout the country as points of local concentration for entrainment.

Some conception of the magnitude of the task confronting the American Railway Association, says its bulletin, in preparing schedules that will assure the safe and prompt transportation of these armies without interfering with regular traffic may be gleaned from the fact that to move merely one field army of 80,000 men requires 6229 cars made up into 366 trains with as many locomotives and train crews.

Meanwhile, in addition to moving the 687,000 recruits for the National Army, the railroads have been asked to supply transportation for the 350,000 members of the National Guard to their training camps. This National Guard movement has already started and will continue in increasing volume until all have been moved.

Oil Producers Need Equipment

The United States Bureau of Mines has informed the Council of National Defense that a lack of well-drilling equipment may make it difficult to meet the country's military and industrial demands for gasoline and other petroleum products.

Van H. Manning, Director of the Bureau, expressed his hope that the council could so arrange that the needed materials might speedily be obtained for the oil producers. "The situation is critical," he said. "At present drilling is being curtailed, costs of oil-well supplies have been increased and it has become impossible to get them in adequate quantities for any price. The situation is worse than at any time since the war started. Were no wells to be drilled for one year's time our petroleum production would drop at least one-fourth. From California to Pennsylvania small producing wells are being abandoned in order that equipment may be used for new wells from which larger production is expected."

"Hooverizing" Foreign Exchange

"Reports from Washington indicate that the Trading with the Enemy Act, still pending in Congress, will be amended to provide for 'Hooverizing' gold and foreign bills of exchange," says the New York *Times*. "It is understood that legislation will be adopted vesting power in the Secretary of the Treasury or in the Reserve Board absolutely to regulate and control the movement of gold from and to the United States, and at the same time to regulate all foreign banking transactions."

Up to the present the larger banks and banking houses have endeavored to adjust the foreign exchange situation the best they could without legislation and without the medium of Government officials. This has been a hard task, and bankers have felt that they have been subjected to heavy responsibilities. They welcome action by the Government which will place control of the exchanges in the hands of a committee or of a controller. The British Treasury, it is said, has repeatedly urged our Government to take complete charge of the exchanges. To buy supplies Germany is said to have used credits on foreign countries, established by sale of German-owned securities here.

Improvement of Nitrate Port

Chile's nitrate business has grown so of late that $8,500,000 is to be spent in improving the port of Antofagasta. One of the objects is to equip Chile to hold this greater nitrate business after the war. Bids have been asked of American manufacturers for this work and will be opened on Mar. 30, 1918. Attention is called to the fact that the projected improvement is of importance to the commerce of Bolivia. Antofagasta is connected with Bolivia, via the Chilean-Bolivian Railway. All particulars may be obtained from the Chilean Embassy at Washington or from the Consulate General of Chile at New York.

Iron Ore and Steel Regulation

Carrying a step further the policy set forth in his coal amendment to the Food bill, Senator Pomerene is prepared to push his bill providing for regulating the production, sale and distribution of iron ore, iron, steel and their products. By its terms, power is given to the President to requisition plants and businesses if he believes it to be in the interest of efficiency. The Federal Trade Commission is specified as the agent through which the act will be administered.

Editorials

Price Fixing, Taxation, Etc.

We are in for experiments in economics, not only in financing, but also in price fixing and taxation; and we might as well make up our minds to it. The most unfortunate part of this is that we are all agreed respecting principles except one, and there ought not to be any radical experimentation. The questions of difference relate mainly to the proper action to be taken in conformity with the fundamental principles. What causes us to fear is the absence of moderation in Washington and the disregard of expert advice.

The great difference as to a principle pertains to what proportion of the expense of the war shall be borne immediately, that is, by direct taxation; and what proportion by posterity, that is, by bond issues. That difference being settled, how shall the taxes be raised?

Everybody agrees on two things, namely, that the idea of war profits is abhorrent. Therefore, all the profit accruing from conditions directly attributable to the war should be absorbed theoretically to pay the bills. Moreover, everybody agrees upon the principle that those persons who enjoy large incomes should pay larger taxes than those whose incomes are small and who are less able to pay.

But, although everybody is agreed on those principles, everybody is not agreed as to how they shall be obeyed. Some legislators advocate the seizure of all war profits, but the more intelligent among them are well aware that such a course would neither be wise nor free from injustice. A machine shop that three years ago was engaged in ordinary manufacturing and during the course of the war changed to the manufacture of shells at greatly enhanced profit, would be a fair subject for complete absorption of all its excess profits. On the other hand, there are important branches of business that have benefited only partially through war prices, and other concerns which show excess profits only through the natural growth of their business, or developments therein. For example, a concern that even before the war began had entered upon a program of reconstruction of plant in order to diminish its cost of production, and having completed that program in 1916, would show in 1917 a profit greatly in excess of anything realized previous to 1914, even in the production of something having nothing to do with the war. The levying of a 100% tax on excess profits would in such a case be nothing but confiscation of capital. Even the assessment of a moderate tax would be an injustice. It is certain that in the adjustment of conditions that are so complicated it would be impossible to be absolutely just. The most that can be done is to be as fair as possible.

Turning, now, to the matter of wisdom respecting the absorption of all excess profits, it is perfectly clear that the machine shop that three years ago was engaged in the manufacture of peaceful articles would not have embarked on the manufacture of shells unless it were going to be able to make more money in doing so. The complete absorption of excess profits would mean that the Government, on its own account, would have to undertake the manufacture of munitions, and it is pretty clear in the minds of everybody that the Government cannot conduct business and industrial affairs so well as private enterprise can do it.

Furthermore, it is extremely difficult to determine just what are profits, anyhow. A large part of what in 1916 was heralded as enormous profits was, in fact, put into plant for the purpose of producing those profits, with the likelihood in some cases that much of such plant would soon become useless, and consequently valueless. The financial records of many important companies in 1917, like that of an important zinc company reputed to have earned nine million dollars in 1916 yet passing a one hundred thousand dollar dividend in May, 1917, furnish ample food for reflection. Therefore, the legislators will find it necessary to allow a liberal margin of excess profits, even on munitions proper, in order to give manufacturers the incentive to make them, and in order, moreover, to compensate for the extraordinary risks that they are obliged to take.

What Congress is going to do in the matter of taxation is still uncertain, but there is no doubt that the Government has embarked on a policy of price fixing, although there is still doubt as to how far it will think it can go. It is mortifying to our national pride that the actual fixing of prices has to be done by the President, the commander-in-chief, who has so many other important things to think about. So far, he has acted only in the matter of coal. Indeed, he has no legal authority to act further. With respect to bituminous coal, his action was drastic and is resented by many producers and already has created chaos in the business. With respect to anthracite coal, the prices fixed were the same as those now prevailing. Indeed, on some grades of coal they were, perhaps, a little higher.

In considering the question of coal, there are questions of public policy and welfare that are different than those governing many other commodities. People must have coal wherewith to keep warm, just as they must have wheat to eat. The Government may properly regulate the distribution of such things as are indispensable, but other commodities, however important they may be, are not absolutely indispensable. For example, lead is indispensable for cartridges. It is important in the manufacture of white paint. If there be not sufficient lead for both purposes, people can get along for a while without painting their houses, and as the cost of paint becomes too high they will not do so.

There are some interests in bureaucratic circles in Washington that are known to favor radical action in the matter of prices and are by no means reluctant to deal with the subject. Thus, the Federal Trade Commission seems to be itching to obtain authority to try experiments with the business machinery of the United States and the world. This would be something like dismissing the officers of a battleship fleet and substituting a corps of lawyers and accountants. We do not think that the President would be so unwise, and we think it is doubtful whether the experiments with price fixing will go so far as pessimists are now supposing.

The theorists themselves seem to be confused, for they talk about the advantage of high prices for some things, in order to stimulate production, which is, of course, common sense. Thus, nobody talks about regulating the price for petroleum products, but rather is a high scale applauded, with the idea that a waning production will thereby be stimulated. Similarly, is the high price for cotton considered to be a good thing, while, as for the Western farmer, he is guaranteed a minimum for wheat that a few years ago would have exceeded his wildest hopes. Nobody has said anything about reducing the prices for agricultural products or wages for labor. Attention has been centered upon a few commodities that are considered to be the interests of big business. This gives the policy of Washington a decidedly political look.

One thing is certain, namely, that in tampering with the machinery of business many things will happen that were not expected. Let us hope that there will not be so many of these surprises of serious character as to cripple the fighting ability of the country, as the curtailment of coal and copper production has done. The slogan of production, then more production, that we used to hear in the early days of the war, seems to have been forgotten.

The Anaconda Strike

Things came to a head in the labor troubles in Montana when the smelters of the Washoe works struck last Saturday. Both the Washoe and Great Falls plants were then closed, except for certain departments, and, it being impossible to treat the ores from the Anaconda mines in Butte, they were closed also. This will affect practically all of the copper mines of Butte, for, with the exception of East Butte, Anaconda smelted their ores. Indeed, the suspension of operations may be said practically to suspend industrial operations in the State of Montana, for coal mining, lumbering, electric-power production, etc., depend substantially on the operation of the copper mines.

Besides thus checking industry in Montana, the United States will be deprived of a large part of its supply. This has not yet been felt acutely, for the reason that the refiners have been working on surplus stocks of crude copper, but in several cases those stocks have now been used up. In 1916, the United States produced 1,943,000,000 lb. of copper, of which 352,000,000 were derived from Montana. With that large output subtracted, together with the curtailment of the production in Arizona, the United States is going to be badly hampered for copper at a time when the maximum production is wanted.

The labor troubles in Montana have been going on ever since the first of July. The company has made liberal overtures to the men, but the latter would listen to nothing but having their own way, which included especially the establishment of a wage scale of $6 per day, irrespective of the price for copper.

Zinc Pigment vs. Lead Pigment

Our Washington correspondent reports that the substitution of zinc pigments for lead pigments has been suggested to the Raw Materials Committee of the Council of National Defense by way of remedying the scarcity of pig lead and the surplus of spelter. While the opinion held within the Council of National Defense appears to be entirely opposed to any action which would interfere with the law of supply and demand as respects these metals, it is admitted that some men of high scientific standing believe the suggestion a feasible one.

It is argued that the substitution of zinc pigments for those of lead would do much to relieve the lead stringency and, by making a market for more zinc, would absorb some of the plethora of zinc ore. It is contended that as a war measure the prohibition of the manufacture of white lead, on the ground that the lead in pigments is needed in munitions, would be on the same basis as the prohibition of the manufacture of distilled liquors because the grain is needed for foodstuffs.

It also has been proposed to the Council to omit the last draw in making spelter and carry the second draw a little further, thus leaving enough zinc in the residues to make the recovery of zinc oxide profitable. This system of operation, it is asserted, would reduce the surplus of spelter production and would increase the zinc-oxide production. It is declared to be feasible to smelt, in this way, zinc concentrates containing considerable lead, avoiding lead in the spelter by taking only two draws and recovering the lead in lead-zinc fume. This would tend also to the conservation of zinc, it is contended, because it would prevent the loss which results from making the clean zinc concentrate at present demanded by zinc smelters.

There is, perhaps, something worth considering in the main idea of substituting zinc pigments for lead pigments, but we are doubtful as to the usefulness of the means that are suggested. In the first place, there is no longer any great plethora of zinc ore, the importation of large tonnages of ore from oversea countries, which was a relieving feature in the market in 1916, having been checked by the present acute shortage in ocean-carrying facilities. Consequently, the price for zinc ore has not declined in anything like the same proportion as the price for zinc, which means that smelters' margins have been greatly contracted.

Nor does the idea of omitting the last drawing of spelter from the distillation furnaces, in order to produce a residue high in zinc, for subsequent extraction by grate burning, look logical. Indeed, at first sight, this looks something like advice to the cook to produce a full garbage pail in order to feed the pigs. However, while such procedure might increase the supply of zinc-lead pigment, it might actually decrease the supply of pig lead, for if all zinc smelters adopted such a practice, the production of pig lead from zinc smelters' residues, amounting to several thousand tons per annum, would be subtracted.

Another thing that stands in the way of the suggestion to the Raw Materials Committee is the difficulty of finding men skilled in the art of making zinc oxide. It is becoming a fairly common custom among American zinc smelters to extract zinc remaining in the residues withdrawn from the retorts by burning such residues on Wetherill grates. From such residues, containing 6 to 8% zinc, somewhere from 60 to 70% of the zinc may be recovered in the form of fume, the cost of the process being relatively small, inasmuch as the retort residues usually contain sufficient unburned coal to serve for all the fuel that is required. However, the fume ordinarily produced is dirty and is used simply as zinc ore, being returned to the retorts. The production of zinc fume of this character and the production of zinc oxide to be used as pigment are two different things. For the latter purpose, proper physical character of the product, especially as to color, is the prime consideration, and the number of available men skilled in that work is rather small. Certain zinc smelters have already undertaken to enter the zinc-oxide business in this way, but they have been having their troubles, which they have not succeeded in mastering, although doubtless they will do so in the course of the next six months.

However, there are possibilities of increasing the use of other white pigments at the expense of white lead. For example, there ought to be a great expansion in the production and use of lithophone; and, as raw material for that process, the crude oxide fume produced by the zinc smelters might be profitably employed. This would have the further advantage of actually adding to the supply of material available for conversion into pig lead. Unfortunately, the present high cost of sulphuric acid is an obstacle. Furthermore, there are low-grade ores, especially the calamine of Leadville, that are too poor for the zinc smelter but ought to be capable of local concentration into oxide fume or to serve as raw material for the manufacture of pigment. The interest of capitalists in making money will surely lead them into such things, if there be any profit in sight, and if the policy of the Administration does not destroy all incentives.

Steel Production in 1917

Partial returns from a number of steel works, including nearly all the larger ones, indicate that the production of steel ingots in the United States in the first half of 1917 was close to 21,500,000 gross tons, or at the rate of 43,000,000 tons a year. This is an increase of 1,600,000 tons over the great output of 1916. This increase in steel in 1917 was made notwithstanding a decrease of 361,000 tons in the make of pig iron, as compared with the first half of 1916. The production of steel for the half-year exceeded that of pig iron by 2,242,000 tons. The difference was partly made up by the use of the stocks of pig iron on hand at the beginning of the year, as it is known that on July 1 those stocks had been drawn down to a low point; but the steel output was augmented in a much greater degree by the use of a large proportion of scrap in the open-hearth furnaces. This is proved by the heavy demand and large sales of steel scrap which have been reported during the past year.

We have heretofore called attention to the fact that steel-producing capacity has been increasing faster than blast-furnace capacity, and the figures above confirm this statement. This state of affairs cannot continue long, and the make of steel must remain nearly stationary until the new blast furnaces now under construction are ready to operate. This will hardly be before the close of the year.

Australian Coal Miners' Working Hours

In the findings of Justice Edmunds in the recent Australian coal miners' strike, the court has ordered that eight hours bank to bank for the first five days of the week and six hours bank to bank on Saturday, Sunday and holidays inclusive; a half-hour for meals; time calculated from the time the first person working on the shift leaves the surface to the time the last person returns to the surface, shall constitute the full working shift in all coal and shale mines in the Commonwealth. What this means to the operators of Australian mines can be apreciated only by those who know of the time actually lost to the companies by the miners taking their "smoke oh's" and "Billy-can" tea.

The "water boilers" who furnish the water for the aforesaid "billy-can" tea are graciously allowed to work a trifle longer if the operators and the executive of the Australian Coal and Shale Employee's Federation can come to some agreement—and the said "water boilers" don't go on strike.

State-owned mines may operate on any scale of wages that Justice Edmunds can affix to his working hours, as taxation pays the losses, and the probability is that the six-hour day and five days per week, which the miners are working for, will be given by Justice Edmunds at the first opportune moment.

BY THE WAY

In relating the remarkable record of furnace at the Cherryvale Works of the Edgar Zinc Co., in a recent issue of the *Journal*, we neglected to state, which we ought to have done, that this excellent furnace was built by the late John C. Dods, under the direction of S. C. Edgar, Sr., who was then president of the Edgar Zinc Co.

It's an ill wind that blows nobody good, and when the wind blows a letter astray it is often ethical to let it do a little of the good work. For example, gaze on this:

> Mina Andalusia, Santa Rica, —— —, 1917.
>
> Dear Harry: This climate is bad enough, but other things simply get my angora. The only way I figure it out is that Don José Arzuaga is a crook or else he is plain bughouse. As an *administrador* he sure is the limit.
>
> The directors have insisted that, until we strike something better than the present low-grade stuff, expenses must be held down pretty close to $3000 each month. My instructions were to deal as tactfully as possible with the former owner, but to confine my activities to the purely technical work.
>
> Old J. A. knows the limitations, but he maintains a staff big enough for a real mine. There is a master mechanic at 350 *colons*, a construction foreman at 350, a mine foreman at 300, a mill foreman at 300, a power house foreman at 240, a storekeeper and a bookkeeper at 160 each and (get this, will you?) a stenographer at 120 *colons* per month and grub; the wages of all this gang coming to an equivalent of at least one thousand real dollars. When you add my little bit and Arzuaga's fat slice it leaves precious little for labor, new tools and supplies. Why with one good bookkeeper and a foreman not afraid of getting his hands dirty, I could run the whole shebang alone. Every time Don José rides to the coast, I fire about half the staff, but he either hires each one back again or fetches another A. P. A., which in this section means: *Algun pariente de Arzuaga*.
>
> We have been short on tools for underground work, but the last pack train brought nothing but food and the following:
>
> 1 cabinet Victrola
> 200 records
> 1 crate carrier pigeons
> 1 repeating shotgun
> 1 box loaded shells
> 2 Airedale terriers
>
> Nary a timber spike, double jack, nor an inch of drill steel. For nearly a week I've had to put some miners on odds and ends of surface work. If I lay them off, they'll quit and go home. Home? Where have I heard that word? Say, Harry, just cable me some urgent message. I'm going to beat it, but I want a plausible alibi. Au revoir,
>
> JACK.

A few weeks ago a million pounds of high explosives were set off by the English under the German trenches on the Messines Ridge in France says *Engineering and Contracting*. The explosion was heard in London, 130 miles away. This is the largest blast ever fired. If each pound of explosive moved only one ton of earth and rock, 1,000,000 tons were hurled into the air. About 200 miners are said to have driven a tunnel, or rather a drift, 1½ miles long in 6 months. In 19 chambers located in cross drifts, the explosives were placed, 25 tons to the chamber. These were detonated simultaneously with an effect that was described as appalling. The speed of driving the drift appears to have been 36 ft. a day. There is nothing remarkable in this performance if the ground was not bad and if it was possible to use explosives liberally. It is not unlikely, however, that explosives were used in small charges so as not to disclose the location of the sapping work to the enemy. [From our own point of view—36 ft. per day is pretty good driving in any kind of ground, and as for small charges of explosives so as not to disclose the location of the sappers, we should imagine that there must have been some "conflicting detonations" on the surface in that vicinity.—Editor.]

August Mining Dividends

Dividends disbursed in Aug, 1917, by 35 United States mining and metallurgical companies making public reports amounted to $13,735,145. Of this amount, $278,389 represented special dividends in favor of the American Red Cross, paid by four companies. The regular payments, therefore were $13,456,756 distributed by 34 companies, which compares with $11,770,358 paid by 28 companies in August, 1916. Canadian and Mexican companies paid $1,771,051, as compared with $1,907,963 a year ago.

American Zinc, Lead and Smelting Co. postponed action on the dividend which would have come due on its common stock, pending more certain information as to terms of proposed revenue law and Government action as to its supplies. Initial payment was made by Consolidated Arizona Smelting Co. The only holding company which paid in August was St. Mary's Mineral Land, which distributed $2 a share or $320,000; which item is not appended to the table.

United States Mining and Metallurgical Companies	Situation	Per Share	Total
Am. Zinc, Lead and Sm., pfd	U. S.	$1 50	$144,840
Anaconda, c	Mont.	2 00	4,662,500
Bunker Hill & Sullivan, l.s.	Ida.	50	163,500
Caledonia, l.s.	Ida.	03	78,150
Champion, c	Mich.	6 40	640,000
Chief Cons., l.s	Utah	10	88,406
Cons. Ariz. Smelting, c	Ariz.	05	83,150
Cresson, g.s	Colo.	10	122,000
Eagle & Blue Bell, l.s	Utah	.10	89,315
First National, c	Calif.	40	240,000
Golden Cycle, g	Colo.	03	45,000
Hecla, l.s	Ida.	15	150,000
Homestake, g	S. D.	65	163,254
Internat. Nickel, pfd	U.S.-Can.	1 50	133,689
Jim Butler, g.s.	Nev.	10	171,802
Loon Lake, c	Wash.	01	14,404
Mammoth, g.s.l.	Utah	25	320,000
Mass. Con., c	Mich.	1 00	97,317
Miami, c	Ariz.	2 50	1,867,785
†Miami, c	Ariz.	25	186,779
Mohawk, c	Mich.	10 00	1,000,000
*Mohawk, c	Mich.	50	50,000
Moscow	Utah	02	18,000
Nevada Hills, g s.	Nev.	05	53,284
New Jersey Zinc	U. S.	4 00	1,400,000
Plymouth Cons., g	Calif.	24	58,520
Richmond, l.s.	Ida	02	16,800
Shannon, c	Ariz.	50	150,000
United Copper	Wash.	01	10,000
United Eastern, g	Ariz.	05	68,150
United Verde, c	Ariz.	1 50	450,000
United Verde Extension, c.	Ariz.	75	787,500
*United Verde Extension, c	Ariz.	10	105,000
Uvada Copper	Nev.	.01	6,000
White Knob, c	Ida.	10	20,000
Wilbert, l.s	Utah	02	20,000
*Wolverine, c	Mich.	50	30,000
Yellow Pine, z l	Nev.	03	30,000

Canadian and Mexican Companies	Situation	Per Share	Tota
Amparo, g s	Mex	$0 03	$10,000
Asbestos Corpn. of Can., pfd	Que	1 00	40,000
Coniagas, s	Ont.	12½	100,000
Esperanza, g s	Mex.	24	109,200
Granby Cons., c	B. C.	2 50	174,961
Greene-Cananea, c	Mex.	2 00	976,888
†Kerr Lake, s	Ont	15	90,000
Trethewey, s	Ont	05	50,000

* Red Cross

† One-half in favor of Red Cross and one-half for Army and Navy Branch, Y. M. C. A.

The totals for the first eight months of the year are as follows: Mining and metallurgical companies, $135,083,376; holding companies, $4,187,789; Canadian, Mexican, Central and South American mines, $13,001,717. The table shows details of the month's payments.

Personals

H. F. Wierum returned to New York recently from Tasmania.

Horace V. Winchell has sailed from Yokohama for the United States.

Corey C. Brayton will spend the next two or three weeks in Utah and Idaho.

R. H. Clarke has been appointed chemist for the Chino Copper Co., at Hurley, New Mexico.

Jay P. Wood has left Bingham Canyon, Utah, and gone to the Presidio, San Francisco, California.

C. Gore-Langton has gone to Chuquicamata to serve on the staff of the Chile Copper Company.

A. F. Hallett has accepted the position of chemist with the Khirgiz Mining Co., at Ekibastus, Siberia.

Livingston Wernecke, geologist for the Treadwell company, has gone to Wrangell on mine examination work.

Prof. William Campbell of Columbia University is serving as consulting metallographist at the Brooklyn navy yard.

J. A. Stewart, formerly with Pickands, Mather & Co., has been appointed superintendent of exploration for the Midvale Steel Co. in Missouri.

John Gross has been appointed metallurgist with the Bureau of Mines and has left for Fairbanks, Alaska, having closed his Denver office.

Ralph B. Green, superintendent of the American Smelting and Refining Co.'s plant at Hayden, Ariz., is taking a vacation in Denver, Colorado.

W. Parsons Todd, vice president of the Quincy and Adventure mines in northern Michigan, has returned to New York after a visit to the mines.

Bennett R. Bates has been appointed manager of the Cubo Mining and Milling Co., at Guanajuato, Mexico. He will leave about Sept. 5 for Guanajuato.

L. W. Bahney has left the Sheffield Scientific School, Yale, to become metallurgical engineer with the Scovill Manufacturing Co., Waterbury, Connecticut.

Arthur P. Watt, formerly with the St. Louis Smelting and Refining Co., is now at Mine La Motte, Mo., as metallurgist for the Missouri Metals Corporation.

Milo W. Krejci, assistant superintendent of the Boston & Montana Reduction Works of the Anaconda Copper Mining Co., is spending a few weeks in New York and the East.

Henry N. Thomson has resigned as metallurgist for the United Verde Copper Co. and is engaged in consulting practice at 918 S. Kingsley Drive, Los Angeles, California.

Claade H. Cooper, assistant superintendent of the Calumet & Hecla stamp mill at Hubbell, Mich., went to Fort Sheridan last week to enter the training camp for officers.

G. C. Bateman, manager of La Rose Consolidated mine, Cobalt, Ont., has gone to Manitoba to make an examination of the Manigotagon, Gold Lake and Long Lake gold camps.

R. B. Farquhar, Jr., recently assistant superintendent of the foundry of the Midvale Steel Co. in Philadelphia, has accepted an appointment as superintendent of the Watertown Arsenal foundry at Watertown, Massachusetts.

A. K. Knickerbocker, formerly superintendent of the Arthur Iron Mining Co. at Hibbing, Minn., and **Edward Kreamer**, formerly chief engineer, have formed the Mesaba Operating Co. for working leased properties at Cedartown, Georgia.

J. E. McAllister has been appointed vice president and general manager of the National Steel Car Co., Ltd., at Hamilton, Ont. Mr. McAllister was formerly general manager of the British Columbia Copper Co., and consulting engineer to the British America Nickel Corporation.

Borr A. Robinson has resigned as assistant secretary of the American Institute of Mining Engineers to take a position with the United States Rubber Co. **Prof. G. A. Ronsh**, of Lehigh University, has succeeded him as managing editor of the Institute's bulletin. **A. L. Gresbam** becomes assistant to the secretary.

F. W. Denton, who lately retired as manager of the Copper Range mines to become consulting engineer and first vice president of the same company, was recently presented with a gold watch at a dinner at the Houghton Club. There were present 56 department heads who had been associated with Mr. Denton for about 15 years.

George Satterthwaite has resigned as superintendent of the Midvale Steel Co., Philadelphia, and has been succeeded by **Henry D. Booth**, formerly in charge of munitions. **Newell C. Bradley**, assistant superintendent, has resigned, and **John L. Cox** has been appointed assistant to superintendent in charge of engineering and research.

J. R. Finlay has gone to Minnesota to do some work for the Bureau of Mines. About Oct. 1, he expects to go to Colorado and thence to the Cœur d'Alene district of Idaho to fill an engagement the latter part of October. Later he expects to drive from Colorado Springs to Tucson, Ariz., where he will make his headquarters for the winter.

B. A. Shutts, superintendent of the North Cornwall furnaces, Bethlehem Steel Co., Lebanon, Penn., has resigned, effective Sept. 1, to become superintendent of the Central Iron & Steel Co., Harrisburg. Mr. Shutts will be succeeded by **Ira Hoover**, Lebanon, who has recently been assistant to the former superintendent, W. L. Wolfe, at the Lackawanna plant of the Bethlehem Steel Company.

C. B. Dunster, manager of the mining department of Breitung & Co., New York, has been appointed manager of E. N. Breitung & Co., at Cleveland, Ohio, and assistant general manager of the Breitung iron properties. **H. L. Kaufman**, the former manager, has resigned to enter the banking business in New York. **H. B. Barling**, formerly chief engineer under Mr. Dunster, succeeds him in New York. **E. N. Breitung** is general manager both of the iron operations from Cleveland and of the miscellaneous mining operations of Breitung & Co., New York.

Obituary

Prof. K. Birkeland of Christiania, Norway, died in Tokyo, Japan, on June 18, aged 50 years. He was a graduate of the University of Christiania and also studied in Paris, Geneva and Bonn. In 1898 he became professor of physics at the University of Christiania. Together with Dr. S. Eyde he developed the well-known Birkeland-Eyde nitrogen-fixation process. He was a member of several societies.

Judge C. C. Goodwin died at Salt Lake City on Aug. 25, aged 85 years. He was born in Rochester, N. Y., and went to California in 1852 during the gold rush, settling in Marysville. He became a miner and later studied law. For a time he edited the "Territorial Enterprise," a mining paper. Later he moved to Salt Lake City, where he became editor of the "Tribune," which position he filled for 21 years. He was editor of "Goodwin's Weekly," widely read in the intermountain region for its trenchant comment on mining and current events.

Oscar Edmund Cary, assistant general manager of the Ohio & Colorado Smelting and Refining Co., died of heart failure at his home in Denver, Colo., on Aug. 20, aged 53 years. He was born at Fort Wayne, Ind. Upon graduation from high school, he entered business which later took him West. In 1901 he entered the employ of the American Smelting and Refining Co. In 1905 he went with the Ohio & Colorado Smelting and Refining Co. at Salida, Colo., where he rose to be assistant general manager. He was a member of the Rotary and Country clubs, and of the Civic Association.

Engene H. Barton died in Los Angeles, Calif., on Aug. 12, 1917, aged 64 years. He was born at Bartonville, Vt., and was a graduate of the University of Louisiana and of Heidelberg. His practice included operations in civil and mining engineering. He built and operated the railroad between Bodie and Mono Mills, Calif., and later became chief engineer for La Grange dam of the Turlock irrigating system. He had charge of mines at Bodie at one time and about 1902 went to the Yellow Aster mine at Randsburg, Calif., where he became superintendent. In 1907 he was made mine superintendent for the Ray Consolidated company at Ray, Ariz., but left soon after, owing to the panic of that year.

William H. Storms, former state mineralogist of California, was shot and killed at Oakland, on Aug. 20, by Richard Hutchinson, following a quarrel over a placer claim that Storms was trying to sell for Hutchinson. Mr. Storms was born in Hackensack, N. J., 58 years ago. He went West at an early age and after a career of several years in Idaho, Colorado and Arizona as a miner and writer upon mining subjects was appointed field assistant of the California State Mining Bureau. Among the mines managed by him at various times were the Baliol in Amador County, the Yellow Aster in Kern County, Calif., and the Junction, near Sodaville, Nev. In 1911 he was appointed state mineralogist of California which position he held until 1913. In 1915 he took charge of the development of a property in New Mexico owned by the Haggin and Tevis estates. He was the author of several technical bulletins and reports, including one on "Methods of Mine Timbering" now used as a textbook. He was a frequent contributor to technical papers, including the "Engineering and Mining Journal." He was twice editor of the "Mining and Scientific Press" and was on its staff at the time of his death.

Societies

Mining Institute of Scotland held a general meeting on Aug. 11, in the Royal Technical College, Glasgow.

University of Utah has increased the equipment of its department of engineering and will offer new courses for the coming year.

Exposition of Chemical Industries, the third of national scope, will begin Sept. 24 in the Grand Central Palace, New York. Opening addresses will be made by Dr. C. H. Herty, editor of "Journal of Industrial and Engineering Chemistry"; Dr. Julius Stieglitz, president American Chemical Society; Dr. C. C. Fink, president American Electrochemical Society and Dr. G. W. Thompson, president American Institute of Chemical Engineers. There will be about 350 exhibitors at the exposition.

Industrial News

Morse Bros. Machinery and Supply Co., of Denver, has purchased all the surface equipment at the upper workings of the Camp Bird mine near Ouray, Colo and will dismantle and ship the equipment to Denver. The new tunnel of the Camp Bird company, being driven to reach the veins at lower depth, renders this valuable equipment unnecessary. The famous Thomas Walsh hardwood-floor boarding house with accommodations for 400 men and the 10,000-ft. aerial tramway are included in the sale.

New Patents

United States patent specifications listed below may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

Cyanidation and Flotation — Process of Extracting Precious Metals and Other Metals from Ore. John M. Tippett, Colorado Springs, Colo. (U. S. No. 1,236,501; Aug. 14, 1917.)

Flotation—Art of Concentration of Ores by Flotation. George D. Van Arsdale of New York, N. Y. (U. S. No. 1,236,504; Aug. 14, 1917.)

Hydrogen Sulphide—Production of Hydrogen Sulphide from Sulphide Ores and Concentrate. Raymond F. Bacon, Pittsburgh, Penn., assignor to Metals Research Co., New York, N. Y. (U. S. No. 1,235,953; Aug. 7, 1917.)

Manganese and Other Metals—Process for the Recovery of Metals From Ores and the Like. Charles S. Vadner, Humboldt County, via Battle Mountain, Nev. (U. S. No. 1,236,236; Aug. 7, 1917.)

Ore Treatment — Method for Treating Roasted Ores with Liquids. Arthur Ramén, Olympia, Hálsingborg, Sweden. (U. S. No. 1,235,598; Aug. 7, 1917.)

Timbering — Improvements in Miners Timber Measuring Rods or Gauges. Daniel Sandbrook Nicholas, Cardiff, England. (Brit. No. 105,129.)

Zinc—Process for the Electrolytic Deposition of Zinc on Metallic Surfaces. Pascal Marino, London, W. C., England. (Brit. No. 105,255.)

Zinc Condenser—Production of Metallic Zinc. Auguste Joseph François de Bavay, Kew, Victoria, Australia. (U. S. No. 1,233,652; July 17, 1917.)

Editorial Correspondence

SAN FRANCISCO—Aug. 25

Pinal Dome Oil Co. has sold its lands and business to the Union Oil Co., the purchase price being about $3,600,000, to be paid $500,000 cash and the remainder in notes or bonds or in cash as the purchaser may elect. The reason given by the president of the Pinal Dome for the sale is that the directors were confronted by many difficulties in the future operation of the property and concluded that the interests of all the stockholders would be best conserved by the sale. The sale was made as of June 1, 1917, and on July 20 the cash first payment, including interest and totaling $504,000 was paid and the Union Oil Co. took over the property. The Pinal Dome has been authorized by the State Commissioner of Corporations to distribute this amount to stockholders as a dividend of 14c. per share on 3,600,000 shares issued. The company has on hand more than $600,000 in cash and expects to receive more than $165,000 additional before Dec. 1, 1917. In announcing this authority or permission the commissioner states that he is acting under the amendment of the Civil Code adopted by the legislature of 1917, by which the directors of California corporations may make partial distribution of assets when of advantage to stockholders and without injury to creditors. Under the amendment corporations can also apply for authority to pay dividends from accumulated surplus, properly distributable from a business standpoint; also to incur indebtedness beyond the subscribed capital stock, where good business practice dictates such course. There is nothing in the amendment prohibiting corporations from doing what they have heretofore done under the "blue sky" law; but in cases where the authority of directors may be questioned they may avoid personal liability by securing authority of the commissioner, under the provisions of the amendment of 1917.

Chrome Deposits in San Luis Obispo County, California, are attracting active interest of operators and prospectors. The prospective and payable chrome region is in the Coast Range, extending from Cuesta Pass on the Southern Pacific R.R. northwest to San Simeon. Cuesta Pass is about six miles north of San Luis Obispo. San Simeon is a seaport about five miles west of the mountains and about 40 miles northwest of San Luis Obispo. The country is a range of hills averaging about 1650 ft. elevation above sea level and on the north and east side of a dike on the southern end of Santa Lucia mountains. George L. Holmes, mining engineer of San Francisco and Angels Camp, just returned from examining chrome deposits in this region, reports that See & Miller are developing several claims known as the Lucky Jake, Lucky Chrome, Lucky Davis, Dunn and others. This company is developing on two trails that rise to an elevation of about 700 ft above Tassajara Valley and have disclosed some small bunches of chrome which is being packed down to the wagon road on burros, employing six men at mining and packing and 11 burros. Further up Tassajara Valley the Obispo Copper Co. has developed a copper deposit by sinking a 50-ft. shaft, producing ore placed on the dump that is reported to contain copper, gold and silver. The north and east side of the range is very brushy and hard to prospect. But good chrome float can be found in most of the cañons and even along the top of the ridge. The main deposits of chrome ore appear to be on the south and west side. Dibblee & Arata have about 1740 acres of ground which is being surveyed and through which trails are being cut, employing five surveyors and other men for general work. A wagon road has been completed to Goldtree, a station on the Southern Pacific about four miles out of San Luis Obispo. The company is shipping two carloads of mixed high- and low-grade ore a week. The total value of the mixed ore is about $25 a ton. The freight rate on this ore from Pacific Coast terminals to Eastern terminals is $11 per ton for ores under $25 a ton value and $14 a ton for ores over $25 a ton value. The extraction of ore and developing new lenses employs about 60 men. From one of these lenses they have saved over 1500 tons of chrome ore sampling 48% chrome and 5.8% silica. This is being shipped direct to Eastern points in carload lots. The company expects within 30 days to be loading an average of one car a day at Goldtree, and possibly to increase that amount within another 30 days. Chrome can be traced along the ridge as far north as Port San Simeon. And on the headquarters of Tobacco Creek, which flows on the east side of the range, some good ore is being developed by Wallor, Prewitt and others of Santa Marguerita. The haul from their properties down to Port San Simeon is about seven miles, or to Bradley on the Southern Pacific about 29 miles northeast. This should be an attractive region for prospecting chrome and copper deposits as good float can be found practically everywhere. But Mr. Holmes states that his examination of the region would prompt the advice to prospect the west and south side if larger deposits are sought.

BUTTE—Aug. 29

(By Telegraph)

Anaconda Mines Shut Down, only enough men being employed to keep properties open and in repair. The shutdown followed the strike of employees at the Washoe smeltery last week. The miners call it a lockout, but the company says the mines could not be worked with the smeltermen on strike. With the Anaconda mines closed, the East Butte, Butte & Superior, Elm Orlu and Butte Detroit are working to capacity, now being able to get plenty of good miners. Other independent companies have been compelled to suspend mining because they have been shipping to the Washoe smeltery. The labor situation in Butte is a complex one. Different unions, taking their type from the Kaiser, have violated and broken contracts before the ink on them was dry. The smeltermen at Anaconda voted not to strike and a few days later they all went on a strike without notice or further preliminaries. The state organization of metal trades voted to enter into contracts with the mining companies and after the contracts were signed the Butte unions in the organization repudiated the contracts, and other unions at Great Falls, which had voted for the contracts, gave the Butte unions permission to go it alone and ignore the contracts. Other unions, like the electricians, made their demands which were granted to an extent satisfactory to the union and then the electricians went on strike just the same. On the other hand there appeared to be an opportunity some weeks ago to reach a settlement with the striking miners, who were ready for a compromise, but the mine managers refused to deal with the committee from the strikers because they represented an "outlaw" union. Now the strikers and the locked-out men are waiting for the next move on the part of the company. It is a remarkable fact that since the strike has been on and 10,000 men have been idle in the district, there has been less law violation, less crime and less disturbances than in any similar length of time in many years. The city police court has practically gone out of business. It has been the most orderly strike in history, and since the lynching of Frank Little, the I. W. W. agitator, representatives of that organization have been extremely quiet and most of them have left the city. In the meanwhile Governor Stewart and officers of the Anaconda company have gone to Washington to lay the facts of the situation here before the Washington authorities. Locally, these hope that the proposed investigating commission will be appointed, for there is a justified belief that some conciliatory commission with Federal endorsement can bring about a settlement. Since the radicals among the labor agitators have left the district there is a greatly changed feeling among the men and a vast majority are willing to negotiate for a reasonable settlement.

DENVER—Aug. 27

Colorado Fuel and Iron Co., notwithstanding the specific agreement of its workmen to the provisions of the so-called Rockefeller Plan that was devised and inaugurated three years ago, is having plenty of labor trouble. The state industrial commission is conducting investigations in all the camps controlled by this company. Hearing of grievances from representatives of about 5000 workmen is being held. Union officials are backing the dissension.

Increased Coinage of Silver, to be considered by the heads of the Federal mints, at a meeting in San Francisco on Sept. 12, has elicited remarks from Thomas Annear, superintendent of the Denver mint. He states that the thirty-seven presses of the Government are incessantly coining dimes but that they cannot meet the demands for these coins. He also concludes that last year was one of unusual prosperity in this country because, although his plant annually buys old gold in the form of jewelry to an average amount of about $125,000, the purchases in 1916 were low, indicating little need, on the part of our population, to convert spare gold into cash.

Colorado School of Mines' turmoil is an absorbing topic of conversation and press items. The trustees' committee appointed last spring at the time of dropping Howard C. Parmelee from the presidency has labored all summer endeavoring to find his successor. The committee met with most negative results until, in an extremity, the position was finally offered—by the committee, not the board—to V. C. Alderson, the former president, ousted four years ago. The place had been offered to Milo S. Ketchum, dean of the engineering school in the University of Colorado; to Dean Raymond, of the University of Iowa; and to G. H. Clevenger, of Stanford University. Doctor Alderson quickly accepted the offer and returned to Golden from Idaho. However, his tenure in office (which now seems like usurpation) may be either brief or exceedingly stormy. The majority of the state's residents are strongly opposed to him. Owing to the absence of A. E. Carlton, the Cripple Creek mining magnate, who is one of the trustees, it cannot be learned definitely whether or not he voted by wire for the appointment of Alderson. It is positive that two of the remaining four trustees extended him the invitation and consequently they declare him appointed; but the remaining two trustees are equally emphatic that no official action upon the matter has been taken and that they are bitterly opposed to Alderson. It is a significant fact that these two men are the only mining engineers upon the board. They are Frank G. Willis, of Cripple Creek, and Orvil R. Whitaker, of Denver. Alumni are sending many telegrams of protest against Alderson, from all parts of the country.

SALT LAKE CITY—Aug. 23

Tintic District's Output for July amounted to 772 cars of ore, estimated at 38,600 tons, valued at $975,000, from 32 shippers. After 50 years the tonnage of first-class ore from this camp still keeps up, by far the greater part of output representing ore of this character. Recently a mill has been built by the Tintic Milling Co., which is taking and successfully reducing to bullion siliceous ores from some of the older properties of the district, which are for the most part maintaining simultaneously their output of shipping ores. The Tintic Milling Co. is getting ores chiefly from the Knight properties, the Iron Blossom, Colorado, Dragon Consolidated, etc.

Congestion at Smelteries in the Salt Lake Valley district has been the natural result of the greatly increased production of mines in this and surrounding states during the height of the shipping season. The situation has been met on the part of the smelteries by an embargo of six days during which time they have had an opportunity to catch up. The embargo was lifted Aug. 16, and shipments are again about normal. The smelters are taxing their capacity to the utmost, but it is to be expected that in these days of increasing production by large and small properties, and with labor not as plentiful as formerly, that there should be an accumulation of ores at times.

RENO, NEV.—Aug. 21

Louisiana Consolidated Mining Co. has completed arrangements for extending the Nevada-California Power Co.'s electric transmission line from Belmont to Tybo, a distance of 30 miles, and a mill for which plans are now being drawn will be built to treat the low-grade ores of the Tybo mine and to make a separation of the lead and zinc. Five trucks are hauling shipping ore to Tonopah, the ore coming from an 8-ft. body on the 300 level of the main shaft. Five more trucks and trailers are on the road from Reno and the management estimates an output of $100,000 a month from September on. The Louisiana has acquired the property of the Tybo Lead Co., which has the west extensions of the Tybo veins, and will sink a new shaft on this ground at once. The company also purchased the Pearl and Zenda mines in Kern County, Calif., and operations under the new management will begin during the month. This is a low-grade, silver-gold, property which is estimated to have 300,000 tons of $5.50 ore in sight. The present mill is to be enlarged to 250 tons daily capacity.

DULUTH, MINN.—Aug. 27

Ore Freight Traffic during July through the Sault canals amounted to 10,341,932 tons. Iron ore constituted 10,308,743 tons of east-bound traffic and copper, 16,709 tons. Cuban manganese ore amounted to 16,480 tons in west-bound traffic consigned to Minnesota Steel Co., Duluth.

Movement of Ore and Coal on the Mississippi River, St. Paul to St. Louis, and return is now assured. The Merritt mine at Manganese is installing a steam shovel to load 8000 ton stockpile of high-grade manganiferous ore for transportation via St. Paul and the Mississippi River to blast furnaces at St. Louis. The Northern Pacific Ry. is arranging temporary ore docks at St. Paul. The Mississippi Valley Iron Co., operating blast furnaces at St. Louis, is arranging to operate a fleet of barges transporting ore and coal. If success is attained by the Mississippi Valley Iron Co., it is predicted that additional blast furnaces will be erected at points along the Mississippi River.

Season's Progress in Shipping shows that continued delays in shipping business has caused the Mesabi operators to give up all hopes of having shipments as large as those of the season of 1916. At one time it was thought that notwithstanding the late season a record as great as last year's would result but the handicap of the late season has been too great. There will be no catching up for the delays which started in the Spring are continuing throughout the summer. The boats are considered by some to be the cause and the lower Lake ports by others. The Mesabi range at least is doing its share in fine shape; railroads are hauling and can haul more ore than the boats can carry, and the mines are in shape to do more than the railroads can take care of. It is too early to predict what the shipments will be for this season as a late closing will increase the total shipments considerably.

Important Mine Sales have lately been consummated. The largest deals of the year were by the Great Northern or Hill interests, who had immense workings on the range. Among their larger properties was the Hill annex at Marble, a state lease which has been exceedingly active during late years; this with the Mississippi at Keewatin, is now being operated by the Jones & Laughlin interests. The largest number of properties involved was in the lease to the M. A. Hanna Co. The Great Northern interests have always taken the stand that to lease or sell is more profitable in these times than to hold and operate their mines. Some years ago the entire group was leased to the Oliver Iron Mining Co., but this lease was thrown up in 1915. The present leases dispose of practically all the larger properties which the Great Northern held. Another important deal was that involving the sale of the Bennett mine to Pickands, Mather Co. This sale was made last spring by the Longyear-Bennett interests. The independent owner of mines cannot afford to hold and operate them unless he has a furnace outlet for the ore. Taxes are too high and operating expenses have been rising continually. The companies which own furnaces and have an outlet for iron ore have a chance at the profits which accrue from the manufacture of iron and steel. Great Northern Iron Ore Properties has found this out in years of experience, consequently the deals mentioned have been made and upon a basis, it is said, which will insure a good return to the stock of the corporation.

HOUGHTON, MICH.—Aug. 27

Several New Exploration Projects have been undertaken recently. The Bear Lake "Pool" is working on the southwest quarter of Sec. 24, about a mile east of Bear Lake, which is about 1¼ miles northeast of the Ship Canal—or the western end of the Keweenaw Waterway. Here Finnish farmers found copper on their farms and George North, of Hancock, has taken options and worked them to a small extent, finding a felsite bearing copper and copper stains; within a year, J. M. Longyear, Jr., explored with a diamond drill some of his father's lands and some of Mr. North's, that he has reoptioned, but nothing has been given out officially, although rumor has it that results were favorable. J. H. Turivas, of firm of Briggs & Turivas, iron and steel merchants of Chicago, also has taken an option on Sec. 1-54-35 and Sec. 6-54-34, except the N.E. quarter, from D. N. Levy; and all of this except the S.E. quarter is outside or west of what has been considered as the boundary of the mineral belt.

JOPLIN, MO.—Aug. 25

Strike at Wayland Mine, at Galena, Kan., on Aug. 25, when 100 laborers walked out on account of the mine management announcing a cut of 25c. a day in wages. The machinemen had been getting $4 and helpers $3.50. The shovelers in the mine also struck because they asked a raise in wages and it was refused. It is believed the difficulty will be adjusted. No cut in wages is being attempted in mines in other camps.

Gallium, the rare metal noted about a year ago in Joplin District zinc ores, may prove commercially valuable, according to G. O. Waring, assayer and chemist, of Webb City. In an address before the mine operators' association, Aug. 16, he talked interestingly of this metal. He said it was first noted by a watchman at the plant of the Bartlesville Zinc Co., at Bartlesville, Okla., who observed it oozing out like mercury from lead residues after the redistillation of spelter from the Joplin district. Analysis showed it to be gallium. At that time there was only about an ounce of the metal in existence, it being in a vial in a laboratory in France. Since then more has been obtained from Joplin ores, and recently Mr. Waring received about half an ounce from Washington for experimentation. It is a peculiar metal. A few drops upon a plate will spread over the entire surface, making it a perfect mirror—much better than quicksilver. If a few drops of weak sulphuric acid are dropped on the plate the gallium will reassemble into a globule. Mr. Waring stated that some of the metal has been sold at the rate of $256 per oz. It is impossible at present to state how much of the metal the zinc ores contain, but it has been detected in appreciable quantities; also germanium and thallium.

Wallower Interests of Joplin and Harrisburg, Penn., have definitely taken over the properties of the Nichols-Williams Mining Co., in the Picher-Century field in Oklahoma, for a consideration officially stated as $1,350,000, previous reports to the contrary notwithstanding. The property includes three concentrating plants and eight 40-acre leases, located between Picher and Century, right in the heart of the Oklahoma field. The mills are the Golden Rod, the Boston-Miami and the Mihomi. All three are going properties. The purchasing company will he known as the Golden Rod Mining and Smelting Co., and its officers are Edgar Z. Wallower, of Harrisburg, Penn., president; W. R. Ramsey, cashier of the Guaranty Bank, of Oklahoma City, secretary and treasurer. . F. C. Wallower, of Joplin, a son of E. Z. Wallower, will be manager. He has for long been one of the prominent operators in the sheet-ground field at Webb City. The new owners announce they will build five more concentrating plants on the Nichols-Williams tracts at once, and they this week purchased the Sparkler mill, at Joplin, to move to their new holdings. Besides this they have subleased one 20-acre tract on which a company made up of J. W. McFarland, of St. Louis, Mo., and Peirce City, Mo., investors have contracted to erect a mill. The leases also include the Bulls-Eye tract on which Charles T. Orr, of Webb City, is reconstructing his Bertha A. mill, which he is moving from Webb City.

The Mining News

ALASKA

ST. ELIAS OIL CO. (Katalla)—Producing most of the gasoline and part of fuel oil used on Prince Williams Sound. Pumping from six wells; seventh, being sunk, was 1810 ft. deep, latter part of June, producing 1 bbl. per day at that depth. Another well is being drilled, 300 ft. deep on Aug. 15, on adjoining claim. G. C. Hazelet, of Cordova, manager.

ARKANSAS

Marion County

BEULAH (Rush)—Leased to W. O. Krueger and associates of Harrison. Ore opened; 100-ton mill on propeprty. Have also leased the Bear Hill mine near Dodd City.

GOVERNOR EAGLE (Dodd City)—Sinking shaft to 180-ft. level to cut blende ore discovered by drilling. Shaft down now 166 ft. Expect to strike ore soon. Mine producing high-grade blende from shallow levels.

SHEPHERD (Rush)—J. C. Shepherd, largest producer of zinc ore in the North Arkansas field, leaves this month to join the officers training camp in Little Rock. Properties will be managed by R. W. Russell.

Newton County

KILGORE (Ponca City)—Isaac Kilgore, producer of lead ore in North Arkansas field, will start erection of mill soon.

ARIZONA

Cochise County

CALUMET & ARIZONA (Warren)—Production for July was 3,551,205 lb. fine copper.

Gila County

MIAMI COPPER (Miami)—Strike situation according to telegraphic dispatches of Aug. 28 report improvement. Three crafts unions have called off strike. Miners continue to hold out, but a number are returning to work and break is expected with old Western Federation organization.

Mohave County

TELLURIDE (Oatman)—Crosscut on 600-ft. level cut several stringers.

GOLD ORE (Goldroad)—Will install 10-stamp pilot mill and cyanide plant. Expected to be in operation in 90 days.

RED LION (Oatman)—Arrangements completed for installation of equipment and sinking 500-ft. shaft. Adjoins producing ground of the Tom Reed.

OATMAN UNITED (Oatman)—Development on the west crosscut at 400-ft. level yielded results that justify sinking shaft additional 200 ft.; work will be commenced at once.

UNITED EASTERN (Oatman)—July production was 7324 tons, having total gross value of $175,898, an average of $24.01 per ton. Extraction averaged 96.47%. Total operating costs, including loss in tailings, was $6.68, and net profits were $120,802. For first seven months' operation mill treated 44,889 tons, having total gross value of $969,395, or $21.59 per ton. Profits for entire period amounted to $611,940. Dividends of 5c. per share declared for July and August; each amounted to $68,000. Mill production will be increased to 300 tons daily or more within 60 days, when installation of three additional cyanide tanks will be completed. Station completed at seventh level and sinking toward eighth, which will be 965 ft. below collar of old shaft and 1090 below collar of new shaft.

CLEOPATRA (Yucca)—Copper and Gold Mines Co. organized by Thor Warner and C W Nelson to develop the low-grade deposit on the Cleopatra claims.

Pinal County

MAGMA COPPER (Superior)—Report by W. H Aldridge, president, for six months ended June 30 shows copper produced was 5,355,183 lb., comparing with 4,276,720 lb. in same period in 1916; average price obtained, 27.77c. against 23.31c. in 1916; operating profits were $736,959, comparing with $575,226 in first half of 1916, without deduction of depreciation in either instance.

PINAL DEVELOPMENT (Kelvin)—Development on new oreshoot opened up in the winze progresses with satisfactory results. Plans being made to begin shipping at an early date.

Yavapai County

JEROME COPPER (Prescott)—At meeting held recently property was optioned to General Development Co Holdings consist of nine claims in the Jerome district and other property in the Mayer district near the Arizona Binghampton. A. L. Johns, in charge.

CALUMET & JEROME (Jerome)—According to telegraphic advices of Aug. 28, crosscut at 20 ft. west of shaft entered slate formation, carrying iron pyrite and chalcopyrite, continuing at a distance of 50 ft. from shaft. Superintendent Rauber says ore will average 5%. Will continue crosscut and start drifting later.

Yuma County

SWANSEA (Swansea)—United Verde interests have taken over the whole Swansea property and commenced sinking 1000-ft. shaft. Reported smeltery will be removed to the Bill Williams River and entirely remodeled Has been producing at the rate of 30 cars per week for a year.

CALIFORNIA

Amador County

FOREST FIRES in the Pine Grove region recently destroyed miles of timber land and many farm buildings. Started east of Sutter Creek and spread south to the New York ranch. The New York schoolhouse and the buildings on John Harker's place were destroyed. Damage to mining property reported not serious.

SOUTH EUREKA (Jackson)—Reported to be extracting large tonnage of ore from deep levels of Oneida. May increase capacity of Oneida mill.

ARGONAUT (Jackson)—Installation of electric pumps reported to be completed, pumping direct from 4800-ft. level to the 2000 and then to surface. Mill running on ore of good grade.

Butte County

EAST BELT DEVELOPMENT CO. (Murphys)—Permitted to sell 90,000 shares capital stock to C. Canfield and James H. Stoddard, to be used in development, purchasers paying in labor to be employed in extending the lower tunnel.

BLOOMER HILL (Oroville)—Reported optioned by Philadelphia men. Formerly a producer. Large tonnage of ore in upper workings and tunnel will be driven below to prove extent If development warrants expect to install modern mill and probably electric-generating plant.

Calaveras County

CALAVERAS COPPER CO. (Copperopolis)—Steam shovel arrived and will be used in handling ore dumps to be put through flotation mill in next few months. Three-compartment discovery shaft, completed to ninth level, will be continued to 10th. New vertical shaft of two compartments and manway started to open up North Keystone mine.

Inyo County

AVAWATZ SALT AND GYPSUM CO. (Los Angeles)—Permitted to sell $350,000 par value bonds, to net 90%. Company holds 50 mining claims embracing 4781 acres in northeast part of Avawatz mountains in south end of Death Valley Deposits reported to be rock salt, gypsum and celestite

MINNIETTA (Johannesburg)—Two new concentrating tables installed Mine closed two weeks in July on account of lack of trucks for hauling ore and concentrate. Extreme hot weather on the desert in Searles Lake region interfered with motor car and truck traffic Mine is situated in the Argus range where the weather does not interfere with mining. Operated by Teagle Brothers.

Mariposa County

EARLY (Mariposa) — Ten-stamp mill working on good ore from 200-ft. level New gas engine installed Ore, medium-grade and not all amenable to stamp crushing and plate amalgamation: but mine is said to be paying satisfactorily by this method of treatment. Like most of mines in southern end of Mother Lode, ore is somewhat refractory and engineers who have made tests report that recovery could be increased by cyanidation or flotation.

Nevada County

CENTRAL (Old Diggings)—F. B. Hink of Oakland and R. V. Montgomery of San Francisco optioned this property. Sampling will be done under direction of W. W. Henry of Copper City, superintendent of the Arps Copper Co. A. A. Anthony is owner.

DELHI (Nevada City)—Preparations for resumption of practical operation in progress. Surface buildings being removed from old site to point near portal of tunnel; mill being overhauled and improved. Mine recently optioned by Reno men.

COLORADO

Boulder County

CLARK MILL (Boulder)—Treating tungsten ore from Lucky No. 2 mine

DEGGE-CLARK (Boulder)—This mill, in Bummer Gulch, operating steadily on ore from Good Friday mine.

Dolores County

RICO-ARGENTINE (Rico)—Ore shipments during July: Company account, 20 cars; lessees, 20 cars. Two classes of ore shipped, one, copper ore with small amount of gold and silver, the other mixed lead-zinc sulphide. New oreshoot opened in raise above main level, assays 3 to 4% copper and some gold and silver.

Gilpin County

RARE METALS CO. (Rollinsville)—Recently purchased two tungsten properties in district. Mill operating at full capacity.

POWERS (Central City)—Mine unwatered and repairing levels under way; sinking and drifting will be resumed.

SILVER DOLLAR (Russel Gulch)—Shaft sunk another lift, and drifting now under way on shoot of good-grade copper-gold ore.

GOLD CUP (Central City)—New shaft house completed and 8-drill compressor installed. On 165-ft. level, electric pump installed. When mine unwatered, 50-hp. electric hoist will be added to equipment.

Gunnison County

DOCTOR (Almont)—Regular shipments zinc-carbonate ore being made from this mine, in Taylor Park. Other properties in district being opened.

Ouray County

SNOWFLAKE, SAILOR BOY AND HERO MINES, at Red Mountain, taken under lease and bond lately

McLENNAN (Ouray) — Discovery of hübnerite made in shallow workings on this property on Mt Hayden. Systematic development work now under way.

SILVER LINK (Ouray)—Mine will be reopened Contract let to drive 600-ft. tunnel on vein from point near south end line and at lower elevation than old workings. Mine a producer of high-grade silver-copper ore in early days of camp.

San Miguel County

SUFFOLK (Ophir) — Being worked through London-Badger tunnel.

FAVORITE (Ophir)—Shipments of crude ore being made. Some ore treated at Suffolk mill

FITZ MAC (Telluride)—This group sold recently to Denver men Contract for 150 ft. of driving let

TELLURIDE CONCENTRATE SHIPMENTS for July were: Tomboy, 48 cars; Liberty Bell, 10 cars; Smuggler-Union and Black Bear, 51 cars to Durango and 16 to Blende; Carruthers Leasing Co, 2 cars; total, 127 cars

BLACK BEAR (Telluride)—Skip recently installed giving satisfaction Electric locomotive for lower-tunnel haulage and larger compressor will be installed; output will then be increased to 200 tons per day Ore treated at Smuggler mill, where capacity was increased by using coarser screens on stamp batteries and regrinding in ball mills; saving increased by flotation.

Summit County

EVANS DREDGE (Breckenridge)—Construction progressing as rapidly as delivery of materials will permit Expected to have dredge in operation during October

AMERICAN METALS CO (Climax)—Controls large acreage of molybdenum-bearing ground, near both Climax and Buffehr's Spur Much activity in evidence; tent towns have sprung up and building material arriving for dwellings Stated company will build mill

BALD MOUNTAIN MINES CO (Breckenridge)—New tunnel 1000 ft below old one will be driven Road to new workings being built, and Golden Eagle mill will be remodeled and enlarged Company holds lease and bond on Carbonate, Golden Edge, Little Tommy and New Era.

Teller County

ELKTON (Elkton)—Twenty-two sets of lessees working Shipments made in July from main Elkton and Tornado shafts.

WORCESTER MILL (Cripple Creek)—Independence men purchased this mill at Rubie mine and are treating Rubie dump ore.

ROOSEVELT DRAINAGE TUNNEL (Cripple Creek)—Progress for July, 78 ft Lateral from tunnel toward Cresson mine driven 100 ft. Water flow 5980 gal. per min.

IDAHO

Blaine County

SMOKY BULLION (Fairfield)—This group of three lode claims and two millsites, situated at head of Little Smoky Three veins outcrop on surface All carry good-grade milling ore A. G Kirby reopening property under lease and bond by tunnel being driven to tap vein at 400 ft.

Shoshone County

GIANT LEDGE CO (Murray)—Power line of Washington Water Power Co., being extended to supply Guggenheim dredging operations in Murray district, will be available for development of this property by early autumn. Drifting on 400- and 200-ft. levels developed milling-grade ore.

MICHIGAN

Copper

ALLOUEZ (Allouez)—Has four of its five trolley locomotives in operation; now running smoothly.

BEAR LAKE "POOL" (Hancock)—Being opened to get dip of old pit and finding good copper; rock is brecciated felsite with copper between fragments.

SOUTH LAKE (Houghton)—Seventy-five cars of rock have gone to mill from this shaft and 30 more will be sent down before Sept. 1

OLD COLONY (Houghton)—No difficulty anticipated in shaft sinking until a depth of 1000 ft. is reached, when broken zone is expected, from drill core results. Sinking progresses rapidly.

ISLE ROYALE (Houghton)—Electric tramming is being installed at Isle Royale to great advantage, particularly in the old shafts where the trams are very long, in many instances. This will also prove advantageous when labor is scarce. Shipping 2700 tons daily as compared with normal of 3200; sinking carried on in five shafts, but much more slowly, owing to lack of muckers.

OSCEOLA CONSOLIDATED (Osceola)—North Kearsarge No 4 shaft closed for repairs Aug 27 for a week, so that tonnage, which was 97,000 in July, will not be over 100,000 for August, notwithstanding two more working days.

HANCOCK (Hancock)—August tonnage increased, if labor were to be had, could increase output one-third Electrical equipment all in operation except Westinghouse storage-battery locomotive, expected any time.

MINNESOTA

Cuyuna Range

STRIKE OF MINERS of the Cuyuna range called off Aug 16 Miners' demands ignored by mine operators, and miners returned to work at same wage and hours as formerly Laws enacted at last session of legislature prevented disorder and demonstrations by striking miners No discrimination by mine operators when miners returned to work Shortage of underground labor on account miners having left for other mining camps.

CUYLER ADAMS (Deerwood)—Operating diamond drill on NW¼, NW¼, Sec. 4-46-49

HALE & BRADLEY (Deerwood)—Prospecting on N½, SE¼, Sec 4-46-49, with diamond drill

Mesabi Range

WOUCOUTAH (Mountain Iron)—State lease operated by La Belle Iron Co., has two shovels at work stripping

HOBART (Gilbert)—Preparations being made by M A Hanna Co. to reopen this property, closed down since 1905 on account of the great amount of water

OLIVER (Eveleth)—Has ten shovels at work removing ore from Adams and Leonidas pits Operating the Weed, an underground mine, and has two shovels at work loading ore out of two pits at Graham mine; expected that all ore will be removed by end of shipping season

MISSOURI

Joplin District

SCOTT (Joplin)—Started new shaft at Duenweg mine, and will tram about 700 ft. to mill.

GOLDEN EAGLE (Baxter, Kan.)—Clearing ground to build 350-ton mill just east of St. Louis, Okla.

ST. LOUIS LEAD AND ZINC (Quapaw, Okla.)—Starting shaft on 40-acre lease with intention of building mill.

P. B. BUTLER (Joplin)—Reports drill hole north of Lawton, Okla., shows 170 ft. pay ore.

J. E. HEAD (Joplin)—With Frank Brown, of Independence, Kan., is starting construction of 350-ton mill on Cooper estate, west of Baxter.

J. T. CHAPMAN (Joplin)—Just completing 350-ton plant for Farmington, Mo., investors on Hocker land, south of state line, south of Baxter.

GEORGE C. MEESE (Joplin)—Purchased lease on Crane land from Tri-State Mining Co., and in first hole put down got one screw of cuttings; showed high-grade zinc blende for 10 feet.

GEORGE MOORE (Webb City)—With associates purchased Symmes mill and will move from lease southwest of Joplin to newly developed lease west of Chitwood, Mo., where new shaft just been put down.

IMPERIAL DEVELOPMENT CO. (Miami, Okla.)—Using 16-in. Pomona, a 12-in. Pomona, and 5- and 3-in. steam pumps in shaft just east of Douthit, Okla. Shaft was concreted as sunk, but when drifting was started at 200 ft. heavy water was encountered.

BULKELEY WELLS (Baxter, Kan.)—Has completed $100,000 plant on Anna Beaver land west of Picher, Okla. Has capacity of 300 tons per shift. Equipped with three-ton skips, being first skips in Oklahoma field. Second shaft to be used for hoisting tools and men. Gas engines used for power; 180-acre lease, well drilled; recovery of 8% expected.

RAINBOW (Quapaw, Okla.)—Has concrete foundations ready for 300-ton mill and heavy machinery mostly set. Company virtually same as Ottawa Mining Co., which is arranging to build 200-ton mill on 40-acre tract adjoining on north. Third mill will be built later on another 40 cornering on east. Also prospecting 200 acres, three miles northeast, and 80-acre lease between Century and Commerce. F. E. Herring, Elk City, Okla., president; O. D. Halsell, Oklahoma City, vice president; R. H. Drennan, Oklahoma City, secretary-treasurer.

MONTANA

Silver Bow County

EAST BUTTE MINING (Butte)—After shutdown of nearly three weeks, company's smeltery at Pittsmont mine started on Aug. 8, with accumulated ore supply and daily output from Pittsmont and Dutton mines.

TUOLUMNE (Butte)—After inspection of company's properties during last week, William Jahn, of Milwaukee, vice president, gave out following statement: Properties at both old Tuolumne, Main Range and Colusa-Leonard make excellent showing and normal operations will be resumed with settlement of labor troubles. Hoist and new machinery at Main Range and Colusa-Leonard are about ready and within short time work at these properties will be pushed with more speed than ever.

ANACONDA (Butte)—Principal addition made during summer to mine equipment has been new hoist at Rarus mine, three electric-driven air compressors at Leonard, two at Bell and one at Never Sweat mine. Rarus hoist is electric with 2000 tons capacity per day, to increase output of Tramway mine, materially curtailed by recent fire. Four new compressors are Ingersoll-Rand, two are Nordhergs with combined capacity of 45,000 cu ft. of air per minute. Increase in activity due to high price of silver in both Alice mine in Walkerville district and Nettie mine, situated in westernmost section of Butte camp. At Alice from 100 to 200 tons per day rich silver-zinc ore taken from upper levels and shipped to Washoe smeltery. At Nettie plans are under way to increase output, which now amounts to about 300 tons per day. West-Nettie being developed through new shaft, 600 ft. from Nettie shaft, with which it will be connected on 500-ft. level.

(Later—All company's mines suspended operations due to closing down of smelteries.)

NEVADA

Lincoln County

PRINCE CONSOLIDATED (Pioche)—Shipments have now reached total of 400 tons per day. Ore recently struck in diamond-drill hole No. 3 and drill moved 300 ft. south to prove continuation of orebody. Murray C. Godbe, general manager.

NEVADA GOLDSPRINGS (Nyala)—Reported to have struck tellurium ore in bottom of 50-ft. shaft. W. C. McMullin, general manager.

Nye County

TONOPAH ORE PRODUCTION for week ended Aug. 18 was 8999 tons, valued at $161,982, comparing with 8543 tons the previous week. Producers were: Tonopah Belmont, 2616 tons; Tonopah Mining, 2050 tons; Tonopah Extension, 2380 tons; Jim Butler, 700 tons; West End, 959 tons: Rescue, 128 tons; Montana, 55 tons; North Star, 55 tons; Halifax, 51 tons; Cash Boy, 105 tons.

WHITE CAPS (Manhattan)—Reduction plant near completion. On 300-ft. level, east crosscut advanced 31 ft.; west crosscut, 40 ft. in quartzite. On 400-ft. level raise on west orebody put up 25 ft., showing ore in face. Large station being cut in east orebody, where electric hoist will be installated to facilitate sinking winze to 550-ft. level. Winze will follow east orebody downward. Station also being cut on 550-ft. level on north side to accommodate large pump and sinking hoist. Believed that timbering will not be necessary as ground is solid quartzite. Making 6 ft. of progress per day in crosscut being driven to strike east orebody.

NEW MEXICO

Grant County

RIVAL (Duncan, Ariz.)—Rival shaft down 60 ft., to be connected at 350-ft. level with Ethel shaft, 1300 ft. distant, on 500-ft. level of latter. Two carloads of supplies recently arrived in Duncan. H. M. Ziesemer, superintendent.

PROGRESS (Steeplerock)—Temporarily suspended mining operations, awaiting arrival of pump to handle increased flow on 200-ft. level. Developing complex ores. A 65-hp. semi-Diesel engine and a six-drill air compressor now on way from factory. Charles Hanson, superintendent.

CARLISLE (Steeplerock)—Mill operating 20 hr. daily, concentrating about 100 tons per shift. Concentrates run about $100 per ton. Ores contain gold, silver, copper, lead and zinc. Shipments now steadily made at rate of about five cars monthly. W. Murray Sanders, manager.

UTAH

Beaver County

MOSCOW (Milford) — Continuation of lead-silver orebody found on 1400 level shipping ore. Winze being sunk below level. July shipments amounted to 12 cars or 600 tons as compared to 20 cars or 1000 tons in June. Lessened output due to 4th of July holiday. Ore brings $1500 to $1600 a car; chiefly lead-silver, and zinc.

Juab County

TINTIC STANDARD (Eureka)—New station on 1300 in shipping ore. Connections to be made by drifting with orebody opened on 1174 level, and continuing to 1300 and downward.

TINTIC DRAIN TUNNEL (Silver City)—Organized by Knight interests to drive long drainage tunnel from east to west over a distance of five to six miles, starting at some point in Goshen Valley and ending near Silver City, where it will enter the Dragon Consolidated mine. Will open at depth large territory, which has been productive at higher levels and allow operation where water has previously prevented. Also expected to develop water for irrigation of Goshen Valley lands.

Piute County

FLORENCE MINING AND MILLING (Marysvale)—Alunite mill of this company in operation. The alunite will be crushed and calcined and shipped to the east. It is planned later to add a leaching plant at Marysvale, and ship potassium sulphate.

PITTSBURGH & UTAH POTASH CO. (Marysvale)—Machinery has begun to arrive for new potash mill to be built at Belnap, on west side of Sevier Canyon, six miles north of Marysvale, at base of main operating tunnel. Switch completed from Denver & Rio Grande track to mill site. James Long, in charge.

Salt Lake County

CARDIFF (Salt Lake)—Average daily output is 125 tons of ore. Recently inspected by Ezra Thompson, president, and other directors, to see recent developments, and transport conditions.

OHIO COPPER (Bingham) — Monthly earnings stated to net $50,000. Through ownership of Mascotte tunnel, transportation costs reduced. Mining costs said to average 22c. per ton. Company handling 60,000 tons of ore monthly, averaging 0.80% copper, with 45% extraction. Minerals Separation flotation plant being installed, expected to raise present monthly output of 500,000 lb. to about 900,000 lb., and give 80% extraction.

Summit County

NEW QUINCY (Park City)—Car of good-grade ore from raise and drift above main-tunnel level being prepared for market.

PARK CITY KING (Park City)—Contract let for extending new tunnel now in 130 ft., 300 ft. further. Being driven toward Crescent-Alliance fissure, with limestone-quartzite contact objective. Some mineralization showing in face.

Utah County

FISSURES EXPLORATION (American Fork)—Reported operating Pacific mine under long lease to extend operations, taking in Live Yankee, Belerophon, and Merrill groups adjoining, and lying at head of Mary Ellen Gulch.

CANADA

British Columbia

IRON-ORE DEPOSITS of Vancouver Island, known as the Bugaboo group, with probable ore tonnage of 500,000 and possibly 250,000 more reported under option to interests headed by D. C. Jacklin. Also intimated new interests will acquire coal properties in the district.

Ontario

McRAE (Porcupine)—Operations suspended after sinking to depth of 100 ft.

MALOOF CLAIM (Sesekinika)—Shaft down 40 ft. Test pit north of shaft shows vein widening with tellurides and free gold.

CANADIAN KIRKLAND (Kirkland Lake)—Surface exploration discovered 17 veins, some giving high assays. Tenders asked for plant for development.

KIRKLAND LAKE (Kirkland Lake)—Beaver Consolidated made third payment on this property, leaving one installment remaining of about $75,000.

SCHUMACHER (Schumacher) — Active development resumed. Compressor with capacity of 25 drills and a new transformer installed.

BUFF (Munro Township)—Sinking begun on No. 1 vein and at depth of 20 ft. high gold content encountered. Small plant will be installed.

ORR GOLD MINES (Kirkland Lake)—This newly organized company capitalized at $3,000,000 has taken over the Orr and another group belonging to Samuel Renaud and associates.

DOME MINES (South Porcupine)—Recently passed quarterly dividend because labor shortage caused heavy curtailment in operations. Dividends reduced from 50c. to 25c. three months ago.

NEWRAY (Porcupine)—Manager Charlebois states vein struck in crosscut on 400-ft. level, 985 ft. from shaft, is 5 ft. wide. United States Smelting, Refining and Mining Co. reported to have optioned mine for 60 days.

COBALT PROVINCIAL (Cobalt)—This property, adjoining the Nipissing, reopened under management of John Redington. Ore reserves estimated at 148,000 oz. Shaft being sunk on vein at southwest end of property.

BLACK CLAIM (Kirkland Lake)—Shaft reached depth of 165 ft., vein at this point being narrower than on surface but continuing highly mineralized. Work temporarily suspended on account of closing down plant supplying air.

MEXICO

BOLEO (Santa Rosalia)—Copper production in July was 1,440,180 lb.; grade of ore 3.516%.

GERMANY

NEW COAL FIELD, discovered in Silesia, according to German dispatch emanating at Amsterdam. Work preparatory to exploitation to begin in September.

AUSTRALIA

GOLD PRODUCTION in Queensland in June was 15,859 oz., a decrease of 1110 oz. from June, 1916. For six months ended June 30 total gold won was 116,862 oz. in 1916, and 86,985 oz. in 1917; a decrease of 29,877 oz. Other Australian gold yields are reported for May: Western Australia 79,434 oz., a decrease of 4443 oz from May of last year. Victoria, 14,005 oz. fine. For the five months ended with May total was 82,971 oz., a decrease of 22,883 oz. from last year. New South Wales output was 6684 oz. in May and 34,097 oz. for the five months, which is a decrease of 10,072 oz., or 22.8%, from last year.

The Market Report

Metal Markets

SILVER AND STERLING EXCHANGE

Aug.	Sterling Exchange	Silver New York, Cents	Silver London, Pence	Aug.	Sterling Exchange	Silver New York, Cents	Silver London, Pence
23	4 7550	88½	44¾	27	4 7550	88¾	45
24	4 7550	88½	44⅞	28	4 7550	88¾	45
25	4 7550	88½	44⅞	29	4 7550	89¼	45¼

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

DAILY PRICES OF METALS IN NEW YORK

Aug	Copper Electrolytic	Tin Spot.	Lead N. Y.	Lead St. L.	Zinc St. L.
23	24½ @25	61⅛	10 30 @10 70	10¾ @10½	7⅝ @7⅞
24	24½ @25	61⅝	10 30 @10 70	10¼ @10½	7¾ @7⅞
25	24½ @25	61¼	10 30 @10 70	10¼ @10½	7 70 @7 80
27	24¼ @24¾	61¾	10 30 @10 70	10¼ @10½	7 70 @7 80
28	24¼ @24¾	61¾	10 30 @10 70	10¼ @10½	7 70 @7 80
29	24¼ @24¾	61⅛	10 30 @10 70	10¼ @10½	7 70 @7 80

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

The quotations for electrolytic copper are for cakes; ingots and wirebars. Electrolytic copper is commonly sold on "regular terms" (r t), including freight to the buyer's works and is subject to a discount for cash. The difference between the price delivered and the New York cash equivalent is at present about 0.25c. on domestic business The price of electrolytic cathodes is 0 05 to 0 10c. below that of electrolytic Quotations for spelter are for ordinary Prime Western brands We quote New York price at 17c. per 100 lb. above St. Louis.

Some current freight rates on metals per 100 lb. are St Louis-New York 17c.; St. Louis-Chicago, 6 3c ; St Louis-Pittsburgh, 13.1 cents.

LONDON

Aug.	Copper Standard Spot	Copper Standard 3 Mos	Copper Electrolytic	Tin Spot	Tin 3 Mos	Lead Spot	Zinc Spot
23	120	119½	137	241½	239½	30½	54
24	120	119½	137	241½	239½	30½	54
25	.	.					
27	120	119½	137	240	238½	30½	54
28	120	119½	137	241½	239½	30½	54
29	120	119½	137	242½	240½	30½	54

The above table gives the closing quotations on London Metal Exchange All prices are in pounds sterling per ton of 2,240 lb For convenience in comparison of London prices, in pounds sterling per 2,240 lb., with American prices in cents per pound the following approximate ratios are given, reckoning exchange at 4 80 £15 = 3 21c ; £20 = 4 29c.; £30 = 6 43c ; £40 = 8 57c ; £60 = 12 85c. Variations, £1 = 0 21½c

NEW YORK—Aug. 29

Stagnation in the metal markets became even more complete than in the previous week.

Copper, Tin, Lead and Zinc

Copper—Sales were but trifling and quotations scarcely more than nominal There was a slightly weaker tone and in the latter part of the week September copper was to be had on terms equivalent to 24½@24¾c., cash, New York, while fourth-quarter delivery was freely offered at 21c regular terms Consumers will not buy until they have learned what the Government is going to do.

Messrs. Baruch, Brookings and Lovett, of the War Industries Board, have been made a purchasing committee in behalf of the Allies. Eugene Meyer, Jr., has been appointed copper buyer for this committee.

The Washoe and Great Falls works of the Anaconda Co. were closed on Aug. 27, owing to strikes, wherefore complete suspension of operations in the Anaconda mines immediately followed.

In Arizona, mines of the Morenci and Miami districts are still closed. Bisbee is reported operating at about 80% capacity.

Copper Sheets are quoted at 37c. per lb. for hot rolled, and 1c. higher for cold rolled. Wire is quoted nominally at 33c. per lb., f.o.b. mill.

Tin—This market was very dull, with nothing more than slight fluctuations in the price. At the close Banka tin was quoted at 58¾@59c.

Receipts of tin concentrates at Liverpool in July were: Bolivia, 943 gross tons; Nigeria, 806; total, 1749 tons, containing 1130 tons metallic tin.

Tin exports from the Straits in July were 4460 gross tons.

The production of Banka tin during the half-year ended June 30 was 6132 tons, an increase of 230 tons over the first half of 1915. Shipments for the half-year were 8241 tons. Stocks on June 30 were: In Banka and Batavia, 211 tons; in Holland and afloat, 1150 tons; total, 1361 tons.

Visible stocks of tin on Aug. 1 as reported by Messrs. Ricard & Freiwald were as follows, including tin afloat: Great Britain, 8429; Holland, 1882; other Europe, 2190; United States, 6867; total, 19,368 gross tons. This is a decrease of 1087 tons during July.

Lead—There was no change in the situation. Transactions were insignificant.

Zinc—Transactions were light. Such as were reported were at reduced prices.

Zinc dust is quoted at 14c. at Denver, Colorado.

Exports of zinc ore from Haiphong, Tonkin, for the four months ended April 30 were 10,566 metric tons, a decrease of 1776 tons from last year.

Zinc Sheets—Price of zinc sheets has not been changed Market is still at $19 per 100 lb. f.o.b. Peru, Ill., less 8% discount.

Other Metals

Aluminum—This market has again relapsed into comparative inactivity; No 1 ingots are quoted at 48c. per lb., New York.

Antimony—Scarcely any business was done. We quote spot at 14¾@15¼c. and futures at 14@14½c., c.i.f in bond

Bismuth—Unchanged at $3 50 per pound

Cadmium—Unchanged at $1.40@1 60 per pound

Nickel—Steady at 50c. per lb., premium of 5c. per lb. for electrolytic.

Quicksilver—Unchanged at $115 San Francisco reports by telegraph $112.50, market steady.

Gold, Silver and Platinum

Gold—Shipments from New York for the week were $6,000,000 to Japan, $800,000 to Spain and $750,000 to Peru.

Shipments amounting to $7,500,000 in gold have been made recently from Japan to British India.

Silver—This market has continued strong with advancing prices the past week, due to small stocks in London and New York, and the urgent demand both for coinage and commercial purposes Owing to lower freight and insurance, via the Pacific, silver is being shipped to the East from San Francisco, and buyers are paying a premium over London price on account of this differential in cost of transportation. Market closed strong

Mexican dollars at New York: Aug 22, 68½c ; 23, 68½c , 24, 68½c.; 25, 68½c.; 27, 69c ; 28 69c.

Silver stocks in Bombay at the close of July amounted to 1700 bars. The stocks in Shanghai at the same date were 15,100,000 dollars and 19,700,000 on sycee silver.

The Indian government currency reserve on July 31 amounted to 2431 lakhs of rupees in silver, an increase of 335 lakhs during July.

The French Mint reports that no gold pieces were coined during 1916. There were struck 162,878,489 coins of silver, having a total face value of 154,283,813 francs. This is the largest silver coinage ever reported in a year.

Platinum—Unchanged at $103@105.

Palladium—Firm at $120@125.

Zinc and Lead Ore Markets

Joplin, Mo., Aug. 25—Blende, per ton, high, $76.90; basis 60% Zn, premium, $75, medium to low, $70@65; calamine per ton, basis 40% Zn, $40@38; average selling price, all grades of zinc, $74.40 per ton.

Lead, high, $108.20; basis 80% Pb, $105@100; average selling price all grades of lead, $103.46 per ton.

Shipments the week: Blende, 13,634; calamine, 864; lead, 1588 tons. Value, all ores the week, $1,156,090. Shipment eight months: Blende, 305,358 tons; calamine, 28,128 tons; lead, 53,635 tons. Value, all ores eight months, $30,258,600. Increase over eight months last year: Blende, 85,664 tons; calamine, 10,808 tons; lead, 14,975 tons.

Buyers were pleased by the arrival of an added number of cars and of capacity of 40 to 50 tons each, making a record shipment for the week of 16,086 tons of all minerals. Price offerings continued strong to the weekend, but buying became easier at the close.

Platteville, Wis., Aug. 25—Blende, basis 60% Zn, $70 for premium ore, down to $65 for medium grade lead ore, basis 80% Pb, $110 per ton. Shipments reported for the week are 3565 tons of zinc ore, 74 tons of lead ore, and 426 tons of sulphur ore. For the year to date, the figures are: 92,601 tons of zinc ore, 4338 tons of lead ore, and 18,698 tons of sulphur ore. Shipped during week to separating plants 3541 tons of zinc ore.

Other Ores

Molybdenite—Unchanged at $2.10@2 20

Manganese Ore—Unchanged at $1 for high-grade metallurgical ore

Iron Ore—The market remains quotable on the season basis, Mesabi nonbessemer being $5 05 It has just developed, however, that in case of making sales, something unusual at this season, shippers would quote an advance equal to the cost of Lake transport, the season prices being based on $1 Lake freight The Bethlehem Steel Co has bought a moderate tonnage of Lake Superior ore, on account of the shortage in imported ore, and paid 50c above the nominal prices, the sale being based on Lake freight of $1 50 It is expected wild charters will soon be on the basis of $2

Pyrites—Spanish lump quoted at 15½c. per unit on basis of 10s ocean freight, buyer to pay war risk, excess freight and any duty Ocean freights are easier, charters having been made at 32s 6d for northern ports, and at 40s for southern ports; further amelioration is expected in ocean rates.

Tungsten Ore—High-grade ore was quoted at $23@25 Low grade at $19@20 High-grade scheelite was reported sold at $27@28 Sales of ore of all kinds amounted to several hundred tons

Iron Trade Review

NEW YORK—Aug. 29

Even with the Government announcement of steel prices known to be close at hand, the market has done some further readjusting on its own account, says "Iron Age" Pittsburgh has been the chief scene of activity and the business done has been almost uniformly at the expense of prices.

The trade is much at sea as to the extent to which the readjustment will go, and is not helped by conflicting advices from Washington as to prices to Allied governments and the public. In the absence of power to enforce a uniform price for the three classes of buying, the Administration is represented as turning to the Senate bill for such control of iron and steel as has been provided for food and fuel. Meanwhile sentiment grows in favor of substantially uniform prices to the Government, Allies and the public provided there is the anthracite type of adjustment rather than that in bituminous coal.

If the Government adopts the proposal to pay higher prices for finished steel to high-cost mills, pig iron may escape regulation except that due to the expected reduction in coke.

PITTSBURGH—Aug. 28

There is no further light from Washington as to what the Government will do in the matter of steel prices, either for itself, its Allies or the general trade. A hint that Washington is thinking of lower prices, in general, than has been surmised was furnished by the fixing of coal prices last week on a general basis of about $2, when the lowest forecast had been $2.50, but coal interests have some expectation that the Government may consent to raise the price somewhat. No action has been announced as to coke prices, but such announcement is expected in the near future, at $3.75 or $4 if coal stays at $2, but otherwise at a somewhat higher figure.

The Government continues to place orders for steel, but the tonnages are not large in the aggregate, and the proportion of the steel output that is being absorbed by the Government, or is likely to be absorbed in the next few months, is decidedly smaller than was estimated a couple of months ago, possibly not over 10%. When shipbuilding is in full swing, six months or more hence, the proportion may be 20%. Steel for the European Allies remains a consideration for future business, although an occasional order is being placed now for some specialties.

Domestic buyers of steel continue their waiting attitude and are exhibiting the greatest patience. The mills are interested simply in shipping against orders and contracts now on books, their greatest hope being that the bulk of this tonnage can be converted into shipments before there is any serious break in the market.

None of the regular finished steel products is quotable at lower prices than formerly, although the tone of the market is softer In unfinished steel there have been further declines and bessemer and basic iron are quotably lower while in all districts pig iron prices are largely nominal. In the local market, heavy melting steel is stronger, the Carnegie Steel Co. having made some purchases at $38.

Pig Iron—Some odd lots of bessemer iron have been purchased by a producer at $50 and $52, valley, and there is more to be had at $52, representing $1 decline in the week and $3 from the top point. A curious sale of basic from an eastern furnace has been made for delivery in this general district at a price equal to $45.75, valley, but this does not make a market. It is assured that basic could be bought at $50, or $4 under the recent maximum. There is no regular buying to make a market, or prices in general would probably be lower. We quote: Bessemer, $52; basic, $50; malleable and foundry, $53@55, f.o.b. valley furnaces, 95c. higher delivered Pittsburgh.

Steel—Billets, which a week ago were offered at $85, afterwards sold at $80 in small lots and now there are offerings at $75 without finding enough takers to absorb the offerings. Slabs are also offered at $75. Last offerings of sheet bars were at $85. The market is simply sagging, without displaying any life at all. Forging billets are lower, being offered at $95.

Ferroalloys

Ferromanganese—The market is not quotably changed, prompt and balance of year being $375@400 and first quarter or half of next year, $350. The trade seems to expect lower prices eventually rather than higher.

Coke

Connellsville—The market stiffened sharply the last two days of last week, weakened decidedly on Monday and firmed up today, on prospects of poorer car supplies on account of diversion of coke racks to comply with Priority Order No. 1 in favor of full car supplies for the shipment of Lake coal. We quote spot furnace at $13.50@14 and spot foundry at $14@15, per net ton at ovens. The trade still awaits fixing of prices by the Government but there is no line on when this will occur.

STOCK QUOTATIONS

N. Y. EXCH.†	Aug. 28
Alaska Gold M	5¼
Alaska Juneau	3⅞
Am.Sm.& Ref.,com.	96¾
Am. Sm. & Ref., pf.	112
Am. Sm. Sec., pf., A	100
Am. Sm. Sec., pf. B.	93
Am. Zinc	20
Am. Zinc, pf	58
Anaconda	71⅞
Batopilas Min	1¼
Bethlehem Steel.	112½
Bethlehem Steel, pf.	109
Butte & Superior	30¼
Cerro de Pasco	33⅞
Chile Cop	17
Chino	52⅞
Colo.Fuel & Iron	44⅛
Crucible Steel	70⅛
Dome Mines	9⅛
Federal M. & S.	22⅛
Federal M. & S., pf.	41
Great Nor., ore ctf.	37½
Greene Cananea	43
Gulf States Steel	102
Homestake	110
Inspiration Con	51⅛
International Nickel	36⅞
Kennecott	40⅞
Lackawanna Steel	81¼
Miami Copper	35⅛
Nat'l Lead, com.	54
National Lead, pf.	‡105
Nev. Consol	21⅞
Ontario Min	6
Quicksilver	1⅜
Quicksilver, pf.	2
Ray Con	26
RepublicI.&S.,com.,	82⅛
Republic I. & S., pf.	102⅛
Sloss-Sheffield	50
Tennessee C. & C.	16½
U. S. Steel, com	119
U. S. Steel, pf	116⅜
Utah Copper	97
Va. Iron C. & C.	63½

N. Y. CURB†	Aug. 28
Big Ledge	1⅛
Butte & N. Y.	1⅛
Butte C. & Z.	9⅛
Caledonia	68
Calumet & Jerome	2
Can Cop. Corpn	2.43¾
Carlisle	4½
Cashboy	.08
Con. Ariz. Sm.	2⅛
Con. Coppermines	9⅛
Con. Nev.-Utah	.07
Emma Con	1½
Ferber	‡.60
First Nat. Cop.	2.81¼
Goldfield Con.	.52
Goldfield Merger	06
Greenmonster	11/16
Hecla Min	9⅛
Howe Sound	5⅛
Jerome Verde	1⅛
Kerr Lake	5⅞
Magma	45
Majestic	.38
McKinley-Dar-Sa.	.65
Milford	1⅛
Mohican	37½
Mother Lode	.31
N. Y. & Hond	15
Nipissing Mines	8⅛
Ohio Cop	1 1/16
Ray Hercules	3⅞
Richmond	.56¼
Rochester Mines	.55
St. Joseph Lead	20
Standard S. L.	⅛
Stewart	.34½
Success	.24
Tonopah	4⅞
Tonopah Ex	2½
Tribullion	.31¼
Troy Arizona	.19
United Cop	.75
United Verde Ext.	36
United Zinc	4.75
Utica Mines	.28
White Knob, pf.	‡1⅛
Yukon Gold	2.18¾

SAN FRAN.*	Aug. 28
Alta	.03
Andes	.10
Best & Belcher	02
Bullion	.02
Caledonia	.12
Challenge Con	.01
Confidence	.05
Con. Virginia	.14
Gould & Curry	‡.02
Hale & Norcross	.03
Jacket-Cr. Pt	.11
Mexican	.08
Occidental	.60
Ophir	08
Overman	.01
Savage	03
Seg Belcher	.02
Sierra Nevada	.06
Union Con	.28
Utah Con	02
Belmont	4.70
Jim Butler	.90
MacNamara	.14
Midway	.12
Mont.-Tonopah	.20
North Star	.10
Rescue Eula	.20
West End Con	.68
Atlanta	.12
Booth	.07
Comb. Frac	.03
D'field Daisy	.03
Florence	.13
Jumbo Extension	.27
Kewanas	.12
Nevada Hills	.13
Nevada Packard	.31
Round Mountain	.27
Silver Pick	.08
White Caps	1.42½
Big Jim	‡.69
United Eastern	4.20

BOSTON EXCH.*	Aug. 28
Adventure	2
Ahmeek	98⅛
Algomah	.50
Allouez	64
Ariz. Com., ctfs.	11⅜
Arnold	.25
Bonanza	.21
Butte-Ballaklava	.55
Calumet & Ariz	79½
Calumet & Hecla	545
Centennial	17
Copper Range	56¼
Daly West	2¼
Davis-Daly	4⅞
East Butte	10¼
Franklin	6
Granby	78
Hancock	13
Hedley	15
Helvetia	.25
Indiana	2
Isle Royale	27⅛
Keweenaw	2
Lake	9¼
La Salle	3¼
Mason Valley	6¼
Mass	11¼
Mayflower	1¾
Michigan	1⅞
Mohawk	79½
New Arcadian	3
New Idria	13
North Butte	16
North Lake	1
Ojibway	1½
Old Dominion	54
Osceola	85¾
Quincy	89
St. Mary's M. L.	74
Santa Fe	1 1/16
Seneca	7½
Shannon	7¼
Shattuck-Ariz.	23
So. Lake	2¾
So. Utah	.16
Superior	7½
Superior & Bost.	3¼
Trinity	5
Tuolumne	1 1/16
U. S. Smelting	59½
U. S. Smelt'g, pf	49¾
Utah Apex	2⅛
Utah Con	16
Utah Metal	4¼
Victoria	3½
Winona	3
Wolverine	15
Wyandot	.30

BOSTON CURB*	Aug. 28
Alaska Mines Corp.	.50
Bingham Mines	12½
Boston Ely	.60
Boston & Mont	.66
Butte & Lon'n Dev.	.16
Calaveras	3
Calumet-Corbin	.01⅛
Chief Con	2½
Cortez	.10
Crown Reserve	.25
Crystal Cop	.77
Eagle & Blue Bell	2 3/16
Houghton Copper	.50
Intermountain	1½
Iron Cap, Com	15½
Iron Cap Cop., pf.	15½
Mexican Metals	.32
Mines of America	1⅛
Mojave Tungsten	.42
Nat. Zinc & Lead	.40
Nevada-Douglas	1⅛
New Baltic	1
New Cornelia	17¼
Oneco	.35
Pacific Mines	‡.30
Rex Cons	.17

SALT LAKE*	Aug. 28
Bannack	.55
Big Four	05½
Black Jack	‡.06
Cardiff	4.50
Colorado Mining	.16
Daly-Judge	8.60
Empire Copper	1.30
Gold Chain	.12
Grand Central	50
Grand Gulch	‡.19
Iron Blossom	87
Lower Mammoth	.03
May Day	.07½
Moscow	.15
Prince Con	1.60
Silver-King Coal'n	2.95
Silver King Con	4.00
Sioux Con	.11
So. Hecla	1.30
Uncle Sam	.04
Wilbert	.28
Yankee	.07

TORONTO*	Aug. 28
Bailey	03
Beaver Con	.34
Buffalo Mines	‡1.00
Chambers Ferland	‡.13½
Coniagas	3.90
Hargraves	.13
La Rose	.50
Peterson Lake	10
Right of Way	‡.05
Temiskaming	.32
Wettlaufer-Lor	‡.05
Dome Exten	.16
Dome Lake	.17
Foley O'Brien	‡.60
Hollinger	4.75
McIntyre	1.57
Newray	.81
Porcu. Crown	40
Schumacher	‡.42
Teck-Hughes	.45
Vipond	34
West Dome	18

STOCK QUOTATIONS—Continued

COLO SPRINGS	Aug. 28
Cresson Con	5.87½
Doctor Jack Pot	.04⅛
Elkton Con	.05
El Paso	.25
Gold Sovereign	.04⅛
Golden Cycle	2.05
Granite	.40
Isabella	.10
Mary McKinney	.10
Portland	1.40
United Gold M	.19½
Vindicator	.50

LONDON	Aug. 12
Alaska Mexican	£0 10s 0d
Alaska Tre'dwell	1 2 4
Burma Dorp	‡3 18 9
Cam & Motor	‡0 10 0
Camp Bird	0 6 0
El Oro	0 9 0
Esperanza	0 9 0
Mexican Mines	4 7 6
Nechi, pfd.	0 12 6
Oroville	0 15 9
Santa Gert'dis	0 10 0
Tomboy	0 18 6

* Bid prices. † Closing prices. ‡ Last Quotations.

MONTHLY AVERAGE PRICES OF METALS

Silver	New York			London		
	1915	1916	1917	1915	1916	1917
January	48.855	56.775	75.630	22.731	26.960	36.682
February	48.477	56.755	77.585	22.753	26.975	37.742
March	50.241	57.935	73.861	23.708	27.597	36.410
April	50.250	64.415	73.875	23.709	30.662	36.963
May	49.915	74.269	74.745	23.570	35.477	37.940
June	49.034	65.024	76.971	23.267	31.060	39.065
July	47.519	62.940	79.010	22.597	30.000	40.110
August	47.163	66.083	....	22.780	31.498	...
September	48.680	68.515	....	23.591	32.584	.
October	49.385	67.855	....	23.925	32.361	. .
November	51.714	71.604	....	25.094	34.192	
December	54.971	75.765	....	26.373	36.410	...
Year	49.684	65.661	....	23.675	31.315	......

New York quotations cents per ounce troy, fine silver: London, pence per ounce, sterling silver, 0.925 fine

Copper	New York		London			
	Electrolytic		Standard		Electrolytic	
	1916	1917	1916	1917	1916	1917
Jan	24.008	28.673	88.083	131.921	116.167	142.895
Feb.	26.440	31.750	102.667	137.895	133.167	148.100
Mar.	26.310	31.481	107.714	136.750	136.000	151.000
April	27.895	27.935	124.319	133.842	137.389	147.158
May	28.625	28.788	135.457	130.000	152.522	142.000
June	26.601	29.962	112.432	130.000	137.455	142.000
July	23.865	26.620	95.119	128.409	125.500	140.409
Aug.	26.120	......	110.283	.....	126.304	
Sept	26.855	.....	113.905	. .	134.071	...
Oct	27.193		122.750	.. .	142.523	...
Nov	30.625	...	134.659	.... .	155.432	...
Dec.	31.890	......	145.316	......	162.842	..
Year	27.202	......	116.059	....	138.281	...

Tin	New York		London	
	1916	1917	1916	1917
January	41.825	44.175	175.548	185.813
February	42.717	51.420	181.107	198.974
March	50.741	54.388	193.609	207.443
April	51.230	55.910	199.736	220.171
May	49.125	63.173	196.511	245.114
June	42.231	62.053	179.466	242.083
July	38.510	62.570	168.357	242.181
August	38.565	......	169.870	. .
September	38.830	......	171.345	....
October	41.241	......	179.307	......
November	44.109	......	186.932	......
December	42.635	......	183.368	....
Av. year	43.480	......	182.096	....

Lead	New York		St. Louis		London	
	1916	1917	1916	1917	1916	1917
January	5.921	7.626	5.826	7.530	31.167	30.500
February	6.246	8.636	6.164	8.595	31.988	30.500
March	7.136	9.199	7.375	9.120	34.440	30.500
April	7.630	9.288	7.655	9.158	34.368	30.500
May	7.463	10.207	7.332	10.202	32.967	30.500
June	6.936	11.171	6.749	11.12	31.011	30.500
July	6.352	10.710	6.185	10.644	28.137	30.500
August	6.244	......	6.088	....	29.734	...
September	6.810	......	6.699	....	30.786	....
October	7.000	......	6.898	....	30.716	. .
November	7.042	......	6.945	....	30.500	. .
December	7.513	......	7.405	....	30.500	.
Year	6.853	......	6.777	....	31.359	. . .

Spelter	New York		St. Louis		London	
	1916	1917	1916	1917	1916	1917
Jan	16.915	9.619	16.745	9.449	89.810	48.329
Feb	18.420	10.045	18.260	9.875	97.762	47.000
Mar	16.846	10.300	16.676	10.130	95.048	47.000
April	16.695	9.459	16.525	9.289	99.056	54.632
May	14.276	9.362	14.106	9.192	94.217	54.000
June	11.752	9.371	11.582	9.201	68.591	54.000
July	8.925	8.643	8.755	8.473	50.750	54.000
Aug	8.730	. .	8.560	.	51.587	
Sept	8.990	......	8.820	.	52.095	....
Oct	9.829	......	9.659		54.159	.
Nov.	11.592	......	11.422		56.023	
Dec.	10.665	......	10.495	. ..	55.842	. .
Year	12.804	......	12.634	......	72.071	....

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton.

Pig Iron, Pitts.	Bessemer‡		Basic‡		No. 2 Foundry	
	1916	1917	1916	1917	1916	1917
January	$21.60	$35.95	$18.78	$30.95	$19.70	$30.95
February	21.16	36.37	18.93	30.95	19.51	30.95
March	21.81	37.37	19.20	33.49	19.45	35.91
April	21.65	42.23	18.95	38.90	19.45	40.06
May	21.78	46.94	19.11	42.84	19.58	43.60
June	21.95	54.22	18.95	50.05	19.34	50.14
July	21.95	57.45	18.95	53.80	19.20	53.95
August	21.95	......	18.95	. .	19.22	.. .
September	22.88	......	19.58	...	19.53	
October	24.61	.....	21.26	...	21.51	.
November	30.07	......	28.18	.	26.55	
December	35.16	......	30.95	.....	30.73	.
Year	$23.88	..	$20.98	.....	$21.15	

‡ As reported by W. P. Snyder & Co.

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Engineering and Mining Journal

VOLUME 104 SEPTEMBER 8, 1917 NUMBER 10

Copper Operation of Compagnie du Boleo

By LINDSAY DUNCAN*

The isolated situation of the Compagnie du Boleo in Baja California has forced the company to depend on its own resources. Noteworthy results have been gained in solving many problems in the face of difficulties. The copper ore is easily mined and crushed and is self-fluxing, the fines being briquetted before smelting. Slag is granulated and dumped in the sea. The harbor at Santa Rosalia is modernly equipped for handling ocean freight.

IT was recently my privilege to spend several months at the mines and smeltery of the Compagnie du Boleo at Santa Rosalia, Baja California, in connection with certain proposed changes in their smelting methods. But little has been written about this plant in technical literature, and, as it is unique in many ways, a description may be of interest.

Santa Rosalia is about half way down the peninsula on the Gulf side and is almost exactly opposite the port of Guaymas. There are two ways of reaching Santa Rosalia: Either by rail to Guaymas, via Tucson and Nogales, and then crossing the Gulf in a gasoline launch, or else by steamer from San Pedro or San Francisco. The latter method is less used but, in revolutionary times, more certain and was the one selected by me, who was fortunate enough to secure passage at San Pedro upon a small tramp steamer bound from Puget Sound to Santa Rosalia with mine timbers. On boarding, I was assured by the captain that I would be uncomfortable and discovered that the commander knew his ship, so that, when Santa Rosalia was sighted on the morning of the sixth day, no regrets were felt.

The central portion of the peninsula of Baja California is an arid and rugged region, volcanic upheavals apparently having alternated with long periods of subsidence and sedimentary deposition. In general appearance it somewhat resembles the country around Great Salt Lake, except that the coloring is much more vivid. The prevailing rocks are sandstone, pumice and obsidian, and, due to the small rainfall, which averages only 0.4 in. per annum at Santa Rosalia, the vegetation is scanty, the most prominent growth being the giant cacti, which grow 20 or 30 ft. high.

Owing to the scarcity of water and the frightfully broken terrain, prospecting is a matter of great difficulty, and but little has been attempted. In most places the mountains rise directly out of the sea and attain a height of several thousand feet, although at Santa Rosalia the range is not so high and is broken by several cañons.

SANTA ROSALIA FROM THE SEA SHOWING PLANT OF CIE. DU BOLEO IN BAJA CALIFORNIA

The climate is mild and agreeable most of the year, but during the four summer months too warm for comfort, an electric fan being essential for a night's sleep.

The harbor of Santa Rosalia is formed by two breakwaters built of massive blocks of slag. Modern machinery for loading and discharging cargoes has been installed, consisting of double tracks along the breakwaters, traveling cranes, pan conveyors for coke, motor-driven pumps for fuel oil, and conveying apparatus for loading floating timbers into railroad cars. Ocean-going steamers can moor directly alongside of the breakwaters. Needless to say, the harbor facilities form a refreshing contrast with the remainder of the West Coast ports.

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*Nevada Consolidated Copper Co., McGill, Nevada.

The town of Santa Rosalia is divided into three portions, known locally as Francia, El Pueblo and Mexico. Francia contains the hospital, administration buildings and the residences of the French staff. El Pueblo contains the stores, hotel and Mexican quarters, while Mexico is the military post. El Pueblo is at the mouth of a cañon, with "Mexico" on a plateau to the south and Francia on a plateau to the north. The smeltery is built on a narrow flat between Francia and the harbor.

The European quarters are carefully designed for tropical conditions, with high ceilings, verandas on all four sides, many windows and transoms, and separate buildings for the kitchens.

Due to the scarcity of water none of the houses are piped and the allotted water is distributed early each morning by tank carts. This method of water delivery obviates the necessity of alarm clocks, as the water boys not only shake the entire house when delivering the water but also make noise enough to awaken the most persistent sleeper.

Salt water is used for sprinkling the streets, slag granulation, furnace water-jackets and for circulating water in the power-house condensers.

There are fully 10,000 people dependent upon the operations of the Boleo company, and it is necessary to import a large proportion of the food supply from the United States. The only local food products are fish, which are very abundant and palatable, and cattle, which are principally horns, hoofs and hide. However, the company has started ranching on every available spot within a radius of 50 miles, and in view of the poor soil and lack of rain, has accomplished truly remarkable results.

Large acreages of Burbank's spineless cacti have been planted and bid fair to furnish fodder for several thousands of cattle. Blooded bulls are regularly shipped in from the United States to improve the local breed. The poorer animals are being gradually killed for meat and the better ones retained for breeding which insures a better grade of beef for posterity but is hard on the teeth of a non-vegetarian visitor at the present day.

There is a well-equipped bakery where thousands of loaves of genuine French bread are baked each day by Mexican bakers carefully trained in years past by some skilled Frenchman. This is celebrated along the entire West Coast. In fact, Santa Rosalia bakers have established shops at several of the West Coast ports which are second in excellence only to the parent shop at Santa Rosalia.

Due to its isolated situation the Boleo company has had to depend upon its own resources to a great extent. Astonishing results have been obtained in training native craftsmen; skilled Mexican brick-masons, machinists, pipe-fitters, metal-workers, electricians, locomotive engineers, and power-house operators are now very much in evidence.

The five copper-bearing veins of the Boleo orebody outcrop on the western slope of a low range of hills five or six kilometers from the coast. Only the three upper veins have been worked to date. The ore dips toward the coast and presumably extends under the Gulf. Although the mines have been worked by their present owners for about 30 years, they show no signs of exhaustion. As is usually the case, the grade of the ore is somewhat lower than in past years but still runs about 8% Cu in the dry ore. A typical analysis is as follows: 43.4% SiO_2, 9.9% Al_2O_3, 8.5% FeO, 5.6% MnO, 3.1% CaO, 4.5% MgO, 2.4% S, 9.3% CuO, 13.1% ignition loss, 28.3% moisture.

The ore is exceedingly hygroscopic and, despite the high-moisture contents, scarcely feels damp to the touch. It is very soft and clayey, crushes easily, and, when dried, disintegrates completely. As mined, the largest lumps are scarcely 9 or 10 in. in diameter.

The veins range from 0.60 to 1.30 meters in thickness and are mined by a method similar to that of the "long wall" system used in coal mining. The ore is handled from several shafts by motor-driven hoists and hauled to the smeltery ore bins in 6-ton, hopper-bottom cars, over a 3-ft.-gage track. The motive power consists of American-built, oil-burning locomotives.

The ore is screened when drawn from the bins, the coarse ore going directly to the furnaces and the fine ore being briquetted. Due to the character of the ore it briquets without a binder. Belt conveyors are used to take the fine ore from the bins to the briquetting machine and to return the briquets.

Coke, coarse ore and briquettes are trammed from the various bins to the furnace hoppers by hand in buggies.

THE HARBOR OF SANTA ROSALIA IS MODERNLY EQUIPPED FOR LOADING AND UNLOADING STEAMERS. ONE

There are five blast furnaces in operation now. Each furnace is equipped with an oil-fired reverberatory settler. The furnace products consist of matte running 63% Cu and black copper running around 90%. The slag is exceedingly viscous, and before the installation of the reverberatory settlers the copper losses in the slag were very serious.

Several of the most famous European metallurgists have declared the ore would not smelt without fluxing. There is no flux available, but by maintaining a narrow smelting zone and a high slag temperature the ore has been successfully smelted for many years.

Matte and black copper are tapped from the furnaces intermittently, but the slag flows continuously through water-jacketed spouts into the settlers. About 500 kg. of copper per furnace per day are recovered by means of these settlers. The slag is granulated after leaving the settlers, run into steel, hopper-bottomed barges, towed out to sea, and dumped. If the sea is too rough, the granulated slag is stacked by means of a Bleichert tramway.

The home offices of the company are located in Paris, and the director general, M. Etienne Michot, handles the Boleo property as well as several other producing mines in different parts of the world. The property of the Compagnie du Boleo is under the direct charge of the resident director, M. Raoul Plouin.

At the beginning of the European war the company

BREAKWATERS IS SHOWN WITH (1) SLAG DISCHARGE LAUNDER, (2) SLAG BARGES, (3) SCALE HOUSE (4) DREDGE

as put to the serious disadvantage of having a large ajority of its technical staff drafted into the French ilitary service. A framed list of those called hangs pon the wall of the plant office with "Mort sur le champ 'honneur" inscribed after a pathetically large number f the names.

Taken as a whole, the plant is exceedingly interesting o an American engineer in that it represents European esign embodying a certain amount of American prac-ice and is adapted to Mexican conditions.

It is the only important copper mine which has perated continuously throughout the recent turbulent imes in Mexico. This is due partly to its geographical cation, but largely to the diplomatic skill and tact hich the French management have displayed in their elations with the various Mexican officials. In fact, he friendship of the Mexican government is at times omewhat embarrassing, as upon one occasion when a couple of hundred of the Yaqui miners went on a strike for some trivial reason and the Government offered to shoot, and, in fact, nearly insisted upon shooting, a dozen or so of the ringleaders to give tangible evidence of the good feeling existing between the Mexican government and the Boleo company.

One cannot help feeling great admiration for the French spirit which has enabled them to combat and overcome difficulties due to war at home—revolution in the country in which they are operating, irregular transportation, shortage of supplies, lack of skilled labor, and the majority of their technical staff called to the colors. Not only has their production been maintained, but they have planned and successfully carried out very considerable improvements.

Bauxite for Lining Furnaces

Bauxite can be converted into a refractory suitable for furnaces and crucibles by the following method, according to M. N. Lecesne, in a recent issue of *La Céramique*, republished in *Iron Age*.

A mixture is prepared of one part of anthracite and three parts of bauxite of average composition, and in the state of moisture in which it comes from the quarry. The mass is charged into a furnace lined with refractory material (preferably fused bauxite) and previously heated up with anthracite. Air is blown through the charge at an initial pressure of about 40 in., water gage, rising afterward to as much as ten times that pressure, according to the depth of the charge, though 160 in. of pressure is the usual maximum.

The temperature rises quickly, and the sudden vaporizing of the water in the bauxite causes the latter to break up and granulate, while the aluminum carbide which is produced burns and raises the charge to over 3000° C. of incandescence. In consequence, the silica is volatilized and the iron, reduced by the action, is expelled by the air blast as a shower of sparks which, in contact with the outer air, are transformed into magnetic oxide. The air blast is continued, to burn off the surplus anthracite and cool down the fused mass, which can then be discharged from the furnace and ground, mixed with crude or calcined bauxite as a binder, molded, dried and fired in the same way as calcined bauxite.

Milling Practice at McIntyre Mine

A review of the past and present milling practice at the McIntyre is given in a recent paper[1] by A. Dorfman, the superintendent of the McIntyre mill in the Porcupine gold district of Ontario, Canada.

About 80% of the ore now milled consists of gray schist, heavily mineralized with pyrite, with a small percentage of quartz. There is also a quartz ore and a basalt ore. The principal associated minerals are ferro-dolomite, forming as high as 80% of the gray schist; pyrite, from 5 up to 20%; also sericite, leucoxene and chlorite. The gold occurs as free grains in the quartz, from extremely fine up to fairly coarse particles; occasionally as fine films in unmineralized schist; but mainly in association with iron pyrite.

The first mill was designed to treat ore mined at or near the surface, consisting mainly of quartz containing free or visible gold, which it was desirable to treat by amalgamation and concentration. A 10-stamp mill and concentration plant was erected, the capacity being 50 to 60 tons per 24-hour day. Crushing to pass a 20-mesh screen, 80% of the contained gold was recovered by amalgamation, and from 10 to 15% by concentration. After two months of operation less and less gold was obtained on the plates and the ratio of concentration decreased from about 32 to 1 until it finally reached 15 to 1, with a consequent accumulation of a large quantity of concentrate requiring special treatment. During the last six months of the 14 months that the plant was operated, about 61.2% of the contained gold was recovered by amalgamation, 24.8% by concentration, and 14% remained in the mill tailing.

Cyanide tests on table tailing, that assayed $1.35 per ton before leaching, showed 45c. still remaining in tailing after 72 hours' treatment. Similar tests on table concentrate, with strength of solution varying up to 10 lb. KCN per ton, gave not more than 30 to 45% extraction even in several days of leaching.

FINE GRINDING NEEDED FOR HIGH EXTRACTION

Experiments involving fine grinding and agitation indicated that all the gold in McIntyre ore may be dissolved in a cyanide solution, which rule should hold in regard to ore mined at other properties in the neighborhood. Samples of $10 ore were ground to pass an 80-mesh screen, and separate tests were made of several grades of fineness. By agitation with cyanide solution for 48 hours a 96% extraction was obtained on material coarser than 150-mesh; while after 40 hours' agitation of material finer than 200-mesh it was found that 99.7% of the gold was dissolved. A concentrate assaying $40 gold per ton was ground in a pebble mill, in contact with a 5-lb.-per-ton cyanide solution, until all sulphides were finer than 200-mesh, the results showing that an extraction of 95% of the contained gold was possible.

In the present milling practice the run-of-mine ore, the specific gravity of which varies from 2.65 to 2.90, is crushed by a coarse breaker to 3-in. size, further reduction to a maximum of 1½ in. being obtained by rolls. The roll product is fed to Hardinge ball mills that crush to 10-mesh, and this product passes to pebble mills working in closed circuit with Dorr classifiers. This arrangement reduces practically all the sulphides (of relatively high specific gravity) to finer than 200 mesh, material of that size constituting about 80% of the final product of the pebble mill. A ball mill and a pebble mill, counted as one grinding unit, crush from 150 to 200 tons per 24 hours, according to the size of final product desired. With the higher tonnage, tests have shown the final pulp to contain only 67% of material finer than 200 mesh.

WASHING RESULTS DEPEND ON NATURE OF PULP

Simultaneously with the crushing and grinding of the ore it is agitated with a cyanide solution containing from 0.6 to 0.75 lb. NaCN per ton of solution. The overflow solution from the primary thickener carries from 77 to 80% of the dissolved gold and goes directly to the precipitation department. The pulp is washed in counter-current decantation tanks, each set treating pulp from one grinding unit. For efficient washing, the design and operation of the tanks must suit the class of ore. Tests showed that in 3½ hours quartz will settle to a pulp containing 35% moisture, gray schist to a 51% moisture pulp, quartz porphyry 60% and sericite 64% moisture. After 18 hours, sericite schist pulp still contains 47% moisture.

The first thickeners installed at the McIntyre were 11 ft. deep. The last two units erected are only 7½ ft. deep and are doing much better work than the deeper ones. It is also noted that while thickeners 32 ft. in diameter will settle 175 tons of ore in 500 tons of solution per 24 hours and yield a clear overflow, the tanks 30 ft. in diameter will handle only 140 to 150 tons of the same ore in the form of a similar pulp.

During a period of 8 months, when operating at the rate of 400 tons per 24 hours, some average costs per ton of ore were as follows: Crushing and rolling, 7.05c.; ball mills, 14.82c.; classifiers and tube mills, 16.75c. The supplies used per ton of ore treated are: Cyanide, 0.35 to 0.45 lb.; lime, 2 to 2½ lb.; zinc dust, 0.40 to 0.42 lb.; pebbles, 4 to 5 lb.; and steel balls, 0.6 to 0.8 lb. The total cost of milling is approximately $0.88 per ton.

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[1] Bulletin 64, Can. Min. Inst., August, 1917.

Chino Quarterly Report

Chino Copper Co. in its 23rd quarterly report, covering the second quarter of 1917, shows an increase of product over the first quarter of 1,321,482 lb. By months the production of copper contained in concentrates was: April, 6,368,874 lb.; May, 6,984,457 lb.; June, 7,193,262 lb.; total, 20,546,593 lb., a monthly average of 6,848,864 pounds.

The total amount of ore treated was 856,600 tons, an average of 9413 tons per day. The average copper content of the ore was 1.704%, compared with 1.6022% for the first quarter, an increase of 0.1018%. The recovery averaged 23.986 lb. per ton of ore treated.

In addition to the copper recovered by milling, there was produced 1,370,668 lb. of copper from shipping ore and 26,833 lb. of copper from precipitates, making a grand total of copper produced of 21,944,094 lb. The net earnings for the period amounted to $2,992,071 from which dividends amounting to $2,174,950 were paid, at the rate of $2.50 per share.

Stope Measurements at Messina*

A method of making and plotting a survey of the stopes in a South African mine. Use of hanging compass proves simple and accurate in the surveying of stopes in which the use of a transit is awkward or impossible on account of narrow or low quarters. A page from a notebook shows how notes are kept.

CERTAIN of the stopes at the Messina copper mine in the northern Transvaal presented difficulties in surveying by ordinary methods, and a special procedure was devised.

The orebodies in these stopes are irregular, almost vertical shoots of large cross-section. In some of the stopes a horizontal slice 7 or 8 ft. high is removed and the cavity filled with waste rock, while in the remainder a shrinkage method is used. In both cases the problem is similar.

Prior to stoping, winzes are sunk through the ore to act as airways and waste chutes, and, as the ore is stoped, double-compartment crossed chutes are carried through the filling as nearly vertical as possible—one compartment being used as an ore chute, and the other as a manway. A space of about 18 in. is usually left above the filling, through which it is possible to crawl and reach the back. The ore is generally too soft to stand without temporary timber supports, and these are very numerous in heavy ground.

The first slice (sill) of any stope is horizontal, but the back often becomes inclined as stoping proceeds and may vary considerably in elevation. It was considered that only methods that gave accurate horizontal cross-sections (contours) of the shoots at regular intervals would be satisfactory.

Hanging Compass Used for Taking Bearings

Methods involving the use of a theodolite were discarded on account of frequency of insufficient height to work the instrument with the ease and rapidity necessary for economic stope measurement; trouble due to interference by timbers; difficulties incidental to connecting stope surveys with development surveys through long, narrow passes; and necessity of using, as assistants, Kafirs who could not be trusted to work reliably at more than, say, 20 ft. from the observer. In the method finally decided upon, the hanging compass and clinometer are used for the traverses and the polar protractor for details. The general procedure is as follows:

Copper nails with numbered tags are driven into the timbers generally at a corner at the bottom of the manways of the chutes. The nails are tied in to the survey of the level and their elevations determined. In the stope any convenient pass is taken as a starting point. A copper nail (numbered) is driven into the timbers in the same relative position as the nail below, and the distance between the nails measured. The passes can usually be treated as vertical; any deflection is easily determined by the use of a plumb-line or clinometer and compass.

From the upper nail, stout twine 100 ft. or more in length is ranged round the stope as a closed traverse or to the reference nail in the next convenient pass. Supports for the string are provided by means of ordinary nails driven into the timbers, wedges driven into cracks in the rock or long pegs driven into the day's drill-holes.

Supports are considered stations, and the lines are deflected as much as necessary to give the most effective positions. Between stations the lines are drawn taut, care being taken that they foul nothing. The stations may be as close together as necessary, but should not be more than 25 or 30 ft. apart, in order to avoid excessive sag and to keep at a minimum the effect of any error made in reading, or due to local attraction.

The compass is hung on the line at a convenient point, with the zero (north) in the direction the traverse is being run. When all steel, such as hammers, drills, shovels, picks, etc., has been removed 20 ft. from the instrument, the north end of the needle is read as a continuous bearing to ¼°. Steel-buckled belts are avoided, but it is found that the nails in mine boots cause no apparent deflection if the feet are kept vertically below the compass or in line with the needle.

After removing the compass, the clinometer is hung at each end of the line in turn, about 18 in. from the supports, and both readings of inclination noted. There is a difference between the readings due to sag, varying with the tension of the string and the distance between stations.

Polar Protractor for Cross-Sections

Local cross-sections of the stope are then taken by means of the polar protractor. This instrument, though simple, is little used by mine surveyors, and the modified form adopted warrants description:

A circular piece of 16 S.W.G. sheet brass, 8-in. diameter, is marked on one side at every 5° from 0° to 360° in cyclic order. The first and fourth quadrants have the central portions removed, and from 180° to the center a slit is cut which is just equal in width to the diameter of the string used (See Fig. 1).

The protractor is placed in position by passing the slit over the string, when it will hang in a vertical plane which is at right angles to the vertical plane of the traverse line, and the zero of the protractor will be vertically over the string at its center. Any tendency of the protractor to slide along steep lines is easily counteracted by the compass clips.

The cross-sections are taken at every significant change in the shape of the stope. The protractor is hung on the line so that the graduations face the observer, who looks in the direction of the traverse. The ring of a linen tape is fastened by a spring hook to the end of a light extensible rod, and by means of the rod an assistant holds it, in turn, on the salient points in the cross-section desired. The tape is drawn taut, the observer reading the inclination and length of the offset, keeping the tape in the correct plane by noting that it is parallel to the protractor. The offsets are limited in length on account of sag, the difficulty of adhering to cross-section plane, and magnification of errors due to reading it. They should not ordinarily exceed 12 ft. The distances of the cross-sections along the traverse line are noted, and for this purpose it is convenient to lay previously a special draft tape along the line, with its end fastened to the point of commencement.

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*A paper by William Whyte, presented at a meeting of the Institution of Mining and Metallurgy, Apr. 19, 1917.

The field notes of a typical survey which need no explanation, with the exception of the cross-section notes, are appended. In these the encircled figure at the commencement of each line is the distance along the traverse line at which the particular section was taken; the figure before each bar is the inclination of the offset, while the figure following the bar is the length of the offset; thus, 120 5½ means that, at an inclination of 120° on the polar protractor, the offset is 5½ feet.

In the office the inclined traverse lines are reduced to their horizontal and vertical components by the slide rule, using the mean vertical angle. The horizontal distances are determined to ¼ ft., and the vertical to 0.1 foot.

Working from the starting point, the elevation of each station is calculated, and if the survey has been closed or tied to other known points, one check on the accuracy of the work is obtained. (Note point D in field notes.)

The results of three calculations, horizontal and vertical components, and elevations are entered in specially reserved columns in the field book. The work is completed graphically, and no other calculations are made.

The graphic records are drawn to a scale of 1: 250 on sheets of good-quality tracing paper, foolscap size, and filed in ordinary end-opening folders, each folder being reserved for one stope. Coördinate lines are drawn on the sheets, and care is taken that they occupy the same relative position on each sheet in any one folder. They will then register when bound and allow comparison of adjacent contours.

The known reference points are plotted or traced on one of the sheets (known as the key plan) and from these the traverse is plotted by protractor with the compass bearings corrected to true meridian; if the work has been properly done, there should be no material difference in the closures. The traverse is plotted in elevation near the top of the same sheet, using the calculated elevations and horizontal lengths, and working from a datum. Lines are drawn in colored inks (alternately red and yellow) parallel to the datum line, 5 ft. apart to scale, and numbered according to the elevations they represent.

METHOD OF PROJECTING CROSS-SECTIONS

The distances at which the polar protractor was placed are scaled along the elevation of the traverse lines, and through these points short vertical lines are drawn. Short lines are also drawn at right angles to the traverse lines, through the projected positions of the points on the plan. These operations give lines which are the traces of the planes on which cross-sections were taken.

In the elevation the cross-sectional planes are rabatted upon the planes of the traverse lines, and the cross-sections are plotted in correct relative position. This is done by means of a paper protractor, marked similarly to the polar protractor, with a 1½-in. square cut out of the center (Fig. 1).

As an example: In the plan of the traverse (Fig. 2), let α-β, perpendicular to *H-J*, represent the plan of the cross-section plane at 12 ft. along the line *H-J*, and in the elevations let the vertical line α-β represent the elevation of the same plane. Let the plane α-β be revolved (rabatted) in a cyclic direction through 90° about its intersection *o* with the vertical plane through *H-J*, as an axis, when it will be coincident with the plane *H-J*, and, in elevation, with the plane of the paper. If the outline of the cross-section is now plotted, it appears as shown around α-β in elevation, where the intersection of *H-J* and α-β represents the center of the polar protractor and α-β the 0-180 axis.

The protractor is centered on the intersections of the vertical traces of the cross-sections with the elevation of the traverse lines, and cross-section outlines directly plotted with a scale. This completes the key plan, on which the date of survey and names of party are noted.

Contours are plotted on individual sheets and are taken at the 5-ft. intervals marked on the elevation of the traverse. The sheet of the contour to be plotted is fitted over the key plan with the aid of the coördinate lines, and the data on the lower sheet are read through the transparent paper.

As the superimposition of the contour sheet, Fig. 3, over the key plan, Fig. 2, would present considerable difficulty in the reproduction of the drawings, the effect of such superimposition is indicated by showing the contour on the key plan, and vice versa, in dotted lines.

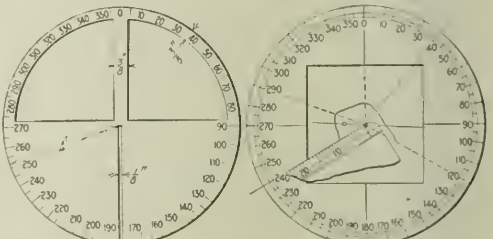


FIG. 1.

CROSS-SECTION POLAR PROTRACTOR
Scale : ⅔

PLOTTING PROTRACTOR
Opening full sizes; circle reduced, showing cross-section plotted at 18 ft. on line G-1 (Fig. 2)

The distance from the vertical axis to the outline of any cross-section is measured with a pair of dividers along the line representing the elevation of the contour and transferred to the line representing the trace of the cross-section plane on the plan. This fixes one point on the contour, and the other points cut at that elevation are obtained by a repetition of the process. A free line drawn through the points represents the contour.

Measurements taken with the polar protractor to the left of the vertical axes of the cross-sections must be plotted on the left-hand side of the traverse lines looking in the direction of the traverse and vice versa.

Difficulty is at first sometimes experienced in finding the correct lines to use and care is necessary, but remarkable dexterity is soon attained. The completed sheets are filed in the covers in order, with the highest contour on top.

The only method, so far as I am aware, comparable in accuracy with the one described, is by means of a theodolite from a coördinated point, after which the calculated positions of the points are plotted and contours drawn by interpolation; but, as already explained, this method is not practicable in the filled stopes for which the polar-protractor method was particularly devised.

In open stopes of considerable height and width, where comparatively long sights are possible and where the whole working may be commanded from one or two settings of the instrument, the theodolite method is preferred, as the polar protractor and compass used as described are not economical in time. Between the two extremes are a variety of stopes where the method adopted is a matter of individual judgment, but it is noteworthy that wherever possible the compass-protractor method is used and that the two methods are found to be interchangeable without difficulty.

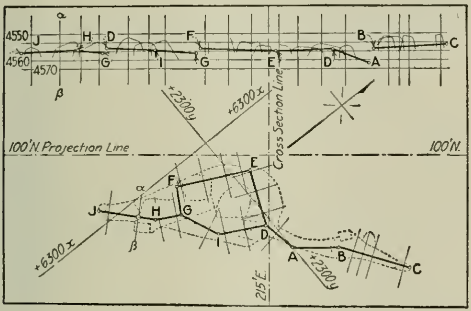


FIG.2

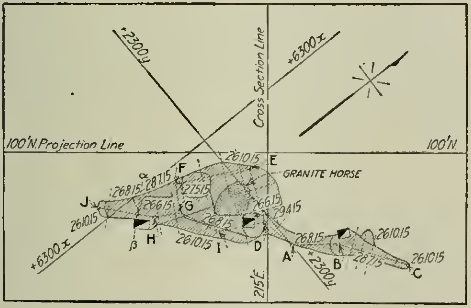


FIG.3

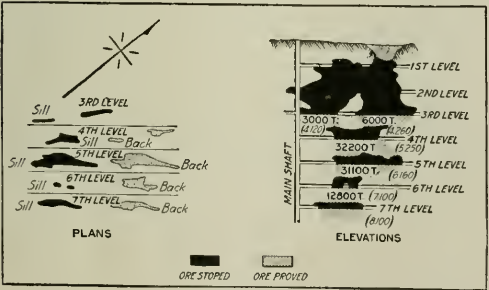


FIG.4

RECORDS OF THE STOPE SURVEY

Fig. 2 shows the key plan of a stope with corresponding section; Fig. 3 shows Contour 4560 of the same stope; Fig. 4 shows projection and contours of a portion of the Bonanza orebody, Messina mine, and illustrates the irregular cross-section and ore-reserve calculation

Semi-permanent fixtures of iron, such as pipes and rails, interfere with the free use of the hanging compass, and where such are common in the stopes, they render the method inapplicable.

An attempt is made to read the magnetic bearing of the traverse lines to ¼°, but as the reading has frequently to be made by the bisection of the movement of a swinging needle, it is probable that errors of ½° occur. On account of the short average length and comparatively large number of traverse lines and the short total length, the final error introduced by these differences is not great. In plan the traverses frequently close with no apparent error and almost invariably within a foot to scale. In elevation the calculated closure is generally within 0.2 ft., and with special care it is not difficult to obtain an exact check.

SOURCES OF ERRORS IN SURVEY

Errors may occur when offsetting with the aid of the polar protractor on account of departure of the 0-180° axis from the vertical; departure of the protractor from a plane perpendicular to the vertical plane of the traverse line; increase in the sag of the string due to the weight of the protractor; or sag in the offset tape. A few experimental plottings will show no serious effect due to departure from planes up to a deflection of, say, 5 degrees.

Small errors due to sag are negligible, but when the total sag is equal to or more than 6 in., it is measured by noting the difference between the height of the string at the offset point before and after the protractor is placed in position, and during plotting the center of the protractor is displaced an equivalent amount. This error is only important on unusually long or slack lines and could be reduced by using a protractor of lighter metal.

Sag in the offset tape causes the inclination shown by the end of the tape at the protractor to differ from that of the straight line joining the end points. It is minimized by the use of a light tape with high tension, but is never entirely eliminated and must be kept small by a limit on the length of the offset. As previously stated, the offsets do not ordinarily exceed 12 ft., which, even with an error of inclination as great as 5°, gives a displacement of only one foot.

VERTICAL PROJECTIONS FROM SURVEY.

Section lines are drawn at right angles to each other on the general plan of the mine, through the center of the main shaft, to represent the planes of the vertical projections, one of the lines being parallel to the average strike. Every key plan and contour sheet has lines drawn parallel to these, with their distances from the original section lines noted. The positions of the limits of the oreshoot on the contour sheets are readily transferred to the vertical projection, with the aid of these lines and a pair of dividers.

A modification of this method is used in practice for the construction of the longitudinal projection. On a sheet of paper similar to the key plan, corresponding cross-section and elevation lines are drawn. The section line of this sheet is fitted over that of the key plan, and by sliding the sheet to and fro, the elevation of the highest point of each of the local cross-sections is brought, in turn, over its position on the plan and marked. The junction of the points thus obtained gives the projection. This method is more accurate than the one first described, as it takes account of work done above the elevation of the highest contour.

For the cross-section the contour sheets are used. In order to obtain this section relatively correct, a continuous line as irregular as necessary is drawn on the longitudinal projection to represent a plane at right angles to that of the projection, along the center of the oreshoot. The intersections of this and the elevation lines are projected on the contour sheets and give lines along which the measurements are taken.

ESTIMATION OF TONNAGE BROKEN AND ORE RESERVES

The calculation of the volume excavated is made by using the ordinary prismoidal formula,

$$V = \frac{h}{6}(a + b + 4m)$$

in which V = volume, h = height, a and b = end areas, and m = middle area. Alternate contours are used to give the end areas of a series of prismoids, the heights of which are twice the contour distances. The result, obtained as cubic feet of solid excavation, is converted to tonnage by a predetermined factor.

26-10-15. Bonanza (Hanging Wall). Stope No 6-160. A S. Corbett and J. W. Walshe, Surveyors.

Traverse	Magnetic Bearing	Vertical Angle	Measured Length	Horizontal Length	Vertical Projection Elevation	Cross-section Notes					
				(⊙ B 35)	− 4567 7						
				⊙ B 35 to A	+ 1 0						
				(A)	− 4566 7						
A−B	53¼	R 17-36 R 17-24	20½	20	+ 7 8						
					− 4558 9						
B−C	72½	R 2-46 R 3-24	40	40	− 2 2	(9)	290/5½	310/8½.	20/6.	110/4	
					− 4556 7	(1¼) (13) (7)	270/12 240/5½ 230/2½.	300/10½ 330/8½ 330/5½	0/5. 15/5½ 0/3½.	20/5. 110/8½ 130/5	120/3½
				(A)	− 4566 7						
A−D	275¼	R 21-30 R 21-48	21½	20½	+ 8 1	(11½)	230/4	320/4.	0 4.	40 4½.	130/9
					− 4558 6						
D−E	310	F 2-46 F 3-24	31½	31½	− 1 4	(6½)	110/15.	90/11½.	0/3.	230/5,	240/10
					− 4560 0	(19½) (30)	105/16½ 130/8½	90/13 60/7.	0 1. 0 5	290/2,	210/5
E−F	233½	R 0-46 R 1-30	41½	41½	+ 0 4	(4½)	90/1.	35/3	320/4	290/6½	250/9
					− 4559 2	(14) (16½) (29½)	100/5½. 105/9½. 140/3.	30/6½ 10/7. 20/5.	0 1. hole. "	310/7½. top inaccessible "	290/8 "
F−G	148½	F 7-36 F 6-44	16	15½	− 2 0						
					− 4561 2						
G−H	220½	R 5-36 R 6-0	14½	14½	+ 1 5	(2½)	255/16½.	270/11½.	290/8.	0/6	
					− 4559 7	(12½)	230/6½	290/4.	0/4		
H−J	345½	F 2-0 F 1-0	31½	31½	− 0 8	(10)	230/4.	300/3.	0/2½.	60/11.	110/11½
					− 4560 5	(26)	230/5½.	290/2½.	0/2½.	70/4.	130/7
				(G)	− 4561 2						
G−I	45	R 2-44 R 2-36	23	23	+ 1 3	(18)	120/9.	40 4½.	0/6.	290/3½.	240/7½
					− 4559 9						
I−D	44	L 2-12 R 3-00	27	27	+ 1 3	(3½)	115/5½.	40 3½	0/4.	290/4½	240/8½
					4558 7	(15)	250/9.	310/6½	0 7.	60/7½.	100/8

COPY OF FIELD NOTES OF STOPE SURVEY

In the case of stopes where this method is used for contractors' measurement, contours must be made at 2-ft. intervals if the excavation is irregular and small.

The ore reserve is calculated in the following manner where the ore occurs as a shoot:

The portion of the shoot remaining between the rail elevations of any two adjacent levels is considered as a block. The cross-sectional area of the sill of the upper level, corrected for any unprofitable ore which has been mined and which will probably be avoided in stoping from below, is taken as the area of the top of the block. The contours of the stope below the block are examined, and the area of the highest contour which represents the full cross-section of the shoot is taken as the bottom area. The height of the block is the difference between the elevations of the end areas.

The ordinary prismoidal formula is of no service in calculating this volume, as the middle area is indeterminate, and the formula,

$$V = \frac{h}{3}(a + b + \sqrt{ab})$$

is used, in which V = volume; h = height, a and b = end areas, m = middle area. To determine the actual contents, the volume already stoped above the elevation taken as the lower end of the block is deducted from the result.

Ore is taken as proved where both ends of the block are fully exposed and there is reasonable evidence of continuity. This is generally provided by a winze through the center of the orebody, but local experience must always be a large factor in the classification.

EXAMPLE OF ORE RESERVE CALCULATION

Block No. 5 = 260 Bonanza, 4th to 5th Levels

(a) Area 4th level sill, 2,675 sq.ft. at elevation − 4,410 ft.
(b) Area 5th level back, 7,996 sq.ft. at elevation − 4,488 ft.

$$h = (-4{,}488) - (-4{,}410) = 78 \text{ ft. } \frac{h}{3} = 26 \text{ ft.}$$

			Log
	(a)	2,675	3.4273238
	(b)	7,996	3.9028728
			2) 7.3301966
	$\sqrt{ab}$	4,625	3.6650983
	$(a + b + \sqrt{ab})$	15,296	4.1845779
	$\frac{h}{3}$	26	1.4149733
	(V)	397,696	5.5995512
Stoped above — 4,488 ft		1,696	
Ore reserve (cu.ft.)		396,000	5.5976952
Factor		12.3	1.0899051
Ore reserve (tons)		32,200	4.5077901

The average grade is determined volumetrically. The (square feet × assay) of each end of the block is treated as an end area in the above formula, which now gives as V (cubic feet × assay); from this result the grade of the block is obtained.

Mining in Rhodesia

The 22nd annual report of the Rhodesia Chamber of Commerce, covering the year 1916 shows that the total mineral production for the year was 930,356 oz. fine gold, an increase of 15,327 oz. over 1915; 200,676 oz. silver; 3521 tons copper; 3.63 tons tin; 2.59 tons wolframite; 38 tons antimony; 6157 tons asbestos; 88,871 tons chrome ore; 5837 tons iron ore; 491,532 tons coal; 1021 carats diamonds. The total value of the mineral production for 1916 was £4,829,704, an increase of £430,630, or 9.7%, over the previous year.

The average number of negro laborers employed during 1916 was 40,214, an increase of 2298 as compared with 1915. Of the number for 1916 there were 36,347 employed at gold mines and 3867 at coal and other mines. The number recruited during the year for mine labor was 2488. Deaths were 1083, and 2.35% of the men deserted. The deaths for two years past were:

	1915		1916	
	Total No	Per 1,000	Total No	Per 1,000
From disease	832	21.94	911	22.48
From accident	159	4.19	172	4.24
Total	991	26.13	1,083	26.72

About one-half of the laborers employed were natives of Rhodesia. About 25% were from Nyassaland and 20% from Portuguese East Africa.

DIAMOND YIELD OF THE SOUTHWEST TRANSVAAL for the five months ended May 31 was 24,910 carats. The largest mine is the Italie. Others, but far behind, are the Kameelkuil, the London and the Bloemhof.

Engineers' Part in the War

To wage the war with the highest efficiency the armies must be so organized, both at the front and behind, that each man shall be doing the work that his training has best fitted him for. Modern warfare calls for the application of the principles of all branches of engineering. The United States, by reason of its large reservoir of skilled specialists, can bring into the struggle a most efficacious aid.

CAPTAIN Gustave P. Capart, of General Pétain's staff, who is now in America, recently expressed his views on the engineer's part in the war in a communication to Secretary Baker. The following summary of Captain Capart's observations has been released for publication:

We are waging in reality a war of engineers and of primary materials necessary to equipment and to transportation under the best conditions. Today a nation which enters the strife must make its appeal to its human material and put to work all the vital forces of the country. That is why the industrial organization of the armies is indispensable. It is essential for avoiding waste of material and human energy. Before everything it is necessary to obtain a good alignment of men. To insure this the largest number possible should be left to work at their specialty or placed in the formation that agrees with their aptitudes. This applies to the fighting troops as to the supporting bodies. A salutary emulation and a certain point of professional honor are also developed by such specialization. To be convinced of this it will suffice to review the corps of the armies as they are now organized.

HIGHLY DEVELOPED TRANSPORT SYSTEMS

The modern battle is a problem of roads and of transport. The railways and roads may be compared to a system of arteries for the army. A constant growth of the network of railways in the zone of the armies is necessary for the rapid provisioning of troops in food and munitions, for their removal from one point of the line to another, for the entry into action of heavy artillery mounted on trucks, etc. It follows that the maintenance of these lines and the construction of extensions daily become of greater importance on account of the constant augmentation of traffic. In both cases the employment of a large and highly trained personnel is required for the laying of tracks, for the repair shops, and to handle construction material.

The means of transport are numerous and varied. All of the systems known to the engineer have been adopted progressively. Narrow-gage railways have become of common usage. Cableways and telpherage systems have given extraordinarily valuable service on the front. One installation of this kind has effected an economy of 600 mules per day at one point on the French front and the Italian army employs similar installations with success. The automobile, with its camions and tractors, plays a rôle that daily becomes more important. The thousands of drivers, mechanicians and repair men now constitute an important unit of the army.

The great distribution systems for electric light and power in the zone of the armies also compel attention. These supply the headquarters, cantonments, artillery, repair shops, hospitals, air service, etc. The mechanical services are developing constantly. The employment of compressors, rock drills and trenching machines has required an increasing number of skilled workmen. In the zone evacuated by the enemy, an immense amount of restoration must be undertaken and a skilled personnel for rebuilding bridges and constructing military works is necessary.

Great shelters, in reality subterranean buildings, are built by company units as skilled as the contractors' forces that construct subways in New York. These units excavate, timber, do the concrete work and leave the shelters complete. Water supply is a necessity that is given great attention in the modern battle, and its organization should be constantly improved. To supply the armies with lumber and timber there has been organized a nearly perfect forestry service. The telegraph and telephone service naturally occupies a place of the greatest importance and constitutes the nervous system of the battle.

SPECIALIZATION IN THE COMBATANT UNITS

In the combatant units the useful effect of specialization is also felt. In aviation, whose scope is constantly widening, airplanes have successively appeared for scouting and photography, for combat and bombardment, for directing artillery fire and for the infantry. Each requires its own trained corps and schools, besides a multitude of mechanicians to maintain the airplanes.

In the infantry specialization is pronounced. There are grenadiers, signal men, machine-gun operators, *ravitailleurs*, trench-mortar operators, etc. This has led to the highest efficiency of combatants. In the artillery the great specialization is well known, such as in the directing of artillery fire, and the sections of cartographers. In passing we may call attention to the trench artillery so important in this war. In the engineering corps, mining, bridge construction and trenching operations are today all works requiring special units.

Better than any other country, the United States will be able to constitute an army conceived on a logical and rational plan, thanks to its immense reservoir of manpower and to its highly developed industries. The military instructions of specialized regiments may be extremely limited and numerous regiments may be made ready in a very short time. The American Government has comprehended fully the importance of organization along these lines. The expedition of specialized regiments responds to urgent military needs, and it reflects one of the aptitudes of the country where you pass so rapidly from project to realization.

The specialized American troops, who are going to France, will at the same time be the pioneers of American industry over there and will prepare the ground for the economic war which will be waged against the Central Empires tomorrow. A flow of business between America and her allies should be the result of the present coöperation, and the French industries that formerly used machines from Germany will in the future get them from America.

Thanks to her industries so powerfully developed and equipped, the United States can bring to the great struggle a most efficacious and precious aid. She can rapidly find the skilled personnel so necessary. That which has been done in the formation of specialized railway regiments should likewise be done for the automobile-transport service (both drivers and mechanicians are required), for the water-supply service, forestry, electrical and mechanical service, and, again in the combatant units, for the aviation where an élite corps of pilots and mechanicians is required, and for the artillery with units of field, trench and truck-mounted guns.

All of these services imply an immediate and effective intervention of the American nation in the war while it is organizing and training its great combatant army. To obtain the highest efficiency it is indispensable that these various specialties be emphasized in distinct militarized organizations, each known by its distinctive title such as "Forestry Service," "Water-Supply Service," "Roads Service," "Railway Service," etc.

The preceding roughly sketches the industrial organization of an army. The art of the engineer is also exercised in the technical organization. It seems strange, although really logical enough, to find consulting engineers on the General Staff along with the tacticians. Technical and industrial problems arising for solution become more numerous every day. We will give two examples:

Raw Materials and Coöperation

One of the most important technical questions demanding solution today is that of coöperation (*liaison*) of troops in battle, since it is this which permits successful maneuvering. Today, in order to arrive at a sure and rapid coöperation between the different divisions, appeal is made to all the means of science—mechanical, optical, acoustic, electrical. Apparatus and method have had an extraordinary development, thanks to the impulse given them by military engineers who have devoted themselves to this arduous task.

The second is that we are waging a war of primary materials, as we have said. Steel, wood, coal, magnets, iron, wheat, essences, oil, etc., are the materials without which it is no longer possible to make war. The creation of bureaus of statistics makes it possible to ascertain in advance the crises that may threaten in one or another material on which the conflict depends and to find a way of avoiding the danger as soon as it arises. Tabulations such as that of the number of projectiles fired against the front of an army are important and instructive. Industrial methods applied to war make it possible to escape many difficulties and surprises.

Schools in the Fighting Zone Necessary

One of the most important questions today is that of establishment of schools of every kind in the fighting zone. Modern war being a perpetual evolution, it is indispensable to continue schooling as a campaign goes on. Both for actual combatants and for troops in the rear there must be provided centers of instruction in different specialties—schools of cooperation (*liaison*), for grenade-throwers and *mitrailleurs*, for miners, aviators, pilots and observers, schools of listening (*écoute*), centers for the study of war and for artillery study. Such schools will render the greatest service if they are conceived in a practical spirit.

To sum up, the United States finds itself in a privileged situation to create an army comprising every branch of the service. It will be in a position to turn away from the old prejudices concerning military matters and to profit by the experience that the other belligerents have gained. The organization of an army may be conceived of as resembling that of an immense industrial enterprise, and the experience of three years of war has demonstrated that it is of the greatest importance to develop the training schools and extend further the system of specialization.

Manganese Mining Active

Secretary Lane in a recent interview called attention to the response of the miners of manganese to the country's need. "Modern steel-making demands manganese," he said, "and the shortage of a domestic supply of this ore has been a matter of concern to those of us who wish America to be industrially independent. But now the war requirements for steel have been realized by the manganese operators, for reports already received in the Department of the Interior show that shipments of high-grade manganese during the past six months aggregate 28,345 tons, or nearly 10% more than the tonnage for the whole of 1916, which amount in turn was three times the 1915 shipments. Shipments are reported from 10 states, but in Montana alone the shipments since last January largely exceed the shipments for the whole United States in 1915.

"The manganese situation therefore is most encouraging, and the Geological Survey estimate for the whole year is 80,000 tons of the high-grade ore. This, however, is less than 20% of the present large demand of the steel industry. It is significant that the shipments of lower-grade manganese ore likewise are record-breaking, the six months of 1917 considerably exceeding the 12 months of 1916, and the present rate of production promises an even larger tonnage for the remaining six months. This gratifying activity in the mining of so essential an ore seems to be largely the result of better financing and better engineering of the industry."

Utah Copper Quarterly Report

Utah Copper Co., in its 37th quarterly report, covering the second quarter of 1917, shows an increase of product over the first quarter of 13,517,149 lb. By months, the production of copper contained in concentrates was: April, 17,231,512 lb.; May, 19,262,856 lb.; June, 19,909,097 lb.; total, 56,403,465 lb.; a monthly average of 18,801,155 lb. In addition, 441,594 lb. was contained in ore shipped direct to the smelters, making a total gross production of 56,845,059 pounds.

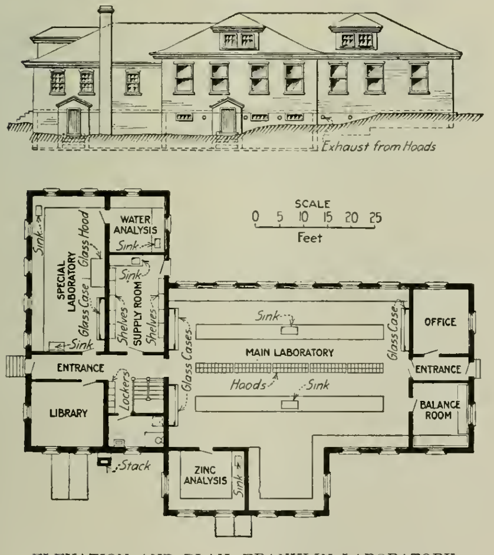
A total of 3,298,400 tons of ore was treated, 920,500 tons more than during the first quarter. The average grade of ore was 1.3881% Cu, a decrease of 0.0419%. The average recovery was 61.59%; net profits were $7,246,318, dividends having been paid to the amount of $5,685,715, or $3.50 per share.

New Jersey Zinc Co.'s Franklin Laboratory*

The Franklin laboratory of the New Jersey Zinc Co. was designed mainly for the analysis of the products from the two concentrating mills situated at Franklin and Sterling Hill, New Jersey, the most important determinations being the zinc, iron, manganese, lime and silica contents and moisture of the ores. Within the last four years, however, it has been found advisable to examine most of the supplies, and therefore additional space and equipment were allotted for the examination of such substances as oils, greases, soaps, alloys, fuels, paints, explosives and water.

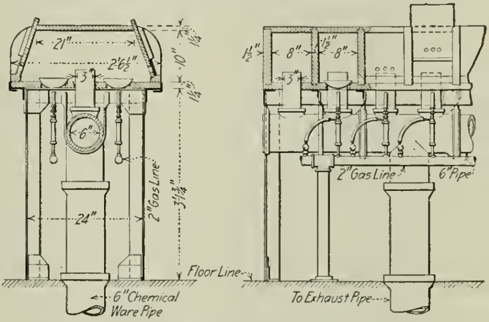
The building as shown in elevation and plan consists of a main or routine laboratory, an experimental laboratory, a water-analysis room and the other accessories such as stockroom, library, sampling and drying rooms and office. The main laboratory is further divided into a balance room and zinc-analysis room.

As the greater part of the determinations are volumetric, good light is an important factor, and with this in view the interior walls of the building were constructed of white enameled brick laid in Keene cement. These also have the additional advantage that they give a clean and attractive appearance to the room. The windows are large, being 76 x 44 in., and even on dark days the light is good throughout the laboratory. Zinc titration requires a constant light and as, on many days, especially in winter, the light is variable, two Artificial Daylight lamps were installed and it has been found that they meet all requirements. They also make it possible to carry out titrations at night if necessary.



ELEVATION AND PLAN, FRANKLIN LABORATORY

On referring again to the plan of the building, one can obtain an idea of the arrangement of the desks, sinks, cases and hoods. These have all been designed with the idea of expediting the work as much as possible with the least confusion. The hoods at the center and running the whole length of the room were designed by R. M. Catlin, and are unusual in construction. They consist of a series of small compartments, there being in this case 50. Each compartment is about 27 in. long, 8 in. wide and 8 in. high, and is made of Alberene stone. Each accommodates two sand baths, and all the gases arising from evaporation are taken off at the center of the hood and conducted outside of the building by means of a slight vacuum produced by an air aspirator placed in the mouth of a 6-in. Orangeburg fiber pipe. One aspirator exhausts the gases from 10 compartments. Each compartment is supplied with two sliding doors which fit into grooves cut in the sides of the hood. By means of a notch cut in these grooves, the doors may be partly opened if necessary. Heat is furnished by means of a series of bunsen burners placed under each sand bath. A better idea of the construction of the hoods may be obtained from the illustration.



DETAIL OF MAIN LABORATORY HOODS

In the old laboratory great difficulty was experienced in keeping the wooden floor in good condition, so in the new building the wood was treated with aniline black and up to the present the floors have remained in excellent condition despite the fact that in many places they have been subjected unintentionally to the action of concentrated acids.

Adjoining the main laboratory is a room set apart for zinc titration only. This arrangement has many advantages, the chief being that the atmosphere of the main room is not contaminated with ammonia fumes, as all zinc titrations are made in ammoniacal solutions. The ventilation of the zinc-analysis room is taken care of by means of a small fan.

The balance room also adjoins the main laboratory. The slabs on which the balances rest are supported by concrete piers which do not connect with the building. This removes annoyance due to jars. The room was built large enough to accommodate the filing case for the samples, which adds to the convenience of the work because the samples are readily accessible in case results are to be checked.

The experimental laboratory is provided with a hood somewhat similar to those in use in the Bureau of Standards. It is constructed of Alberene stone and wire glass. The top and sides being of glass makes the hood very light. The hood is downdraft, being exhausted by an aspirator similar to the one operating the hoods in the main laboratory.

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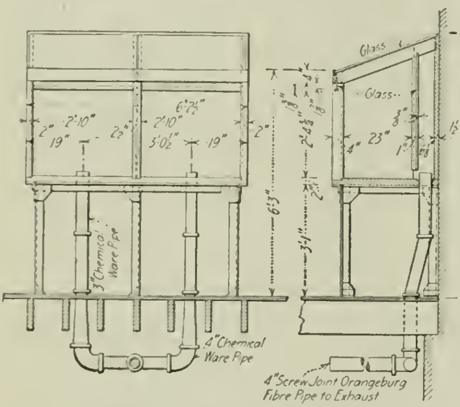
*A paper by D. Jenkins to be presented at the St. Louis meeting of the A. I. M. E. in October, 1917.

The experimental laboratory is equipped to make any analysis of the supplies furnished for the plant that may be required. Gas is used for general heating purposes, but electric hot plates or multiple-unit furnaces are employed where it is possible to use them. For drying purposes Freas electric ovens have been installed, and for electrolytic work a Veit apparatus has been provided.

As the supervision of the town water supply is intrusted to the laboratory, it was found advisable to fit a room for carrying out both the chemical and bacteriological examination of the water. Equipment is of the usual nature required for such work, consisting of a sterilizer, incubator, refrigerator and the other accessories.

This covers, in general, the principal features of the building, but before closing I would like to call attention to the size and location of the stock room, which is so situated that it is central to both the main and the experimental laboratories.



HOODS FOR SPECIAL LABORATORY

The library, also, is easily accessible from both laboratories and is so furnished that the men can calculate and keep their records in this room and not have them distributed, as is the usual custom, throughout the whole building.

The rooms for drying and grinding the samples are in the basement and are equipped with hot plates, bucking board and grinder. Only the small samples are handled in these rooms, as the sampling and grinding of the large samples is carried out at the sample houses situated near the different mills. The basement also affords ample room for storage and packing. A Barnstead still of about 5-gal. capacity per hour furnishes distilled water, which is distributed to all parts of the building by means of block-tin pipes. An adequate washroom and individual lockers are provided for the men.

Inflammability of Mixtures of Gases

An investigation was undertaken by the U. S. Bureau of Mines to determine the limits of complete inflammability of mixtures of mine gases and of industrial gases with air. In *Technical Paper 150*, George A. Burrell and Alfred W. Gauger summarize the results of experiments with gasoline vapor, ethane, methane, natural gas, acetylene, artificial illuminating gas, hydrogen, carbon monoxide, and blast-furnace gas.

When enough of the combustible gas is present to permit combustion to spread through the mixture from any point of ignition, then propagation of flame takes place from layer to layer, without the continued presence of the source of heat that started the inflammation. It was found that the limits of complete propagation were affected to some degree by the conditions of experiment. In general, when ignition occurs from the bottom upward, the limits are slightly lower than when it occurs from the top downward.

The results obtained for the limits of complete inflammability of mixtures of different gases with air were as follows: with gasoline vapor, gas mixture in air 1.5 to 6%; ethane, 2.5 to 5%; methane 5.5 to 14.5%; natural gas, 5 to 12%; acetylene, 3 to 73%; artificial illuminating gas, 7 to 21%; hydrogen, 10 to 66%; carbon monoxide, 15 to 73%; and 36 to 65% with blast-furnace gas.

International Nickel Co.

The International Nickel Co.'s report for the quarter ended June 30, 1917, shows total income amounting to $4,457,862. The principal items, compared with the corresponding period of 1916, are shown below:

INTERNATIONAL NICKEL CO.'S FINANCIAL REPORT

	1917	1916
Total income	$4,457,862	$4,025,396
Administration and general expense	896,368	222,422
Net income	3,551,494	3,802,974
Depreciation and mineral exhaustion	487,678	497,400
Profits	3,073,816	3,305,574
Preferred dividend	133,689	133,689
Balance	2,940,127	3,171,885

The balance in the 1917 quarter is equal to $1.75 per share on the common stock, and for the 1916 period is equal to $1.89 per share.

The earnings for this quarter in 1917 show a smaller balance for the common stock, due very likely to the larger taxes the company has had to pay in the United States and Canada. The reserve for taxes in the current report is contained in "Administration and General Expense" item of $896,368; this amount being equal to more than four times the amount of $222,422 noted for the corresponding quarter of 1916. The great amount of the increase is a reserve against taxes.

The production in the year that ended March 31, 1916, was about 60,000,000 lb., and as the plant, except the one at Bayonne, N. J., had been running at about the same capacity, production for the quarter ended June 30, 1917, can be estimated at about 15,000,000 pounds, since it is not possible to approximate the loss occasioned by the strike.

Work on the new refinery at Port Colborne, Ont., is progressing favorably, and according to the president's last statement to the stockholders, the new plant will be ready for production by the beginning of 1918. The initial production of this plant is placed at 20,000,000 lb. per year, increasing the output one-third, and bringing the total capacity to 80,000,000 lb. per year.

The balance sheet for June 30, 1917, shows some important changes compared with the annual balance sheet of March 31, 1917. The property account on June 30 was $46,124,208 compared with $45,169,973 in March, an increase of about $1,000,000. The general surplus on June 30 was $5,858,759, a decrease of $418,346 from the $6,277,105 noted on March 31.

Future Treatment of Tailings*

Mill tailings should be stored for future treatment and in such a way that widely different grades are not mixed together. Thus, as processes of recovery improve, portions of dumps may be worked over without necessitating the handling of a large tonnage of worthless material.

IN EARLY milling methods little attention was given to the care of tailings. It was thought that if the mill could be built by a stream where their final disposal could be forever lost sight of, it was highly desirable. What was lost in these rich tailings can now be appreciated. Fortunately for many, the depositing of tailings in these streams was finally prohibited by the state legislatures. Those milling companies that seemingly were not so favorably located, or the companies that were forced to discontinue the pollution of the streams, have found themselves in the possession of tailings that are of great value, due to the new methods of concentration and of recovery.

The problem of future treatment of present mill tailings is more difficult for the future metallurgist and mill man on account of recent advancement in milling methods; yet relatively the valuable content that still remains may have proportionately greater value as mines become exhausted. If the residues from modern concentrators are not isolated by segregation they will often be forever lost on account of admixture with valueless material.

SEGREGATION OF TAILINGS AT ANACONDA

The Anaconda Copper Mining Co., in 1901, made arrangements to segregate the fine slimes from the sands, supplementing the arrangement which their new plant afforded in saving all of the tailings instead of allowing a portion of them to go down Warm Springs Creek. It was realized, in starting this new concentrator, that these slimes were of great value on account of the copper content, so ponds were made, 300 x 600 ft. and about 14 ft. deep, to settle the fine material and decant the water. The ponds were operated intermittently; as soon as loaded they were drained and excavated by dragline bucket. The discharge from the bucket was piled along the side of the pond. Part of this slime was made into blast-furnace bricks and smelted, and the remaining portion stored for future treatment. The effect of saving these slimes for the last 16 years at the Washoe Reduction plant has resulted already in the recovery of millions of pounds of copper with many millions more yet unrecovered. The present slimes flotation plant at Anaconda, working on these particular slimes, recovers more than 1,000,000 lb. of copper per month.

The Chino Copper Co. segregated the tailings from its mill at Hurley and now has a retreatment plant handling 1000 tons per day, with further extension under construction. There are other companies that have segregated their tailings to some extent. There are millions of tons of sulphide tailings that are now becoming slowly oxidized, and cannot be treated without installing expensive grinding machinery plus the flotation equipment; if the more valuable slimes had been segregated, millions of pounds of copper could easily be recovered by the simple flotation methods of today, as illustrated by the Anaconda and Chino practice. The sands, which are of lower value, would oxidize faster without the slimes and become available for leaching where coarse material is desirable.

STORE MIDDLINGS SEPARATELY FROM GENERAL TAILINGS

There are concentrators where some portion of the middlings cannot be brought to grade or made a marketable product. These should be stored separately and not mixed with the general tailings. It has not been practicable to recover the oxides and carbonates that are mixed with the sulphide tailings. J. M. Callow's filming experiments, which he has so carefully described[1], point out what may be expected. There are millions of tons of tailings, however, whose oxide and carbonate content is even less than the tailings thrown away by the present filming process, and it would seem that enrichment for future treatment should be made if possible. Mr. Callow has made the following statement of his views on what may be expected as to recovery from tailings:

> In the treatment of complex ores, such as those carrying lead, zinc and iron, and in copper ores containing both sulphides and oxides of this mineral, present methods of recovery are still in embryo, and such tailings must inevitably carry an appreciable portion of the original contents of the ore, in the complex zinc, lead and iron ores especially. Sixty and 70% zinc recovery is often considered passable work, the rest of the zinc being either entangled or in some other way combined with the iron and lead which future inventions will no doubt show us how to recover. In the copper ores, flotation has added greatly to past recoveries, but only in the recovery of sulphides; the oxides are still an unavailable asset, which in due time will undoubtedly be recovered by improved methods of extraction.
>
> In laying out a system for impounding tailings the plan hitherto has been to impound them without any discrimination as to their values. In some ores it has been found that the principal values lost lie with the sands, and in others, with the slimes; so that a segregation might well be practiced.

As an illustration, assume the accumulative analyses of the tailings from one of the great copper concentrating mills where the process consists of tabling and flotation, making a total extraction of 82%. The total copper in the various screen sizes is given in the table.

SCREEN ANALYSIS OF GENERAL TAILINGS

Mesh	Ind. Wgt. %	Cum. Wgt. %	Sulphide Cu Content	Oxide Cu Content	Total Cu Content
+ 48	1.6	1.6	0.009	0.002	0.011
+ 65	16.2	17.8	0.030	0.021	0.051
+100	11.2	29.0	0.016	0.012	0.028
+150	11.0	40.1	0.019	0.016	0.035
+200	8.0	48.2	0.013	0.013	0.026
—200	52.0	.	0.051	0.188	0.239
	100.0		0.138	0.252	0.390

On such tailings it is possible with a Dorr classifier to separate the sands from the slimes; the slime tailings may be divided again into two parts by deflocculating and decanting, making a fine crystalline mineral and a decanted slime. It is my belief that the decanted material will carry an enriched amount of oxide copper, as compared with the general mill tailings, by two or three times. While it may not be possible with the present means to make a satisfactory and marketable concentrate, it would appear desirable to store separately rather than to mix with the impoverished tailings which might carry only 0.15% Cu, and hold such segregated material until metallurgy has advanced or the market is such as to make it profitable to treat it. This is what some preliminary experiments seem to show. To re-treat 15 or 20 millions of tons of unsegregated tailings in which a large portion carries only 0.12 to 0.15% is no easy problem for the future metallurgist.

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*Abstract of a paper by F. E. Marcy to be presented at the St. Louis meeting of the American Institute of Mining Engineers in October; it was originally presented at a meeting of the Utah Section on May 23, 1917.

[1] "Bulletin 122," American Institute of Mining Engineers, February, 1917, p. 245.

There are many milling plants that treat complex ores which carry lead, zinc and copper, and it is not possible to make a satisfactory extraction of all of these. In such plants the extent to which enrichment and segregation of tailings can be carried on is limited only to the extent in which the expenditure seems desirable in the way of a future investment. Whether there ever will be a better opportunity for segregation, or greater ease of separation of these values, and whether it can be done at a lower cost than when the tailings were produced, remains to be seen. Fresh and loosely combined material is always the most desirable.

In general, tailings that contain probable recoverable values should not be allowed to accumulate over large areas or in horizontal layers. Tailings from our first work in concentration generally contain the greatest values. Such tailings should be stored, if possible, so that those that are richest and most easily recoverable can be worked first, thus avoiding handling much worthless material when re-treatment is commenced. It is certainly not desirable to pile the present low-grade tailings coming from mills where 90-95% recovery is made upon tailings from which only a 65% recovery was made.

I believe the segregation of tailings can be advantageously accomplished in many instances, so that the weathering action will oxidize them for the ordinary leaching. The piling of tailings, so that the maximum oxidation can take place, and the elimination of all colloidal and talcy material would seem desirable, and a greater total recovery could be made by leaching and precipitation with iron.

Welfare Work at Rio Tinto

The Rio Tinto Co. has had in progress of establishment for several years an extensive system of welfare work, which embraced not only improved housing but various forms of recreation and of bonuses. Commenting on this work at the recent 44th general meeting of the company in London, Chairman Fielding said:

"A substantial bonus was given at the close of 1916 to all the workmen as well as to the salaried staff of the company, and the shareholders are now informed that, should the affairs of the company in any of the coming years show a profit considerably in excess of the normal, the board proposes in such years to set on one side a good round sum to be employed on the welfare and well-being of the workmen in Spain.

"While on this subject, I would like to inform the shareholders that we have already commenced an improvement in the housing accommodation for the workmen at the mines, and propose gradually to further improve the miners' cottages. We are in this respect already equal to any other mining enterprise in the Peninsula, but the directors are sure that the shareholders will wish that we should be well in advance in all matters affecting the comfort, health and happiness of our people.

"During recent years, we have been further developing our hospitals and medical service, and have established outdoor places of recreation, in which bands play on certain evenings, at our various towns. Last summer, two large swimming baths were built at the chief town of Rio Tinto for the workmen. The establishment of these first baths was such a great success that we have decided to build some more at our other large mining towns. We propose to further develop such social amenities at the mines.

"At Huelva, where the engineering workshops and repair establishments are situated, and where the men employed in shipping the mineral reside, we are laying out a model workmen's town with gardens, and are already commencing to build houses for our own workmen, who have hitherto had to live in the crowded town where the rents are exorbitant and accommodation inferior."

United States Production of Barytes

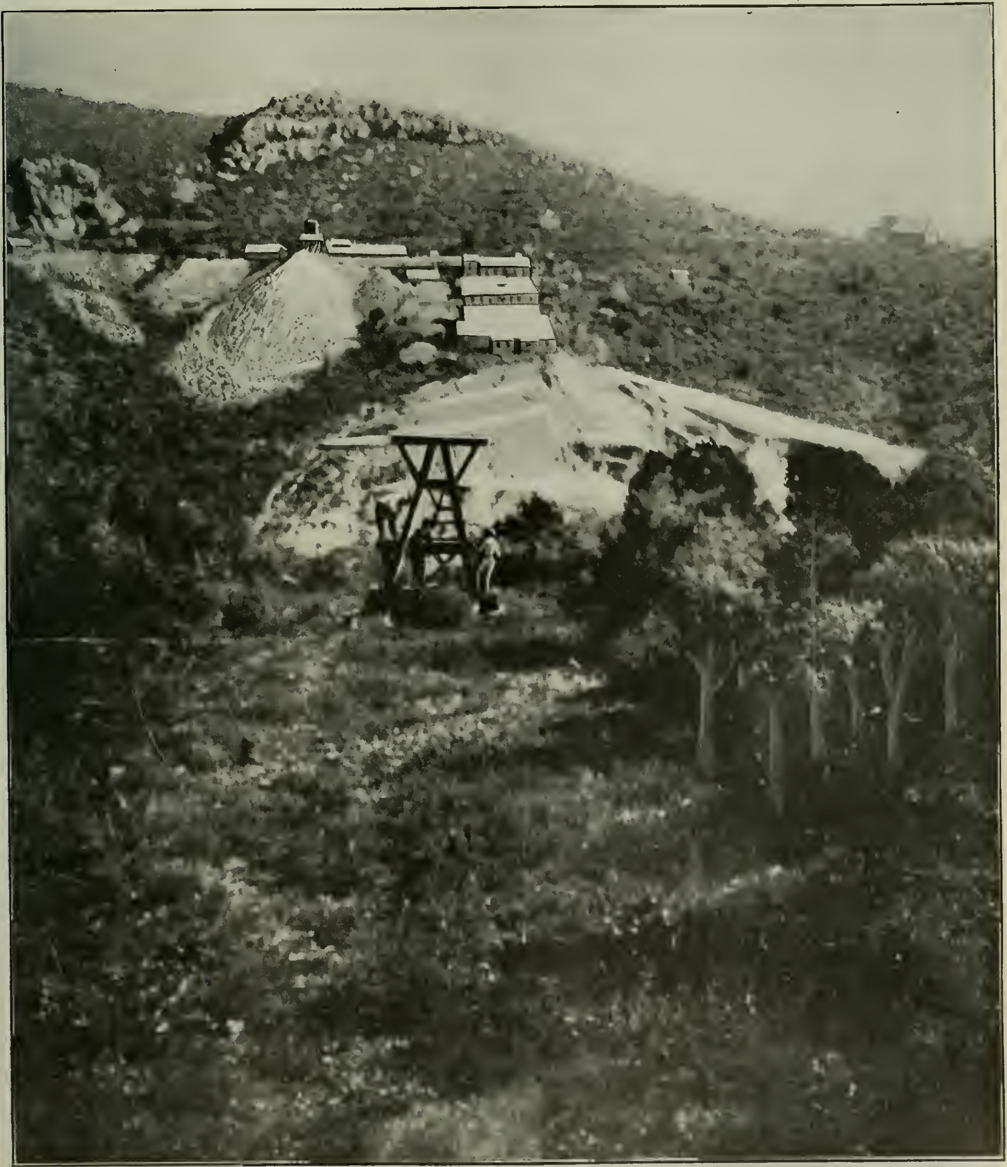
For the first time in the history of the industry the value of domestic crude barytes marketed in the United States passed the million-dollar mark. The domestic manufacture of barium chemicals has been established and put on a firm foundation in the last two years, according to J. M. Hill, who has lately reported on this industry to the United States Geological Survey.

The manufacture of lithopone and ground barytes has also been further expanded. An important feature of the growth in 1916 was the shifting of the largest state output from Missouri to Georgia, followed by the entrance of Colorado and Nevada into the list of barytes-producing states. The average market price of crude barytes in 1916 was $4.56, as compared with $3.51 in 1915, an increase of about 30%, which was no doubt brought about by a greater demand and keener competition among buyers.

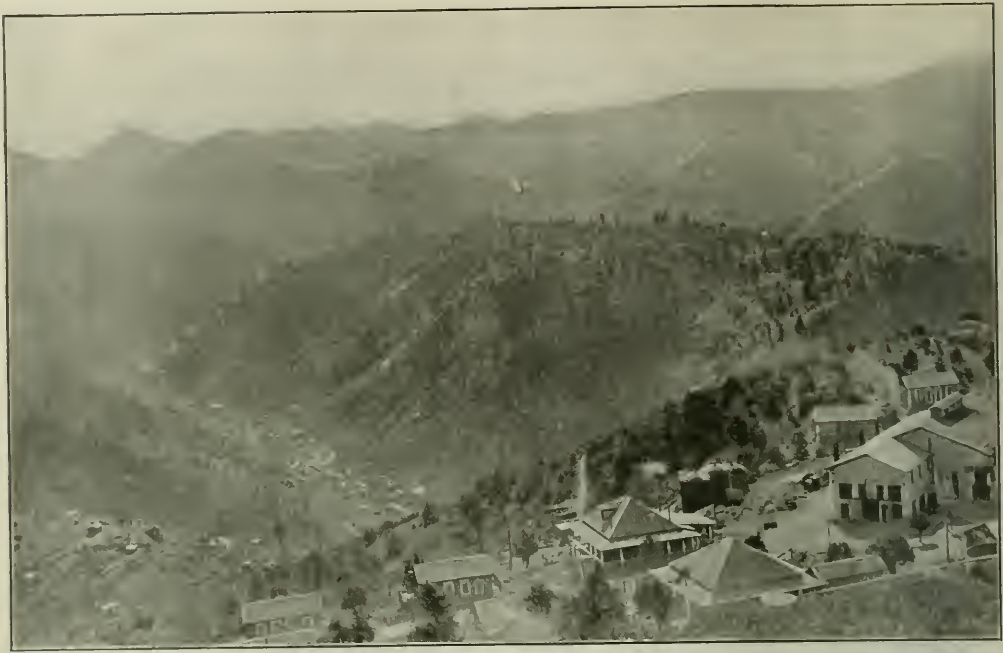
The value of the barium products made in the United States in 1916 was over 8½ million dollars. The apparent consumption of barytes in the United States in 1916 increased practically 100% over that in 1915, due not only to the demand of the new barium chemical industry in this country, but also to increased manufacture of lithopone, used principally in making rubber goods and as a pigment in "flat" wall paints, also in making enamel, calcimine and paper. There was a greater use of ground barytes in the rubber industry. The barium chemicals have many uses, the largest consumption being that of barium binoxide in the preparation of hydrogen peroxide.

The production of barytes during 1916 amounted to 221,952 tons, as follows: Alabama, 7631 tons at an average price of $3.56; Colorado, 481 tons @ $6.25; Georgia, 104,784 tons @ $3.83; Kentucky, 11,068 tons @ $1.97; Missouri, 58,223 tons @ $6.27; North Carolina, 878 tons @ $3.70; Tennessee, 32,416 tons @ $3.85; other states, 6471 tons @ $5.01.

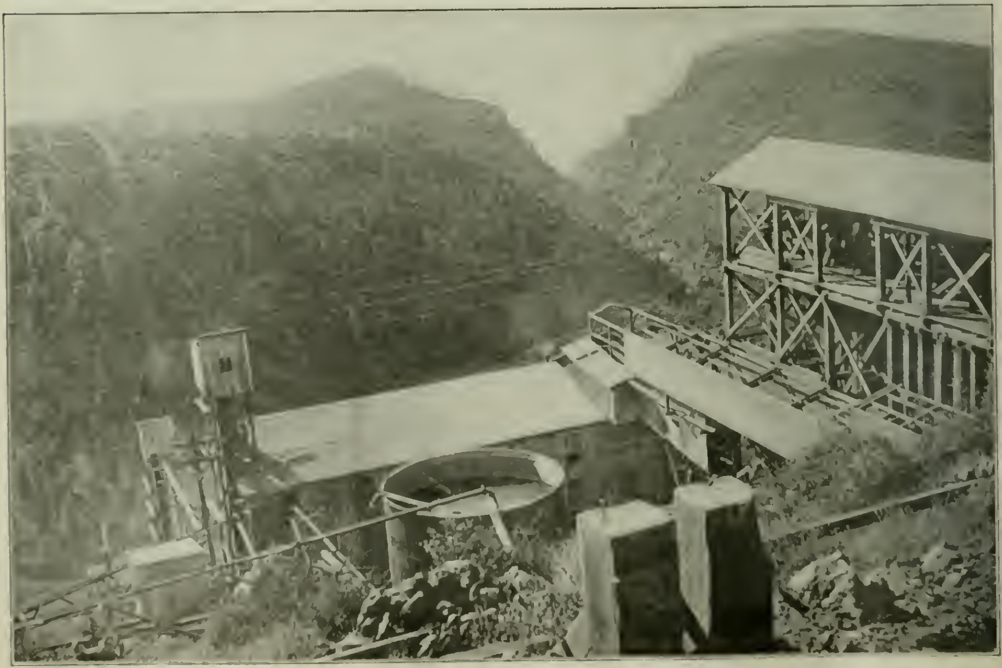
Mogollon District, New Mexico



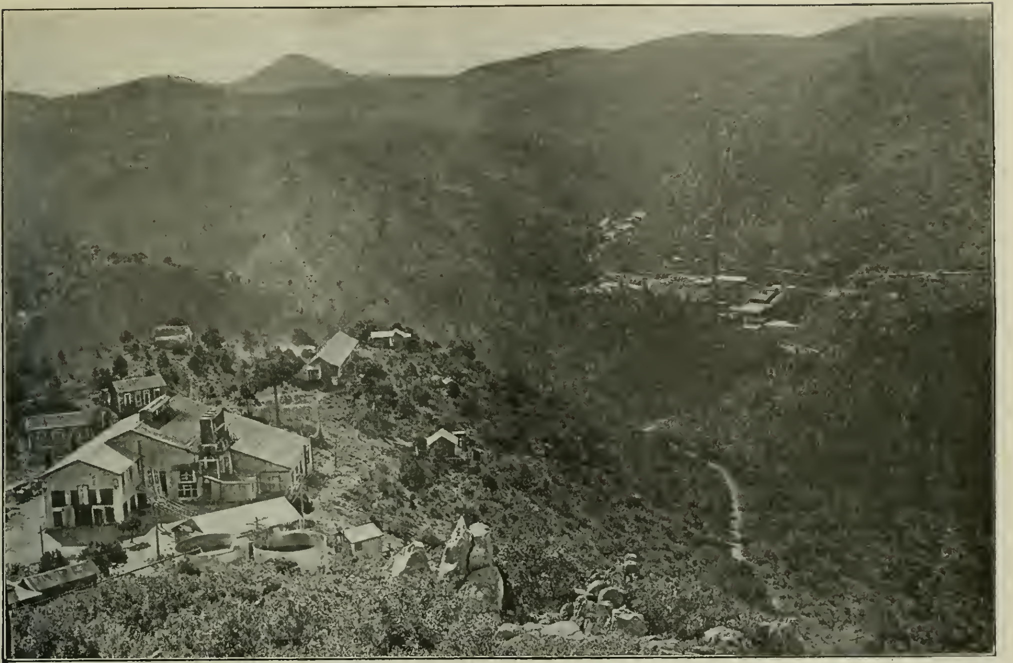
MINE AND CYANIDE MILL OF SOCORRO MINING AND MILLING CO., SHOWING AERIAL TRAMWAY FROM THE PACIFIC MINE



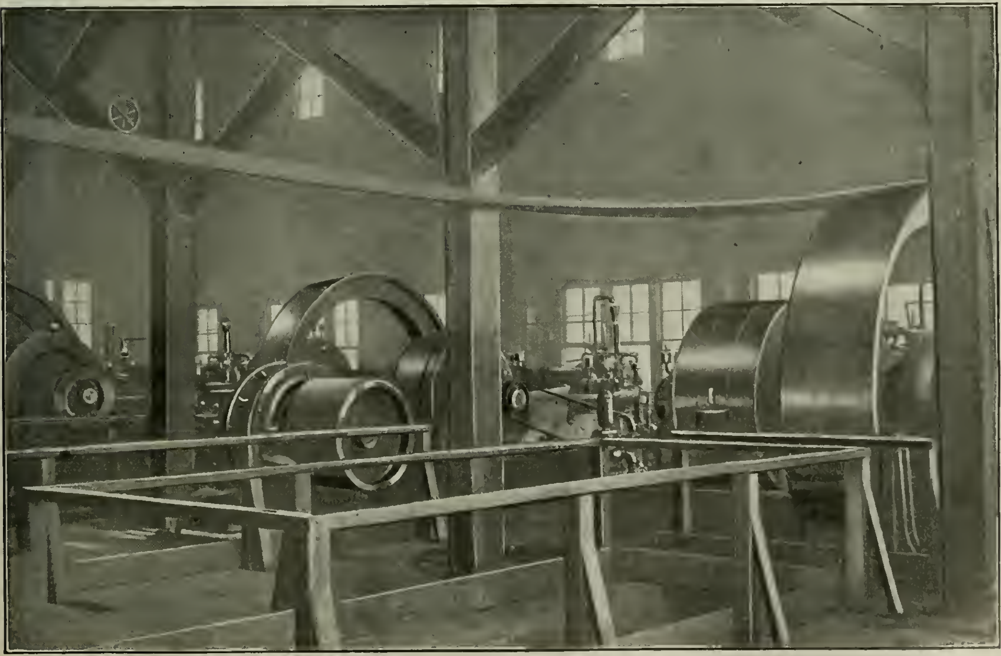
PANORAMIC VIEW IN MOGOLLON MOUNTAINS, SHOWING POWER PLANT, OFFICES AND BUILDINGS OF SOCORRO CO.S PLANT, AND BEYOND, ON THE ROAD TO SILVER CITY, THE DEADWOOD MILL OF CLEVELAND &



VIEW OF UPPER SECTION OF MILL BELONGING TO THE SOCORRO MINING AND MILLING CO., SHOWING AERIAL TRAMWAY TERMINAL FROM PACIFIC MINE



MINING AND MILLING CO. IN FOREGROUND. IN THE DISTANCE ON THE RIGHT IS SHOWN THE MOGOLLON MINES WEATHERHEAD. IN THE CANYON ON THE LEFT, PART OF THE TOWN OF MOGOLLON MAY BE SEEN



DE LA VERGNE OIL ENGINES IN THE SOCORRO POWER PLANT—THE MOGOLLON WAS ONE OF THE FIRST MINING DISTRICTS TO USE OIL ENGINES

A New Ideal for the Labor Unions

SPECIAL CORRESPONDENCE

The nature of labor conditions in the Butte district forced the adoption of the rustling card system. Hostile attitude of discontented element tends to make the mines less safe. Labor unions based on proper ideals would benefit both the men and the employers.

THE situation in our industrial world, as typified by conditions in Butte, is an outgrowth of too much bad unionism, too much prosperity and a lack of proper authority. Under the old contract between the operators and the Western Federation of Miners the operator was restricted to employing only members of that organization. The only discipline that he could use was to discharge a man. This meant that that man could not again secure work at that particular shaft or mine until the next month. Only on rare occasions and for exceptionally good reasons was any man blacklisted from a mine. The excuses for discharge were many and often trivial. Smoking was one of the principal reasons. A boss who smelled tobacco smoke when entering a stope was supposed to discharge the smoker if he could identify him or else discharge all the men in that stope. If a man was caught sitting down, or resting—"taking five," as it is called—he was "sent up." Any excuse could be used and many a man was sent to the top on suspicion that he might have done something wrong or not have been working hard.

The natural result was that as a man might lose his job any day he felt that his work was only temporary at best and many of the men became hardened to the process of being fired and hired again and had no feeling of loyalty to the company or to that mine. The union officials did not care, as long as they received the dues and assessments.

The men hated the union officials who came to each mine once a month to inspect the union cards. If the card showed no dues paid for the month, the owner of that card was sent home and could not work in the mine until he had paid up. The mine operator had no say about it, but in certain cases the foreman would use this as an excuse for not letting the man come back. Of the two evils, as they were considered, the men liked the mine officials better than they did the union officials. The result, however, was that a man did not care much whether he was fired or not; for he could go to one of the other mines and, after rustling a day or so at several mines, would soon be taken on.

ORIGIN OF THE RUSTLING-CARD SYSTEM

Sometimes a man working in a hot place, on a job where he had to work hard, or with a shift boss whom he disliked, would "rustle" at another mine to try to get a better berth. He might succeed in being hired and would go to work for a day, sending word to the first mine that he was sick or went to his cousin's funeral, or any old excuse. He would try out the new job and, if he liked it, keep on; if not, he would then go back to his first job or rustle again. This kind of work was common in Butte, and the Anaconda Copper Mining Co. tried to remedy it with the "rustling card." This system means that in order to get a job a man must first go to a central office and register. He was then given a rustling card and started to one of the twenty or more shafts to try and get on. On being hired by one of the foremen, his card was taken up by the timekeeper and returned to the central office, and the man could not get it again until the next month. Butte always paid the top wages and was noted for the small amount of work a man could do and "get by with." It had a large number of what were called "ten-day" men, so it was rather easy to get on.

Everyone knows what happened to the Western Federation, brought about by the many and heavy extra assessments that were necessary to enable the Federation to finance strikes all over the country. The Butte miner got nothing in return for these assessments. Nowhere in the country has the miner been treated more as a hand and less as a man than in Butte. Notwithstanding these conditions, in case of fire or accident there were many who showed true loyalty.

UNRULY ELEMENT A SOURCE OF DANGER TO ALL

Judging from reports in the newspapers and in the *Engineering and Mining Journal* the recent disastrous fire in Butte was caused by an action typical of the attitude of so many men in Butte. A man was told by his boss not to put his light in a certain place. Undoubtedly he said, "All right," and as soon as the back of the boss was turned, put his light in the same place where it was before. As a result all mine managements were blamed, even by prominent people. The mine management may have been to blame for something that was not published, but the system which causes lack of respect for authority is more to blame than any man. A hoisting engineer who goes to sleep and allows a cage to go to the sump is fired, but this does not mean that he is discharged from the engineers' union. It means he loses employment at that mine and can go to another. The union still protects him and insists that he be given work as an engineer. What is the answer? He scoffs at the authority that is not able to see its orders fully carried out.

GOOD DISCIPLINE AN ESSENTIAL OF SUCCESS

There must be authority in every organization and strict obedience to orders must be observed in industry as well as in the army if successful operation is to be attained. Can an organization of soldiers pass judgment on the orders of their officers and still expect to win? Can a union of soldiers fix the hours, the wages, and the methods of operation and still maintain an effective organization? Can an army succeed whose only method of discipline is to discharge a soldier? There must be a head to every organization and that head must be obeyed. The more dangerous a vocation, the more essential is strict obedience. The greatest good that will come out of this war will be that men will learn that they must obey and respect authority.

Authority is given to those who have shown by their actions and training that they are worthy of it. Who decides on the placing of authority? Men who by their own actions have shown they are fit for this decision, have won the confidence of their associates and so obtained their preferment. Many such have come from the ranks of the manual-laboring men. It is no more possible for all, or for the majority, of men in authority to come from this class than it would be for all of the officers of an army to come from the ranks. To enter an officers' training corps a man must show that he is fit mentally to become an officer; when he has done so, then he is trained to be an officer.

Our soldiers will be taken care of. They will be clothed, fed, sheltered and supplied with arms. This will not be done by a union or by men selected by themselves, but by the men who have been selected by a large number of our people to direct and appoint those in authority. The same system must exist in civil life. The officers of an industrial organization must take care of their men. A corps of soldiers who are not well taken care of, have not clothes, things to eat, good arms, and a comfortable confident feeling that they are led by competent officers, cannot fight as those that are. Neither can the workers work unless they are so taken care of. As long as they are wrangling among themselves over wages, conditions, and their environment, they will not be good workmen.

Persistence of the Grievance Habit

Two years ago the workman was asking for more money. He has more than he ever hoped to get now but is no better satisfied nor will he be as long as his mind continues to dwell on the grievance which he thinks, or is led to believe, that he has. The United States elects a president every four years. So far no man has governed the country for more than eight years. A president to be successful must meet the views of both parties to a great extent. A leader of a union should do the same and if he cannot get along without continually having strikes, another leader should be elected. How are the leaders of unions selected? Are they elected by a fair system of balloting or do they secure their election by methods similar to those used by the ill-fated General Diaz of Old Mexico?

What are the objects of the unions? Are they to help the men in their daily life or simply to secure or attempt to secure higher wages, shorter hours and less work for their members? Are these the ideals of labor? Is there any tangible result, any permanent monument that the unions can point to and say, "This was created by us for the benefit of our members"?

The rulers of the Germans say, "Our system is correct and we must win because our people are better off than the people of the rest of the world." But to be a German you must obey what the Kaiser dictates and then you will be better off only because you must not even think you are not. Is not this the same principle now governing many unions? Do not the union leaders say to the workman: "You must be a union man! You must acknowledge that the unions give the only way to secure happiness! Leave all of your interests entirely in our hands and we will protect them! We will see that the open shop is done away with and that a man can not work until he acknowledges our control!"

This is a wrong principle but there is a right one. There is a place for the unions in our daily life and that place is not tearing down our industrial organization but in helping to build up a larger and stronger system of industry. With the large sums of money taken in by the unions, great good can be done. Take the queston of the health of the miner. If the unions would use their funds to erect a sanitarium, such as the world has never seen, where men could go and get well it would be worth while.

A Hint to the Laboring Man

Suppose the unions say, "We will organize an employment office so that if a man loses his employment we will secure a new place for him and in the meantime give him enough to live on if he is needy or unfortunate. We will see that each man secures the position or work for which he is best adapted. We will employ the best experts in the world to find out what each man can do best and try to locate him in that place. By these means we will make the advantages of our unions so apparent that men will wish to be members and not be forced to join. Then we will be in a position to say to those desiring to join us:

" 'Men, you must show that you are good workmen, for no slackers are members of our union. After working a year for one organization bring us a credential from it showing you know how to do something well and we will let you join and receive the benefits that unionism means. We have a standard to maintain and you must not fall behind.' "

This will mean that every union man will be sought by employers of labor. that capital will come to organized labor and say, "We want so many of your men." A laborer will be proud of the fact that he is a good workman and the union will be prouder of the fact that the best men are union men and only the slackers are non-union.

Shops will employ all the union men they can secure and only fill up on the slackers. Open and closed shops will be things of the past. The great majority of men will be union, not because they have to be, but because they want to be. The engineer who goes to sleep will feel that in losing his place as a union man he has lost more than a temporary job. This spirit will so pervade the men that they will feel it a greater disgrace to lose their standing in the union than anything else.

What the unions have sought is typified by the relation of the locomotive engineer to the railroad. The engineer is employed by the master mechanic. He is given a locomotive by this department. With this he is turned over to the train-operating department and it gives him his orders. He makes his run and turns back his locomotive to the mechanical department. He can be discharged only by the master mechanic or his superiors. The unions desire to be in the position of the master mechanic. To attain this result they must first demonstrate that they can handle such authority as the master mechanic has and for which he has proved that he is capable.

When unions can show that they merit authority and confidence, then their place will be established in the industrial world. The place of the unions is between capital and labor, helping each and not injuring both.

Report of Copper Production

This table is compiled from reports received from the respective companies (except in the cases noted by asterisk as estimated), together with the reports of the United States Department of Commerce as to imported material, and in the main represents the crude-copper content of blister copper, in pounds.

	April	May	June	July
Alaska shipments	10,585,518	7,146,824	7,714,928	8,116,538
Arizona:				
Arizona Copper	5,000,000	5,200,000	4,800,000	
Cons. Ariz. Smelting	1,650,000	1,650,000	1,600,000	1,550,000
Inspiration	11,400,000	11,900,000	11,150,000	nil
Miami	5,364,000	5,112,000	5,349,000	nil
Old Dominion	3,516,000	4,430,000	3,965,000	nil
Ray	7,902,724	8,815,281	7,614,114	7,808,766
Shannon	924,000	964,000	956,000	nil
Other Arizona	26,995,962	25,954,310	24,232,675	20,032,410
California:				
Mammoth	1,850,000	2,000,000	1,800,000	1,750,000
Michigan:				
Calumet & Hecla	14,347,181	14,450,011	13,347,525	11,933,433
Other Lake Superior*	9,000,000	8,500,000	8,000,000	
Montana:				
Anaconda	29,300,000	28,400,000	20,400,000	12,400,000
East Butte	2,081,080	2,008,060	1,519,240	nil
Nevada:				
Mason Valley	1,300,000	1,528,813	1,465,000	1,316,725
Nevada Cons	6,727,192	7,239,978	6,850,186	7,253,337
New Mexico:				
Chino	6,368,874	6,984,457	7,193,262	7,343,757
Utah:				
Utah Copper	17,231,512	19,262,856	19,909,097	18,127,154
Eastern smelters*	2,386,855	2,521,800	2,200,000	
Total reported	163,930,898	163,068,390	150,066,027	
Others, estimated	24,755,000	24,682,420	22,182,000	
Total United States	188,685,898	187,750,810	172,248,027	
Imports, ore and concentrates	18,250,215	16,820,020	15,607,586	
Imports in blister, etc.	29,824,141	32,026,855	45,100,414	
Grand total	236,760,254	236,597,685	232,956,027	
British Columbia:				
Canada Copper Corpn.	352,732	270,816		
Granby Cons	3,775,140	3,159,284	3,030,929	3,147,886
Mexico:				
Boleo	1,653,680	1,929,088	1,740,500	1,411,290
Cananea	4,730,000	4,370,000	3,210,000	nil
Other Foreign:				
Braden	5,102,000	6,750,000	5,002,000	6,015,000
Cerro de Pasco	5,936,000	4,670,000	5,032,000	6,262,000
Chile	8,028,000	8,250,000	6,114,000	6,250,000
Cape Copper	353,920	396,825	359,350	
Kyshtim	1,110,000	1,176,000	*1,379,000	
Katanga	5,070,580	5,643,775	5,246,950	4,850,120

* Estimated.

The grand total, which in the case of April was 236,760,254 lb., includes, under "Imports in ore and blister copper" the production of such companies as British Columbia, Granby, Cananea, Braden, Cerro de Pasco and Chile. As a matter of record, however, the individual figures are given after the total. We also report the production of the Boleo, Cape Copper, Kyshtim and Katanga companies, whose copper does not come here.

The item "Alaska shipments" gives the official figure of the United States Department of Commerce. Kennecott production April to July was 7,180,000; 7,208,000; 5,848,000; and 3,580,000 lb., respectively.

The total production of the United States for the first six months of 1917 was as follows:

January	174,658,603
February	183,859,588
March	192,211,648
April	188,685,898
May	187,750,810
June	172,248,027
Total	1,099,414,574

It should be noted that the great curtailment in production owing to the strikes did not commence until July. The total production of United States mines in 1916 was 1,942,776,309 lb., from which it would appear that the production in the first half of 1917 was apparently at only a moderately increased rate.

United States Steel Corporation

The earnings of the United States Steel Corporation for the quarter ended June 30 were the largest ever reported and exceeded, in fact, those of several entire years in the history of the Corporation. The advance reports made public give the results for the quarter and for the first half of 1917 as follows: The net earning being the amounts remaining after paying operating expenses and ordinary repairs:

	June Quarter	Half Year
Net earnings	$144,498,076	$257,619,094
Reserved for excess profits tax	53,918,872	87,783,872
Net earnings above taxes	$90,579,204	$169,835,222
Depreciation, sinking fund, etc	$16,154,151	$25,944,975
Interest, etc	5,557,517	11,136,955
Total charges	$21,705,668	$37,081,930
Surplus	$68,873,516	$132,753,292
Dividends paid	27,909,775	60,898,575
Undivided surplus	$40,965,761	$71,854,717

Dividends for the six months included the regular 3½% on the preferred stock; the regular 2½% and 4% extra on the common stock; and the extra or Red Cross dividend of $5,083,025 paid in July.

The amounts reserved for taxes are based on careful computations of the taxes that will be levied should the bills pending be passed by Congress.

The statements also said that about $43,000,000 had been expended during the half-year for improvements and extensions of works, a considerable part of this amount being for the new plant at Duluth. Expenditures for the current quarter will include $12,000,000 for the new plate mills and other plant at the Fairfield Works of the Tennessee Coal, Iron and R.R. Co., and $6,000,000 for new shipbuilding plant on Newark Bay.

Another extension planned is a large ship building plant near Mobile, for which land and waterfront have already been secured. Material for this plant will be brought from Birmingham by water, the Warrior River navigation being now open for traffic.

Antimony in Italy

The total production of antimony ore in Italy, in 1916, was 4334 metric tons, having an average tenor of 19.9%, according to a report published in the *Annales des Mines*. This output was much greater than in 1915, when the ore produced amounted to 555 tons, averaging 24.5%. The high price and strong demand for the metal resulted in more extensive working of the mines of Su Suergas and Corte Rosa, in Sardinia. These, with two or three smaller operations in the district, produced a total of 4197 tons of ore, averaging 19.5% metal. The same causes brought about the reopening of the old mines of La Selva and Cettine de Cortoniano in Tuscany, which report 137 tons of ore of an average tenor of 34.5% metal.

The two old smelteries in Tuscany, idle since 1909, were started up. That at Cettine de Cortoniano made 65 tons of regulus. That at La Selva was not started until late in the year and made only 600 kg. of regulus. The first smeltery treated a quantity of old stock which had been on the dumps since the mine was closed down. The smeltery at Su Suergas in Sardinia turned out 481 tons of regulus and 67 tons of sulphate, a large increase over the previous year.

Details of Practical Mining

Testing and Recording the Efficiency of Drills

By H. H. Hodgkinson
Mine Superintendent, Wharton Steel Co., Wharton, N. J.

There is probably no company in the country that takes more pains to obtain the most efficient and up-to-date drilling equipment than the New Jersey Zinc Co., at Franklin, N. J. It was among the first to realize that efficiency in mining depends largely on supplying the men with efficient drills—machines which will drill rapidly; whose air consumption is low; whose maintenance is a minimum; and machines which, when put to work, will stay on the job. In the testing and development of drills, the company has gone to considerable expense, and judging from the results obtained, it has unquestionably paid to do so. When a new type of drill is received, every effort is made to get the best results in regard to drilling speed and air consumption that can possibly be obtained from that drill, and in addition the maker is given every assistance possible in his effort to develop a drill to meet the conditions at hand. A drill-testing plant has been established in the mine for the purpose of obtaining accurate results in testing drills. This is situated in an abandoned pump station in the limestone hanging-wall. This white, coarsely crystalline limestone makes excellent ground in which to test the drilling speed of machines, having the advantage of being more homogeneous than the ore, while at the same time it has about the same drilling speed. The roof and sides of the old pump station afford an ideal place to test drills, making set-ups most convenient. Compressed air is delivered to the station by means of a 3-in. pipe at an average pressure of 95 lb. per square inch. The apparatus used for testing the air consumption of a drill is shown in Fig. 1. It consists of two tanks *A* and *B*, both of the same dimensions made by screwing blind flanges to the ends of 12-in. pipe and boring out and tapping the pipes and flanges to make the necessary connections as shown. Tank *A* is equipped with two gage-glasses upon each of which a marker is placed at an interval of 34¾ in. Tank *B* is filled with water by means of the ¾-in. pipe *W*, which is fitted with an elbow and plug to facilitate the refilling of the tank when required. A 1½-in. four-way valve is situated at *V*, by means of which compressed air is supplied to the small receiver *C*, alternately from tanks *A* and *B*. When tank *A* starts to supply air, tank *B* is full of water as shown and the meniscus in the gage-glass is at the lower marker *Y*; as the air passes out of *A*, the water in tank *B* flows through pipe *M* and rises in tank *A* until it reaches the upper marker *X*; in the meantime the volume of water which passed over into tank *A* has been displaced by an equal volume of compressed air. The valve *V* is then reversed quickly by means of the lever, and the water gradually returns to tank *B*, the air displacing the water in tank *A* until the meniscus in the lower gage-glass reaches the marker *Y* and so on. The water is colored so that the meniscus is clearly defined in the artificial light. To facilitate the passage of the water back and forth between *A* and *B*, pipe *M* is 2 in. diameter, while the remainder of the piping is 1½ in. The third tank *C* is a small wrought-iron receiver which acts as an equalizing reservoir and supplies air to the drill at a more constant pressure and in addition catches any water in the air, or water which might have possibly come over from tanks *A* or *B* in case the four-way valve has not been

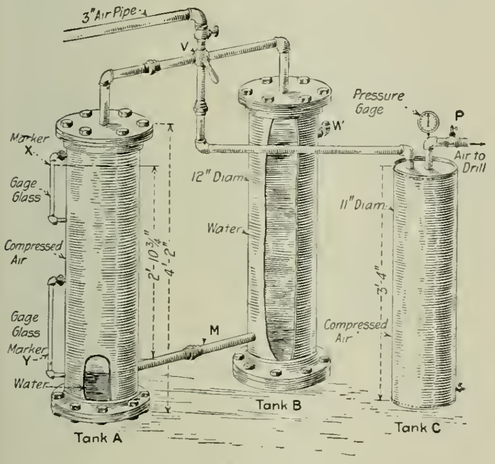
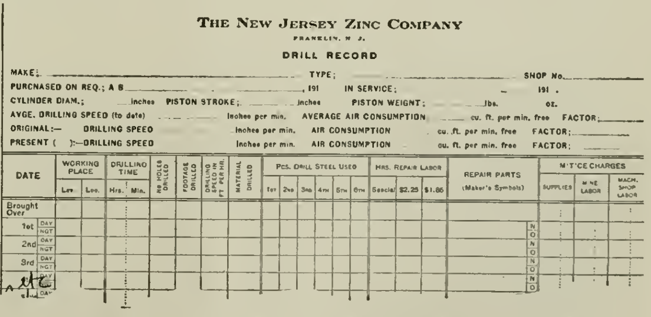


FIG. 1. APPARATUS FOR MEASURING AIR CONSUMPTION



The New Jersey Zinc Company
FRANKLIN, N. J.
DRILL RECORD

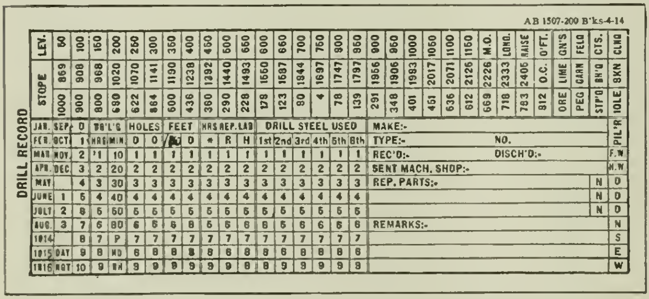
MAKE: ______ TYPE: ______ SHOP No. ______
PURCHASED ON REQ.; A B ______, 191 IN SERVICE: ______ 191 .
CYLINDER DIAM.: ______ inches PISTON STROKE: ______ inches PISTON WEIGHT: ______ lbs. oz.
AVGE. DRILLING SPEED (to date) ______ inches per min. AVERAGE AIR CONSUMPTION ______ cu. ft. per min. free FACTOR: ______
ORIGINAL:— DRILLING SPEED ______ inches per min. AIR CONSUMPTION ______ cu. ft. per min. free FACTOR: ______
PRESENT ( ):—DRILLING SPEED ______ inches per min. AIR CONSUMPTION ______ cu. ft. per min. free FACTOR: ______

DATE		WORKING PLACE		DRILLING TIME		No HOLES DRILLED	FOOTAGE DRILLED	DRILLING SPEED IN FT PER HR.	MATERIAL DRILLED	PCS. DRILL STEEL USED						HRS. REPAIR LABOR			REPAIR PARTS (Maker's Symbols)		M'T'CE CHARGES		
		Lev.	Loc.	Hrs.	Min.					1st	2nd	3rd	4th	5th	6th	Special	$2.25	$1.86			SUPPLIES	MINE LABOR	MACH. SHOP LABOR
Brought Over																							
1st	DAY																			N			
	NGT																			O			
2nd	DAY																			N			
	NGT																			O			
3rd	DAY																			N			
	NGT																			O			
[illegible]	DAY																			N			
	[illegible]																			O			
	DAY																						

FIG. 2. FORM FOR RECORDING AIR CONSUMPTION AND DRILLING TESTS

closed properly, thus preventing the water from reaching the drill. This tank makes it possible to read the pressure gage mounted at the top of the tank more accurately, as the indicator of the gage does not flutter with each movement of the valve of the drill, as would be the case if it were not in the system. At the bottom of tank *C* is a small pet-cock to drain any water so that the volume of the receiver is not cut down, in addition to keeping it away from the drill. At *P* another small pet-cock is inserted for the purpose of raising or lowering the water in the tanks to the markers in order to start a test.

By using these tanks in testing a drill, the volume of compressed air is kept constant for each run, while the time, inches drilled and air pressure are the variables; that is, five tanks of compressed air are supplied for a run which is equivalent in this case to 11.38 cu.ft. The time required by the drill to consume this amount of air, the inches drilled and also the pressure in pounds per square inch are recorded. A 1⅞-in. raised-center cross-bit is the standard used for testing purposes, and the condition of the bit at the end of each run is noted as being either fine, good, fair or poor. Good results cannot be obtained when the drill bits are poorly made. The air consumption and drilling tests are recorded as shown in Fig. 2. The factor obtained in the last column is of great value in comparing different types of drills.



AB 1507-200 B'ks-4-14

DRILL RECORD

LEV.	50	100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	950	1000	1050	1100	1150	M.O.	LONG.	RAISE	O'FT.	GN'S	FELD	CTS.	CLNG
STOPE	869	908	968	1020	1070	1141	1190	1238	1292	1440	1493	1550	1587	1844	1697	1747	1797	1956	1906	1983	2017	2071	2126	2226	2333	2405	O.C.	LIME	GARN	BK'G	SKN
	1000	900	800	680	622	864	600	436	360	290	228	178	123	80	4	78	139	291	348	401	451	636	612	669	718	783	812	ORE	PEG	STP'G	IDLE

JAN.	SEP.	0	DR'L'G		HOLES		FEET		HRS REP. LAB			DRILL STEEL USED						MAKE:-		PIL'R
FEB.	OCT.	1	HRS	MIN	D	O	O	D	*	R	H	1st	2nd	3rd	4th	5th	6th	TYPE:- NO.		
MAR.	NOV.	2	1	10	1	1	1	1	1	1	1	1	1	1	1	1	1	REC'D:- DISCH'D:-		F.W
APR.	DEC.	3	2	20	2	2	2	2	2	2	2	2	2	2	2	2	2	SENT MACH. SHOP:-		H.W
MAY		4	3	30	3	3	3	3	3	3	3	3	3	3	3	3	3	REP. PARTS:-	N	D
JUNE	1	5	4	40	4	4	4	4	4	4	4	4	4	4	4	4	4		N	D
JULY	2	6	5	50	5	5	5	5	5	5	5	5	5	5	5	5	5		N	D
AUG.	3	7	6	60	6	6	6	6	6	6	6	6	6	6	6	6	6	REMARKS:-		N
1914		8	7	P	7	7	7	7	7	7	7	7	7	7	7	7	7			S
1915	DAY	9	8	NO	8	8	8	8	8	8	8	8	8	8	8	8	8			E
1916	NGT	10	9	RH	9	9	9	9	9	9	9	9	9	9	9	9	9			W

FIG. 3. TICKET FORM FOR SHIFTBOSS' DRILL REPORT

In addition to the care in testing drills when first received, the company has gone further by keeping a daily record of each machine. A report is made out by the shiftbosses, who punch the slip, shown in Fig. 3, in the proper squares by means of a railway ticket-punch. These records are punched in duplicate, one brown, the other blue. Little writing is necessary in making a report for a drill, and a complete record is given of the number of holes and the feet drilled, the drilling time in hours and minutes, the hours of repair labor for repairman and helper, and the number of drill steels of each length used. The number of the stope and of the level are also punched, in addition to whether the drill is working in a drift, raise, stope, chute, longitudinal stope, pillar, block-holing or opencut. The material being drilled is recorded by punching squares for ore, limestone, garnet, gneiss, pegmatite or feldspar as the case may be. If the drill is not in use, idle, broken or cleaning is punched. This small slip makes a valuable record of each drill without burdening the shift boss with a lengthy written report and occupying his time, which can be used to better advantage elsewhere. The brown record is filed at the mine for reference, while the blue one is forwarded to the office where a permanent record is kept of each drill from day to day, by means of which one can tell at a glance how much work each is doing, the maintenance cost, also the repair parts, and if the drill is idle, the reason for its being so.

Rapid Drifting at Jerome, Ariz.

By Axel Peterson

General Foreman, Arkansas & Arizona Copper Co., Jerome, Ariz.

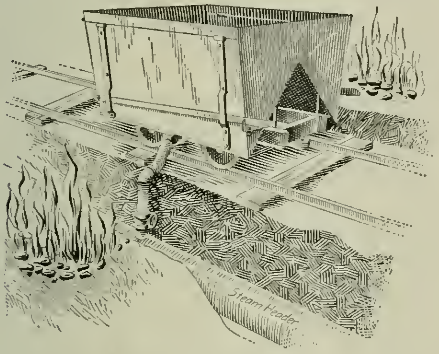
During June, 1917, the 1601 drift on the 16th level of the Arkansas & Arizona mine at Jerome, Ariz., was advanced 535 ft. The formation was diorite for 300 ft. and medium-soft Yavapai schist for the remainder of the distance. All the ground was hard enough to stand without timbering. The diorite drilled much more slowly than the schist, but was blocky and broke better.

The drift was carried 5 x 8 ft., and an average of sixteen 8-ft. holes was drilled each round. The drilling was done with two No. 148 Super-Leyner drills, using 1¼-in. steel, and mounted on a crossbar. Air was delivered to the drills at a pressure of 110 lb. The drills gave perfect service, and not a minute's time was lost on their account; the only parts replaced during the month were three water tubes. Three shifts per day were worked, and each shift drilled and shot a round. The crew on each shift consisted of three machinemen, three muckers and two trammers, and besides there was a foreman and two track and pipe men on the day shift, making a total of 27 men. An average of 30 cars (19 cu.ft. each) was mucked each shift; the smallest number ever handled on any one shift was 24 and the most 42. The distance trammed was 1500 ft. at the start, and of course increased with the advance to the maximum of 2035 feet.

The order of work was for the machinemen to muck back a space about 6 ft. long at the face, and down within 1 ft. of the bottom; then they set up the drills and put in 13 holes. By the time that was done the muckers had the muck all out, and the drills were then torn down and reset in the bottom and three mucker holes drilled. A 40% gelatin powder was used, and the average charge took 75 lbs. Ventilation was secured with a No. 5½ Roots blower running as an exhauster, and sucking through 3500 ft. of 15-in. and 12-in. pipe. Five minutes were usually sufficient to clear the fumes from the face so that all holes could be reloaded and shot which had not broken at the first shooting; and 15 min. always cleared the drift completely so that the succeeding shift could begin work. The Miami wage scale was paid, and the men received $5.40 per shift with a 50c. bonus to each for every round shot on his shift; also a bonus of $6 per ft. for every foot over a 12-ft. per day average for the month was distributed to the full gang on the basis of number of shifts worked. No bonus was paid to any man who quit or was discharged during the month, but the full amount earned was distributed to the men who were on the job at the end of the month. Needless to say, it was a steady crew. Ninety rounds were shot during the month, for an average advance of 6.1 ft., and 27 men participated in the bonus which totaled $1120. The total labor cost was $8.10 per ft. of advance.

Thawing Ore in Open Cars

Thawing ore that has been frozen in an open ore car is sometimes necessary. The illustration shows one method of accomplishing this. Steam at about 25 lb. pressure is admitted through the opening at the door on the side of the car (the car in question being a wooden side-dump gondola) and allowed to stay in this position for about five minutes and then moved along the car a couple of feet and the operation repeated. After the main mass has become fairly well thawed, coal fires lighted at the side of the track materially assist in keeping the ore in the car above freezing temperatures. The fire must be back far enough to preclude any possibility of setting fire to the car. With no wind blowing, this system proved very effective at a temperature of about zero. Steam pressure greater than 25 lb. will, of course, produce quicker results than steam at a lower pressure, or will produce the same results in colder weather.



ARRANGEMENT FOR THAWING ORE IN CARS

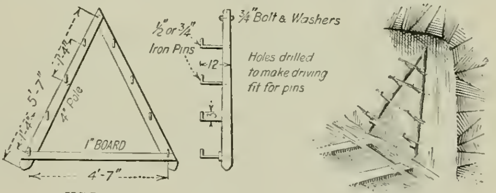
Noiseless Blasting

Although Maxim has not yet invented a "silencer" for use by those engaged in blasting rock, it is possible to split rocks noiselessly, according to *Engineering and Contracting*. This can be done in several ways, one of which consists in drilling holes about 2½ or 3 in. in diameter and filling them with small lumps of freshly slacked lime. The drill hole is filled a foot at a time, and water poured in to fill the voids, then another foot of lime and more water, and so on up to within the upper sixth of the hole. The top part of the hole is then filled with tamping, well rammed. In less than a quarter of an hour the rock begins to crack. The holes must be speedily loaded and workmen must remain away from them, for the tamping is occasionally blown out with a great deal of force. Building and machinery foundations may be removed in this manner without endangering nearby structures.

Underground Drill Rack

The use of hollow steel in rock drilling has brought with it many disadvantages, one of which is the tendency of the water hole to become plugged with sludge and grit. When this happens it causes a delay to the miner, who usually tries to clear the hole and use the drill if possible. When he is not successful, which is usually the case, it means that the drill can not be used until it has been returned to the blacksmith shop, cleared and sent down again. When a large number of drills are to be sharpened, the fact that a drill is plugged but not dulled will escape the notice of the man at the forge; and the result is an entirely superfluous resharpening and re-tempering of the steel. Such complications add to the expense of operating rock-drills when this kind of steel is used.

There are various ways by which hollow steel is caused to become plugged. The chief one is the manner in which it is handled underground. A trip through the mine will show a surprisingly large number of drills lying around in the dirt. This affords an excellent opportunity for material to lodge in the hole, causing it to choke. Miners, for convenience, will stand their drills in a row along the wall, thereby facilitating the entrance of dirt in the end standing on the ground. It would seem impossible to prevent this evil unless suitable racks are provided. Many types of racks are in use but most of them are permanently fixed in one place. This is a disadvantage in drifting operations in which the miner gets farther away from his drill rack as the drift advances. If a new rack is not built in a more accessible spot, he will keep his drills nearer his machine any way, and they will soon be lying around or standing up in the dirt again.



FRONT VIEW SIDE VIEW PERSPECTIVE SKETCH

PORTABLE RACK FOR HOLLOW DRILL STEEL

To overcome the difficulty, the rack shown in the illustration was designed. It consists of two poles fastened together at the top with a bolt and properly distanced at the base by a board. The iron pins on which the drills are supported are driven into holes previously bored in the poles and can be made of scrap material. The distance board at the base has a large hole bored at each end, which permits the board to slip down over the bottom pins of each pole.

The whole rack can be easily and cheaply built and may be taken apart by removing the bolt and slipping off the baseboard. This makes it a one-man job to move from one place to another.

A glance at the sketch will show that drills of different lengths may be kept separate, and the bits and shanks can be inspected without picking up each drill. This saves time for the miner and facilitates the work of the nipper or any other man responsible for the distribution and care of drills.

Events and Economics of the War

Riga has fallen to the Germans, the ease with which the seaport was taken emphasizing the Russian disorganization. A monarchistic plot to seize the Russian cabinet failed. A wide breach has been made in the Austrian lines by the Italians who are pushing ahead slowly down the Brestovizza Valley and on the Carso Plateau. Germans are reinforcing the Austrians. Pola, the Austrian naval base, has been shelled from the Adriatic by the Allied fleet. In France, the British lines have been advanced at St. Julien but otherwise the western front is quiet. The British Trade Union Congress now in session, voted overwhelmingly against sending delegates to Stockholm. Canada has passed a military-service act providing conscription.

In the United States, President Garfield of Williams College has been appointed fuel administrator. Price of wheat was fixed at $2.20 per bu., Chicago. Food stocks in the country were estimated on Aug. 31 by means of inventories taken in 44 representative counties. "Confiscation of wealth" by excessive taxes on profits has been defeated in the Senate. Movement to cantonments of the draft army's first contingent was begun on Sept. 5.

Ford Making Airplane Cylinders

Henry Ford is quoted in a recent interview as saying:

"I cannot see that any great harm has come in waiting until now with our war preparation. Things have moved so fast in a mechanical way since this war began that many things that were new three years ago are out of date now. We are making 200,000 airplane cylinders of steel for the Government, to be delivered at the rate of 1000 a day. We have just developed a way of making a cylinder of solid steel cheaply. We are glad to help the Government and would help even more if called on. We are glad to help in the fight to stamp out militarism; we feel that we are doing that in producing the cylinders and would produce 5000 or 10,000 a day if called upon."

Consumers Urged To Use Less Coal

An appeal to coal users to consume less is made in a bulletin issued by the Chamber of Commerce of the United States. Consumers are given the following specific advice: Inquire into the methods employed by your fireman and consider them as compared with the ones suggested by the Bureau of Mines; learn what plants in your locality secure the best results from coal; endeavor to have the wasteful users of coal profit by the best experience of the locality; improve all local methods by consultation with the Bureau of Mines and study of the stoking methods recommended by the Bureau; buy your coal as near home as possible.

The Bureau of Mines has made a study for years of stoking methods. Elaborate investigations and experiments have been conducted, the results of which are available to every user of coal. The Director desires that all consumers call upon this division of the Government for advice and assistance. The Bureau has analyzed samples of coal from all sections of the United States, and is already prepared to give information regarding the best uses to be made of different kinds and grades.

In the past, if the available supply of coal was insufficient for all needs, new mines could be opened. Today men are not available for this purpose. Moreover, one effect of price-fixing may be reduction in output.

Embargo Heavier on Exports to European Neutrals

The existing embargo on exports to European neutrals was extended on Aug. 30 to include all supplies that, either directly or indirectly, may be of benefit to the enemy. The control of such exports is in the hands of the Export Council. Coin, bullion, currency, and evidences of debt are now included in the list although they are not to be put under the licensing system unless the Secretary of the Treasury so orders.

In a separate section of the President's proclamation on the extension of the embargo, the number of articles already requiring licenses for export to all other countries of the world is increased. The most notable additions are cotton, sugar and lumber. The distinction made between neutral countries adjacent to the Central Empires, on the one hand, and the remaining neutrals and the Allies on the other, foreshadows a policy of strict rationing for the former.

The New Fuel Administrator

While Dr. Harry A. Garfield, president of Williams College, who has been appointed by President Wilson to carry out the provisions of the Food Bill with regard to the control of fuel, does not claim to be thoroughly versed in coal-mining technic, he is not without experience in the industry. In 1901-2 he directed the organization of the Lake Erie, Alliance & Wheeling Coal Co., which opened up 8000 acres of virgin coal land in Ohio. He later negotiated the sale of the property to the New York Central Railroad.

Dr. Garfield is the son of James A. Garfield, the twentieth president of the United States. He was born at Hiram, Ohio, in 1863. He was graduated from Williams College in 1885, and holds degrees from Princeton, Dartmouth, Amherst and Wesleyan. Much of his career has been devoted to pedagogical pusuits. He occupied the chair in politics at Princeton for five years prior to his election as president of Williams College.

The new fuel administrator practiced law in Cleveland from 1888 to 1893. For many years he has been prominent in the affairs of that city. He has served as president of the Cleveland Chamber of Commerce and of the Cleveland Municipal Association. When asked to outline his plan with regard to coal, Dr. Garfield declared he was too busy fixing the price of wheat to do so. He said:

"All the machinery given to me will be used to enforce the prices named by President Wilson. Our purpose will be to secure all the benefits contemplated in the act and the fuel control put into force will insure a reduction to the consumer. Any person who thinks this will not mean a reduction in retailers' profits will find he is mistaken."

Defense Council Seeks I. W. W. Probe

As a result of I. W. W. agitation, the Council of National Defense has issued the following statement:

In accordance with the determination of the Government to omit nothing which might aid in the adjustment of the social disturbances of every character throughout the country, the Council of National Defense and the Advisory Commission in joint session have passed a resolution asking the President to designate a new commission to have as its special field the investigation of the type of disturbances best represented in the public mind by the I. W. W. agitations in the Western States. The proposed commission would have the authority and support of the President to investigate and report on such agitations and labor disturbances related thereto.

The resolution had the unanimous support of the members of the two bodies. It was originally suggested by Commissioner Samuel Gompers, who was instrumental in framing the recent agreement for settling shipyard strikes through an adjustment commission, and who has been active in working toward a solution of all outstanding labor problems.

It is felt that the suggested commission, going from one state to another representing the National Government, perhaps meeting in each instance the governors of the states with the view to lending sympathetic counsel to the state governments and dealing with both employers and employees in a conciliatory spirit, would go far toward discovering the real causes of this particular manifestation of social discontent and assist further in the adjustment of the whole industrial situation.

Price of Wheat Fixed

The wheat price-fixing commission headed by Dr. Harry A. Garfield has fixed $2.20 a bushel as the basis price of the 1917 wheat crop. The price, which is equivalent to $12.50 per bbl. for flour at Chicago, is based on Chicago delivery and will be paid by the Food Administration for No. 1 northern spring wheat purchased for the United States and the Allies. The basis price in the New York district will be 10c. higher. This is thought to be acceptable to producers. However, the Administration has the power to enforce it in any case, through the licensing system. Millers and wholesalers are to be brought under this system at once.

Regulations governing flour milling became effective Sept. 1. Until terminated by 30 days' notice from the Administration the flour mills, which are all licensed if of over 100 bbl. daily capacity, are allowed a maximum profit of 25c. per bbl. on flour and 50c. per ton on feeds. Cost is figured on actual production and market and does not include interest on investment.

Beginning Oct. 1, sugar refiners are requested by Food Administrator Hoover to sell cane refined sugar at about the same price as beet sugar, which is 7¼c. per lb. for granulated.

Canada Cuts Munitions Output

TORONTO CORRESPONDENCE

The Imperial Munitions Board at Ottawa has been advised by the British Minister of Munitions that the increased capacity for producing shells in England makes it unnecessary to maintain the Canadian output on the present scale. Certain lines are to be discontinued and others produced in lessened quantities.

The effect of this policy has already been experienced in the decrease in orders and the cessation or curtailment of work in many plants in Ontario that are engaged in such manufacture. The number of men and women employed in the munitions industry in Canada was recently estimated at 200,000. Many of these are now being laid off and it is expected that the number will reach 75,000. Many of the large firms engaged in munitions work are reverting to their former activities and others are engaging in new lines of industry.

Embargo on Sulphur

An embargo has been placed on exports of sulphur to Canada, that the supply for war needs of the United States may not be unduly depleted.

Sulphur, classified with explosives, is included in the list of commodities for which export licenses are required. No shipments will be licensed, it is said, until Canada has presented complete estimates of the requirements of Dominion news-print makers and of the needs of explosives factories.

The greatly decreased imports of Spanish pyrites has increased the demand for sulphur from the Louisiana and Texas deposits. Sulphuric acid must be had for explosives and many other essential materials, and while pyrite deposits in the United States are numerous, recourse must be had to southern sulphur until new pyrite mines can be developed or the output of the older mines increased.

Coal Men Organize

Operators from all the bituminous coal producing states met in Washington recently and organized the National Coal Operators' Association to promote united effort on the part of the coal producers and coöperation with public officials, especially during the war emergency. Delegates were present from state and other organizations representing 700 operators whose annual production aggregates 200,000,000 tons.

An executive committee was named as follows: H. M. Taylor, for Missouri; Rembrandt Peale, Central Pennsylvania; W. K. Field, Western Pennsylvania; Howell J. Davis, Tennessee; F. C. Honnold, Illinois; A. M. Ogle, Indiana; George H. Barker, Ohio; J. J. Tierney and J. H. Wheelwright, West Virginia.

Among the objects of the association, besides coöperation with the Government, are conservation of coal by increasing the yield of the mines, prompt observance of state and national laws, installation of uniform cost-keeping methods and improved accounting systems, and promotion of proper relations between producers and carriers. It is announced that no part of the organization's machinery is to be used for the regulation of production or control of prices.

Federal Ships To Move Nitrates

To facilitate the movement of large cargoes of nitrate now held up in Chilean ports as well as to help in building up trade, the United States Shipping Board has decided to put five cargo ships, of 5500 tons each, into the South American service beginning Oct. 1, which are to sail fortnightly. They will run between New York and Valparaiso via Panama, with stops at the chief intermediate ports.

These vessels were being built by W. R. Grace & Co., which firm is prominent in the West Coast trade, and were among the ships recently commandeered by the Government to speed construction. Their movements will be controlled by the Government, though they will be operated by the Grace company under charter. Freight rates to be fixed by the Government will be effective on this line, at least as far as nitrates are concerned, it is said. At present much nitrate is held in South American ports because of excessive rates.

As the trip from New York to Valparaiso takes 18 days, it will be possible to reach Buenos Aires from New York by this route in less than 20 days, using the Trans-Andean Ry. from Valparaiso, a trip of about 40 hours. It is said that the sailings of these vessels will alternate with those of the regular fortnightly line to Buenos Aires, thus giving a weekly service thither from New York.

"Car Shortage" Cut Three Quarters

Fairfax Harrison, chairman of the Railroads War Board, authorizes the statement that the excess of unfilled car requisitions over idle cars, or what is ordinarily but inaccurately termed car shortage, was only one-fourth as great on Aug. 1, 1917, as on May 1, 1917.

The excess of unfilled car requisitions on May 1 was 148,627; on June 1 it was 106,649; on July 1 it was 77,682; and on Aug. 1 it was 33,776.

This has been done at a time when the railroads are supplying from 15 to 20% more freight service with the same number of cars than was being given this time last year.

Colorado Coal Men Protest

After an all-day conference at Denver on Aug. 30 of representatives of 210 Colorado mines, a committee of mine owners left for Washington, instructed to inform Dr. H. A. Garfield, Coal Administrator, that the new Government prices are confiscatory, and if there is to be any price reduction in Colorado the Government must take over the mines.

It was contended by the operators that it would be impossible to operate the mines at the Government scale because of the high cost of production and transportation.

Fires Threaten Airplane Stock

Big forest fires have been raging in the vicinity of Lolo Hot Springs and along Randolph Creek in western Montana. Millions of feet of timber, including that intended to furnish airplane stock for the United States and its Allies is endangered.

The Government Forest Service has concentrated all available forces in the Northwest to fight the fires. Backfires have been started and trenches dug for many miles. No rain has fallen in western Montana for 65 days.

Indiana Protests Priority Order

"Priority order No. 1" was issued by Judge Robert S. Lovett, of the War Industries Board, to Pennsylvania R.R. officials, directing roads serving Lake Erie ports to give priority to coal shipments for those ports so as to get all coal possible to northern Michigan and Minnesota before navigation closes. The order was issued at the request of the President to relieve a coal shortage in the Northwest.

The chairman of the Indiana Public Service Commission has protested that, because of this, coal consumers in the so-called central competitive bituminous district in Indiana are facing a serious shortage. Indiana coal operators have been trying to get cars from other roads as a result.

Work Started on Armor Plate Plant

Ground was broken on Aug. 30 at South Charleston, W. Va., for the new Government armor plate and projectile plant by Secretary Daniels. About $22,000,000 is to be spent on the 211-acre site on this work. The situation is 200 miles inland to insure safety from attack in time of war. It is near to coal, iron and gas sources. Within two years about 2700 men will be employed there, it is expected. There have been many rumors and some positive assertions, now proved wrong, that this plant would not be built.

Contracts Signed for Shipyards

The Emergency Fleet Corporation has completed contracts for three Government-owned shipyards, in which fabricated steel merchant ships will be built. The yards will cost $35,000,000 and will be built by the Merchant Shipbuilding Co., the American International Corporation and the Submarine Boat Corporation. Congress has been asked for another $915,000,000 to purchase and commandeer materials, plants and ship construction. Contracts have also been drawn for the construction of about 200 vessels in the yards.

Italy's Giant Airplanes

"Air cruisers capable of carrying 25 passengers are the latest Italian development in aëronautics," according to Major Perfetti, the head of the Italian aëronautic mission to the United States. "These airships are the Caproni triplanes which hold a number of world's records, including the record for useful weight carried—close to five tons—the speed record of 157 miles per hour, and the distance record which was made on a non-stop run of 920 miles in 10 hours. They are equipped with three motors of 700 hp. each."

Industrial News from Washington

By Our Special Correspondent

Work of the Superior Mining Station

To make the steel industry less dependent on imported ores, means will be studied for increasing the output of domestic iron ores at the new Lake Superior station of the United States Bureau of Mines. Dorsey A. Lyon, the Bureau's new supervisor of stations, and Edmund Newton, temporarily in charge of the station until a civil-service examination can be held for the place, have outlined the work to be pursued there.

It will include a study of the character of individual iron- and manganese-ore deposits; ways of improving methods of mining and beneficiation; deoxidation and desulphurization; possible modifications in alloy manufacture; the effect on metals of the addition of manganiferous alloys; and the production of ferro-alloys in blast and electrolytic furnaces and substitutes for those manufactured at present. Inquiry will also be made into the use of manganese in making steel as well as into the conditions necessary for building up a domestic manganese industry in normal times to compete with our foreign sources of supply.

Purchasing Commission Organized

Priority shipments of copper, tin and zinc have been placed in charge of Eugene Meyer, Jr., of New York, who will act directly under Judge Robert S. Lovett of the War Industries Board. Mr. Meyer will also superintend the buying of the metals named, acting in this capacity under Bernard M. Baruch, of the newly appointed Purchasing Commission. Upon the former falls the duty of seeing that supplies of copper, tin and zinc required by the Government and the Allies are obtained as needed. Alexander Legge, the general manager of the International Harvester Co., has been appointed chief adviser to Mr. Baruch in his new capacity.

The Purchasing Commission is now sufficiently organized to begin work. It should be emphasized that this commission does no actual buying. Its function is simply to assist in obtaining the materials and to recommend the price to be paid. The regular purchasing officers of the various departments of the Government and of the foreign governments will continue to be the final arbiters on all contracts.

Decision on Nitrogen Fixation

Southwestern Virginia has been selected as the best site for the fixation of atmospheric nitrogen. Of the $20,000,000 appropriation the Government will spend $3,000,000 for a synthetic ammonia plant, employing the process of the General Chemical Co., $600,000 for a plant for oxidation of ammonia to nitric acid and concentration of nitric acid, and $200,000 on experiments to develop the Bucher process for the production of ammonia. The sum of $100,000 is also to be expended on investigating methods of producing nitrogen compounds used in making explosives and fertilizers.

The synthetic-ammonia plant is to have a capacity of 60,000 lb. of ammonia per 24 hours, and the oxidation plant a capacity equivalent to 24,000 lb. of 100% nitric acid per 24 hours. To avoid delay, priority orders will be issued, so as to secure prompt delivery of materials. The necessary machinery manufactured in anticipation of this decision can be set up as soon as the buildings are erected.

An important part in the investigations prior to the above conclusions was played by a committee selected by the president of the National Academy of Sciences consisting of Arthur A. Noyes, Charles H. Herty, Theodore W. Richards, Leo H. Baekeland, Gano Dunn, Warren K. Lewis, Elihu Thompson, Michael I. Pupin and Willis R. Whitney. The recommendations were strongly influenced by reports made by Dr. Charles L. Parsons and Eysten Berg, who visited Europe and examined the processes in use there.

Dispute Over Pyrites and Manganese Imports

Irreconcilable differences seem to have sprung up among those most directly interested in the pyrites and manganese situations. Lack of accord has its origin in the question of how much of these minerals should be imported. One faction claims that this is no time to await the outcome of questionable prospecting when the supplies of two such vital minerals are concerned, and would have a considerable amount of shipping allotted to carry manganese and pyrites with the idea of building up reserves in this country.

The other faction is desirous of seeing as little shipping as possible tied up in these trades and would exert great effort to increase the domestic production. It contends that investigations of domestic supplies have demonstrated that the United States can produce much greater quantities of pyrites and manganese than had heretofore been thought possible. It claims that the prospect of obtaining much larger imports has kept capital from entering into the development of such properties, thereby discouraging prospecting. All this is taking out of service a large number of urgently needed ships. It is argued, moreover, that even should the Shipping Board and the British Admiralty designate tonnage for pyrites importations the supply could not be relied upon, as more urgent needs for the shipping are likely to develop at any time.

Geologists Will Survey Camps

Acting on suggestions from Washington, state geologists will survey the areas covered by the 16 army cantonments. The main purpose is to interpret land forms and underlying rock structures for military ends.

Editorials

Price Fixing and Taxation

AS THE debate in the Senate on the revenue bill draws to a close, it is worth while to consider once more some of the broad economic aspects of the problem, although this is in no wise an appeal to the congressional intellect. Any one who has read the Senate debates during the past couple of weeks must have come near, at times, to despairing of the human intellect, as the *Evening Post* remarked a few days ago. Such a waste of time, such a mass of irrelevances, such speaking at random and discussing at cross purposes, such loose statements, such childish misunderstandings, such an advertising of small minds could never have been got together before in the same space. No later than last Monday Senator La Follette shouted in support of his amendment levying a flat tax of 70% on war profits, "It is proposed to take the lives of our boys, the heads of our families and all the people have got, but still to leave the money-making corporations with 30% of their blood profits to add to their normal business profits and to their capital unimpaired."

Some of the governments of Europe, including Great Britain, have not found it expedient to take so large a proportion of excess profits, while those which have done so have paid the penalty for their disregard of economic principles. The revolutionary government of Russia has taxed war profits at the rate of 97% and has learned that this contributes to strangulation of the supplies of the new nation, which above everything else are needed. What our socialistic congressmen are contemplating simply duplicates the experience of Canada, which takes 50% of all profits in excess of 15% on capital and 75% of all in excess of 20%. It has been a constant allegation in Canada that the "profiteers" are let off too lightly. As a matter of fact, however, it has been found that the Canadian excess profits tax is too high; that it has prevented manufacturing expansion, and, for that reason, the Government is likely to modify the tax, having learned that undue severity of taxation has a tendency to curtail productivity and interfere with the success of bond issues. It should be borne in mind that in conducting business at the present time, capital is required to assume extraordinary risks and make extraordinary expenditures, wherefore it must be allowed to retain a fair proportion of the extra profits, else there is danger that many concerns will cease to produce or will cut down their activities.

Exactly the same principles apply in the matter of price fixing. We have seen already, as the result of the arbitrary, drastic and ill-considered reduction in the price for bituminous coal, that there is prospect that coal production will be curtailed owing to checking of incentive to produce and inability to meet the increasing demands of labor. While, moreover, the operators of certain districts have informed the Government that they cannot afford to operate at the official prices, and that if the Government thinks otherwise it may take over and exploit their mines on its own account. Everybody in possession of his senses knows that the Government could not operate any business as economically as can be done privately.

The British experience has been that complete control of a market is impossible. The British ministries that started out by attempting to fix maximum prices ended by having to name minima. On the other hand, it was discovered that as the Government becomes the chief buyer in any market it is able by virtue of that fact to influence that market powerfully, if not absolutely to control it. This is in conformity with the principles of economics. Referring to Washington, it will be noted that at no time in handling the food situation has Mr. Hoover departed from sound principles. Economic and financial vagaries would not be expected from a man of business of his experience and a philosopher of his high standing. The desire to enter upon economic adventures and experiments has been exhibited mainly by the bureaucrats, commissionaires and the doctrinaires, who would listen equally respectfully to the inventor of a device for perpetual motion or to the promoter of a scheme to make water run up hill.

It is gratifying that in action upon the revenue bill the conservative element of the Senate seems likely to prevail. The war is going to be fought in the mines, the factories and the fields of the United States just as much as it is in Flanders and in France. In order to make things secure in this country, in the rear, economic and financial policies must be framed according to business experience and to the principles of common sense, and new experiments must be tempered with great moderation. Failure to recognize these principles is one of the great troubles, perhaps the greatest, of revolutionary Russia.

Gold Production of the World

FOR reasons that will be readily understood, it was not possible to give any approximately correct estimate of the gold production for 1916 earlier in the year. At the present time many full returns have been received and a fair approach to correctness can be secured. There are, of course, some gold-producing countries where no accurate returns of production are collected. This is the case in several South American countries, in China and in Mexico. Making these allowances, we find that something over 80% of the world's gold production is covered by fairly accurate statistics, while of the remainder a considerable proportion can be checked up pretty closely by export and other trade returns. The total output of gold, therefore, can be ascertained within fairly close limits, even if absolute accuracy cannot be secured.

The accompanying table gives the value of the gold won in the world for the three years, 1914-16 inclusive. The figures give the value in dollars of the fine gold reported in each case.

The total production of 1916, as given in the table, was $470,442,068. This was less than that of 1915 by $8,110,154, or 1.7%; but it exceeded that of 1914 by $10,344,640, or 2.2%. The most important gain shown in 1916, as compared with 1915, was of about $6,000,000 in the Transvaal; but this was offset by decreases of $8,720,000 in the United States and $6,980,000 in Australasia. The Transvaal gain was due to intensive working of mines and a larger supply of labor. The loss in Australasia, on the other hand, resulted from scarcity of labor, from the diversion of capital to other fields and from the absence of prospecting, which has prevented the discovery or opening of new mines to replace those which have been exhausted.

GOLD PRODUCTION OF THE WORLD

	1914	1915	1916
Transvaal	$173,176,133	$186,105,890	$192,138,770
Rhodesia	17,745,980	18,892,959	18,957,310
West Africa	8,671,371	8,521,682	7,861,210
Madagascar, etc.	1,980,000	1,865,000	1,905,000
Total Africa	$201,573,484	$215,385,531	$220,862,290
United States	$94,531,800	$101,035,700	$92,315,363
Mexico	18,185,000	14,950,000	14,150,000
Canada	15,925,044	18,977,901	19,162,025
Central America	3,500,000	3,575,000	3,605,000
Total North America	$132,141,844	$138,538,601	$129,232,388
Russia, including Siberia	$34,458,088	$35,150,000	$34,750,000
France	1,450,000	1,025,000	950,000
Other Europe	2,350,000	1,675,000	1,580,000
Total Europe	$38,258,088	$37,850,000	$37,285,000
British India	$12,327,980	$11,484,169	$11,184,062
British and Dutch E. Indies	4,690,000	4,825,000	4,960,000
Japan and Chosen	7,476,500	7,850,000	7,980,000
China and others	3,625,000	3,675,000	3,750,000
Total Asia, not inc. Siberia	$28,119,480	$27,834,169	$27,874,062
South America	$13,525,000	$13,750,000	$13,975,000
Australasia	46,479,532	45,193,921	38,213,328
Total for the world	$460,097,428	$478,552,222	$470,442,068

Apparently the war has had little direct effect on gold production. Most of the producing countries are out of the direct track of the conflict. Even in Russia the only effect on gold mining felt was the withdrawal of working forces for the army, and this operated only to a moderate degree. Mexico's activity was diminished by internal troubles entirely. The only countries affected were in Europe, where the production is but small at any time.

The total gold production of the world for 20 years past is given in the second table. As already noted, the total for 1916 was less than that of 1915; but it was greater than that of any preceding year except 1912. It was nearly twice that of 1897, or 20 years ago. Gold production gained steadily through the 20 years with the exception of the three years, 1899-1902, when the Boer War stopped production in South Africa. The growth was in part due to the opening of new fields in South Africa, in Alaska and the Yukon, and in the Lena district of Siberia; and in part to the advances in metallurgy, which increased the yield of many older mines and districts and which made possible the profitable working of low-grade deposits.

GOLD PRODUCTION FOR 20 YEARS

1897	$237,833,984	1907	$411,294,458
1898	287,327,833	1908	443,434,527
1899	311,505,947	1909	459,927,482
1900	258,829,703	1910	454,213,649
1901	210,877,429	1911	459,377,300
1902	298,812,493	1912	474,333,268
1903	329,475,401	1913	462,669,658
1904	349,088,293	1914	460,097,428
1905	378,411,054	1915	478,552,222
1906	405,551,022	1916	470,442,068

As usual, it is very difficult to say what proportion of the gold won actually passed into circulation or became part of the world's money stock. The demand for gold was large, as in 1915, and it is probable that a larger proportion of gold than in ordinary years was monetized, or in the form of bullion used to support credit reserves. One consequence of the commercial disturbances caused by war was that an unusual quantity of gold found its way to the United States, which now holds the largest gold reserve in the world—probably the largest amount ever accumulated in any country. Another effect of the war was found in changing routes of gold shipments. Thus a large part of the Transvaal gold, instead of going to London, was shipped to Canada, whence it passed into the United States. The adoption of such unusual channels of transmission has added to the difficulty of tracing the movement of gold. It is possible only to say, as above, that probably an unusual proportion of the gold supply has been used as money or the basis of credit. It is probable also that only a small proportion was used in the arts—much less than in an ordinary year. But the whole question of the disposition of the new gold seems impossible of any exact solution.

Stocks of Spelter

THE recent decline in the price of spelter has been manifestly due to pressure exerted by holders of accumulated stocks in a market wherein buyers were conspicuous by their absence. The government report respecting the situation at the mid-year showed an increase in stocks, but that revealed only a part of the story, for those figures pertained only to stocks at smelters' works. Besides such stocks there was reason to believe that there were important accumulations in warehouses and, furthermore, it was a fact that certain important consumers had large supplies of unused spelter in their yards. The last condition is one of the explanations of the absence of buyers in the market.

In fact, the accumulation of spelter has been going on ever since the first of this year, and perhaps earlier. At first the smelters did not feel this very keenly, for the freight congestion in the early part of the year obscured the true situation. Manufacturers who failed to receive spelter that they had bought, or considering it advisable to increase the supplies in their yards, kept on buying and thereby kept down the accumulation of spelter in producers' hands. The surplus was accumulating, but temporarily it was to a large extent in transit. When manufacturers began to receive supplies freely, they no longer needed to buy, and then stocks began to accumulate rapidly in smelters' hands.

Since then the zinc market has been governed not so much by cost of production as by the attitude of the holders of unsold stocks. As we have previously pointed out, a price of 8 to 9c. for spelter corresponds probably to 5c. before the war, the increment representing the increased cost of production or the inflation—or whatever it may be called—in this industry. Certainly, a good deal of spelter that is being produced at present costs considerably more than 7¾c. per lb., and with the market at that price zinc may be considered cheap under existing conditions.

The Flotation Patents

IN the bear market of last week a part of the ammunition that was brought up and used against the copper stocks was the great damages for which these companies would be liable for infringement of the patents of Minerals Separation, according to Judge Bourquin's recent decision. This argument failed to take into consideration three important things.

1. Anaconda, Inspiration and that group of copper companies, also Braden and others, are immune, having early taken out a license from Minerals Separation.

2. The Hayden, Stone and Jackling copper companies have not until recently been important users of the flotation process. Their backwardness in adopting that great improvement in the art was long a subject of adverse criticism directed against their technical managements. Butte & Superior is the great infringer, if infringer it be.

3. The decision of Judge Bourquin will probably be appealed. Without venturing to express any opinion as to its merits, not having the full text, we may nevertheless state the case thus: The Supreme Court sustained the Minerals Separation patents upon the use of less than 1% of oil together with a certain kind of agitation. Butte & Superior then reverted to the use of more than 1% of oil and Minerals Separation claimed that that was still an infringement of its patents. Judge Bourquin has upheld that contention. However, this so involves the construction of a decision of the Supreme Court, and is so contrary to the letter thereof, that it is practically certain that the case will be kept open until the Supreme Court has ruled again.

The index for Vol. 103, Part 1, of the *Engineering and Mining Journal* will be mailed with this issue. Any subscriber not receiving a copy of same should notify the subscription department at once.

BY THE WAY

Long before Bingham became famous as a copper camp and before the U. S. S. R. & M. Co. took over the Old Telegraph mines, hundreds of men had leases in upper Bingham Canyon. Many of these men—good miners too—were not able to do a good job of tool sharpening, and a one-legged blacksmith named Cook added to his income by sharpening them for a nominal sum. As a shop would not pay in itself, Cook had a lease at which he worked when unoccupied as a tool sharpener. The few "white men" on the Old Telegraph "had an eye" on him, as his peg leg made it difficult for him to get up and down the winzes, which always seemed to hold more inducements as good leasing ground than points more accessible to one afflicted as he was. One night he failed to appear after "tally," and a hunt was instituted for him. Upon a call down the winze where he had been working, an answer was received and a request to "come down." There sat Cook, literally in pieces, his peg leg used as a stull under a rock which would fall if the "stull" were removed, yet perfectly safe as it was. Cook did not try to get out, as he knew help would reach him sooner or later and if the rock fell, he would have to remove it as waste. A sprag was substituted for the "leg," and Cook went home. The "rescuers'" remarks have been deleted by the censor.

The Reef is the title of a monthly magazine recently started by the Prevention of Accidents Committee of the Rand Mutual Assurance Co., Ltd., at Johannesburg. It is devoted to the prevention of accidents, first aid and similar work. It lays especial stress on the necessity of instructing the Kafir laborers in the mines.

The Australian authorities are continuing vigorously their attempts to put an end to the activities of the Industrial Workers of the World. According to a cablegram of Sept. 4, three more members of the society at Sydney and 34 at Broken Hill have been sentenced to six months' imprisonment for belonging to an unlawful association.

When a mining engineer is in such straits that necessity bids him try to be versatile, let him also be canny. In trying to land a position that is a little out of his own line he should say as little as possible and be prepared to substantiate that little until the last pay day. Such positions are seldom landed by mere correspondence. Once upon a time (but this is no fairy tale) a young engineer had a job as chemist with an iron company in Michigan. He had chosen iron as his specialty, had married and was happy. When one is a proud daddy, why should he worry over a debt that is being paid off a little each month? But suddenly the iron company went out of business. Wife and kiddy went to visit the old folks while Dave hustled for a new job. At the bank, asking for an extension on the balance of his note, he told of his prospects and asked advice. One opening was available, as chemist for an iron company in the same district; while another vacancy, at a lower salary, was at a mine in Canada where a rarer metal was to be recovered from a troublesome copper ore. The bank advised his trying for the place in Canada. "But," said Browne, "I don't know a thing about nickel and, furthermore, I am without funds to keep me alive until I can hear from the company's head office in Cleveland." The banker replied, "Don't write letters. Go down to Cleveland and get that job. Here is $100 for expenses. Pay it back as soon as you can." In telling the yarn to a younger engineer and protégé, David H. Browne said, "I obeyed instructions and, when I reached the works, my predecessor had gone, leaving a small boy in charge. The boy asked for instructions, so I told him to keep right on as usual until I got my boxes unpacked and everything arranged for comfort. But I watched that kid out of the corner of my eye and, as soon as he went home that night, I pitched in and practiced the things I had seen him do. After working nearly all night for three nights I felt competent to hold the job."

Defective Safety Appliances

BY CHESLA C. SHERLOCK*

Safety appliances to protect workmen from dangerous machinery or to add to their convenience in going about their daily tasks are quite common in the industrial world. These appliances may have been installed in shops and factories because of specific state legislation compelling employers to do so, or employers have installed them on their own initiative because they wish to take every means possible to protect their workmen from injury.

The legal questions involved in the proposition of safety appliances are manifold and intricate, particularly as to the liability of the employer for a defective safety appliance which results in injury to a workman.

ACCIDENT FROM FAILURE OF HANDGRIP

In an Iowa case it was shown that a railway fireman had relied on the grabiron or handgrip provided by the employer on a locomotive. Taking hold of the grabiron, which was defective, it gave way, causing his injury. He sued the employer company for negligence in failing to maintain the appliance in proper condition.

The court ruled that "the casual connection between the injury and the negligence of the defendant may be proved by direct or circumstantial evidence. If the latter, it must be something more than consistent with plaintiff's theory of how the accident occurred. It must be such as to make that theory reasonably probable, not merely possible, and more probable than any other hypothesis based on such evidence."

In another case, the same court said: "If the circumstances surrounding the case do no more than indicate a possibility of the accident happening because of a defective appliance, or if they are no more consistent with the theory that the accident was due to some defect, but equally explainable on some other theory than the one charged, then plaintiff has not made out his case. The reason for this is that the burden is upon the plaintiff, not only to show some defect for which the master was responsible, but also to show that this defect was the proximate cause of the injury."

Inasmuch as there was a doubt as to whether the fireman's foot slipped off the step before the grabiron gave way, the court refused to allow him to recover for his injuries.

Employers may be of the opinion that this is a very narrow point to make in a discussion of this sort, but that very fact makes it highly important. The law announced is applicable in a multitude of cases quite common in the ordinary daily events of the industrial world.

For instance, in a Missouri case it was held that a master is not only bound to furnish suitable and reasonably safe means and instruments with which the servant is to perform his labors, but he must also maintain them in suitable and safe condition, which requires their continuous inspection, the repair of the defective, and the replacement of worn, parts.

In another Missouri case it was said that making tests, only at intervals of two or three weeks, to determine whether or not a device installed to stop machinery in which employees have become caught is in working order, may be found to be negligence where the device is of delicate construction and frequent tests have shown it to be out of order.

The Federal courts have held that it is a violation of the Federal Safety Appliance Act for a railroad company to send, as a part of a regular train, a defective car to shops for repair. They have held, however, that it is not a violation of the act for the company to send such cars to repair shops in a train made up entirely of such cars.

A great number of the states have passed their own safety-appliance statutes, which are applicable to all occupations hazardous in nature. It is the duty, of course, of employers to keep posted on their local laws on this subject in order to avoid liability for any contingency that may arise.

The law, having laid down certain rules intended for the protection of workmen in hazardous occupations, is a very jealous mistress in their enforcement. It is the supreme and paramount duty of every employer to keep these safety appliances in the best of working order. The mere fact that an appliance is not in the best of repair seems to be prima facie evidence of the employer's negligence. Unless some peculiar circumstance arises, as was the case in the Iowa case mentioned, such as to raise a doubt, the master will be liable in every instance for damages.

Where the law prescribes a means of safeguarding the interests of the laboring classes and an employer is lax in following the prescribed method, the law has no sympathy for him and will hear no excuses.

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Market for Canadian Mineral Products

TORONTO CORRESPONDENCE

The report of the Special Trade Commission to Great Britain, France and Italy, appointed by the Canadian Government May 9, 1916, has been issued by the Canadian Department of Trade and Commerce. As the result of an extended visit to these countries, and conferences with the commercial organizations and municipal authorities of the leading industrial and commercial centers, the report comprises classified lists of the principal commodities in requisition, or for which markets could be opened.

In Great Britain the commission found that there were on every hand many inquiries for Canadian metals and minerals, the following being the more important opportunities for increased trade indicated.

Magnesium: There is every possibility of a permanent and growing trade in this metal, apart from war requirements, as it has been found that it alloys with other metals in such a way as to assure its increasing use in the future.

Asbestos: This is one of the leading articles for which inquiries were made and there is no doubt that the development of the trade in this material can be widely extended. British importers require, in addition to the crude article, asbestos sheets, gloves, shingles and every form of manufactured asbestos.

Antimony: Great Britain is a large importer of this article and, as Canadian mines are now able to produce an improved quality, there should be an opening after the war for large quantities of metal and oxide.

Tungsten: Repeated inquiries were made for this article, either in the form of metal or concentrates.

Cobalt: Owing to improved processes for the use of this metal in electroplating and as an alloy with other metals, there was much interest displayed as to the prospect of getting a supply from Canada.

Mica: In many centers there were inquiries for mica, but it was stated that the mica powder hitherto shipped had not been satisfactory as it was not ground sufficiently fine. Some criticism was offered as to the quality of Canadian mica some of the smaller shippers having forwarded goods which had not been properly graded and were generally in bad condition. The Indian mica business is well organized and seems to give complete satisfaction. It was admitted that the quality of Canadian amber mica was second to none, and the opinion was expressed that if exporters would organize a system on the lines of the Indian shippers, a largely increased and profitable trade could be developed.

Molybdenite: The demand for this commodity was general, but the Canadian occurrences are widely distributed and to secure the best results the trade would have to be well organized. The high prices now realized make the question of developing the trade worthy of serious consideration.

Zinc: Canada has a great opportunity to secure a share of the British demand, as Great Britain is likely to continue to be a good customer when the war is over.

Nickel: A demand for nickel, chiefly for the hardening of steel, was found in all the countries visited. Some of the smaller buyers stated that they had difficulties in getting supplies and desired a better medium for obtaining their requirements at more favorable prices. Some of the larger buyers intimated that they would prefer to do business directly with Canada.

BRITISH, FRENCH AND ITALIAN MARKETS WERE INVESTIGATED

Other minerals for which the British market seemed to offer some possibilities were graphite, corundum, magnesite and chrome-iron ore. In treating of the opening for manufactures of iron and steel the report devotes much attention to the great demand for wire. This was largely supplied by Germany before the war and there is consequently a great shortage in the supply. On the assumption that there will be a continuance of this condition a favorable opening exists for the furnishing of wire from Canada. A large trade in wire nails is also being established.

In France the commissioners found many inquiries for Canadian metals and minerals; more especially asbestos, antimony, mica, tungsten, cobalt and nickel. French importers were also ready to receive offers of spelter, pig lead ready for rolling, and copper ingots as soon as Canadian manufacturers were prepared to offer them.

The commissioners had only a limited time at their disposal in Italy, but reported important possibilities in that market for Canadian metal and mineral products.

The members of the Commission were James W. Woods, Toronto, chairman; H. Edmond Dupré, Quebec; W. Frank Hatheway, St. John, N. B.; Theodore H. Wardleworth, Montreal; Frank Pauzé, Montreal; and George W. Allan, Winnipeg.

Methods of Exploring for Oil and Gas

By George E. Burton
Assistant Director, Oklahoma Geological Survey

There are in Oklahoma at present two general methods of exploring for oil and gas—making one or more churn-drill tests at random, and geological examination of the surface. Then, if favorable structure is found, churn-drill holes are drilled.

Although the former method has to its credit a long list of dry holes, the great Healdton pool was discovered in that way. However, the chances are small. The second method has to its credit the discovery of several oil and gas pools, among which are the great Cushing pool, the Blackwell, Ponca City and the new Garber and Billings pools. The churn-drill method of exploration, although it has some discoveries to its credit, is too expensive in proportion to the favorable results obtained to remain in favor much longer.

It is generally conceded by petroleum geologists that the surface in the possible oil and gas territory in Oklahoma has been pretty thoroughly examined, that most of the favorable structures have been located, and that the lands overlying such structures have been pretty well leased up, so it seems that the end of the second method is in sight. The petroleum geologist has been confined to those areas within probable oil and gas territory in Oklahoma where there are what he calls "reliable outcrops." Where sufficient outcrops of these reliable strata occur, the geologist can work out the structure and point out the location of anticlines or other folds.

At shallow depths in these areas there are, no doubt, strata which have considerable horizontal extent, which are deposited horizontally and which could be recognized from the core of a diamond drill. By proper spacing and careful surveying of drill holes, the underground structure could be determined.

CORRELATION OF STRATA FROM DRILL CORES

The cost of this kind of exploration is, I think, entirely proportionate to the reward sought. A churn-drill hole costing $20,000 was drilled to a depth of 3000 ft. in the NW cor. Sec. 30, T. 23 N, R. 6 W, by the City of Enid, Oklahoma. This well is located in an area where there are very few outcrops, and consequently the underground structure cannot be determined from the surface. The sum total of information gained for an expenditure of $20,000 is that this particular hole is dry. There may be oil or gas within a few hundred feet in any direction from this hole. This method of exploration is obviously too expensive to continue.

As shown by the log of the Enid well, there is at a depth of 830 ft. a limestone 2 ft. thick, which has, no doubt, considerable horizontal extent. The Duluth Diamond Drill Co., of Duluth, Minn., contract diamond and churn drillers, roughly estimate that they could drill with diamond drill to a depth of 1000 ft. at a cost of from $1 to $2 per ft. At the maximum charge per foot, 12 drill holes could be put down to the 830-ft. "lime" stratum in the Enid well. By properly placing and carefully surveying these holes, the attitude of this stratum could be determined over considerable area in the vicinity of the Enid well. I want to point out the fact that these figures are probably extreme. I feel sure that from a core a reliable stratum could be recognized at considerably less depth. This would permit the exploration of a larger area for the same amount of money.

Reclaiming the Scrap Pile

It has not been so long since most plant managers, superintendents, and owners regarded anything thrown into the scrap-pile as waste, beyond reclamation. Probably two things have contributed more than anything else to change their opinions of waste—war and modern welding processes.

In ordinary times the scrap-pile is a neglected avenue for the escape of profits. Now that war has pushed up the prices of raw material, the American plant owner and factory man have begun to analyze their scrap heaps. Usually they find huge accumulations of damaged or worn machinery, tools, "short ends" and other material that represents considerable profit thrown away. Face to face with labor shortage, metal shortage and the time factor, plant owners are reclaiming these worn and damaged machines and broken tools and putting them back to work earning profits.

Recently an engineer for an oxyacetylene concern made an investigation in a Western mining field. At one big mine he found in the scrap-pile dollies and dies for drill sharpening worth $9 each that could be welded and put into service at a cost of about $1 each. The mining company was on the anxious seat, too, as to when it would be able to get more new material. It was found that the scrap heap of one year's accumulation would yield a three months' supply of good material.

At another time the engineer found a year's supply of tram buckets, worth $40 each, with broken bottoms that could easily be repaired by welding at a slight cost. In addition he found a three months' supply of stamp stems and short ends of tungsten steel, that could be welded. He found crusher plates of manganese steel worth $20 each, slightly too big for the machines then in use, but which could be cut down by the oxyacetylene process at small cost, and put into service again at a large saving.

The various processes of welding have made it possible to reclaim machines and tools that formerly were sold as waste, and at a fraction of the original cost. Nowadays any kind of metal—steel, iron, both cast and malleable, brass, bronze, copper, aluminum, sheet iron and precious metals such as gold, silver and platinum can be welded and broken parts made as good as new. At a heat of 6300° F., produced by the combustion of acetylene in oxygen, any of these metals fuse and run together, a virtual remolding of the parts.

A railroad company had an accumulation of scrapped driving wheels for locomotives, most of which had cracked spokes. The demand for more rolling stock, caused by war pressure, caused the company to reclaim the wheels. The oxyacetylene welding process did the work, saving the road several thousand dollars and making it much more in profits through putting discarded engines to work.

In one plant, stub ends of nickel anodes, used in electroplating, were sold as scrap at a low price to get rid of them, until it was found feasible to weld them together and thus use up every bit of the material at an enormous saving. It was like sticking a small piece of soap, left from the old bar, on a new cake and getting 100% use of the article.

A big milling concern rummaged its scrap heap and discovered a quantity of discarded gear-wheels—castings with teeth broken out. At a trifling cost new teeth were fused into the castings, making them good as new and saving the concern an enormous amount of time.

Imports and Exports of Ferroalloys

Imports and exports of ferroalloys and of special metals and ores in the United States for June, and the fiscal year ended June 30, are reported, as below, in long tons, by the Bureau of Commerce at Washington:

	June		Year	
Imports	1916	1917	1916	1917
Ferromanganese		3,817		73,741
Ferrosilicon	536	869	5,469	8,715
Nickel ore and matte	7,848	3,503	87,700	33,053
Manganese ore	58,143	62,778	492,860	656,088
Tungsten ore		343		3,823
Exports				
Tungsten and ferrotungsten, lb.		172,079		1,784,306
Ferrovanadium	60	91	497	1,168
Nickel, nickel oxide, etc.	1,022	804	11,451	13,842

Tungsten and ferrotungsten are given in pounds. They were not reported separately until the last fiscal year. Ferromanganese and ferrosilicon were also not reported separately untl last year.

Chronology of Mining for August

Aug. 1—Frank Little, I. W. W. agitator was hanged at Butte, Mont., by masked men.

Aug. 4—Explosion of gas occurred in No. 7 mine of West Kentucky Coal Co., Clay, Ky., killed a total of 61 men, 84 being rescued.

Aug. 10—U. S. Senate adopted Pittman Bill providing for the leasing of Government lands containing potash and other chemical resources.

Aug. 11—New position of superintendent of experimental station, with headquarters in Washington, created by Director Van H. Manning of U. S. Bureau of Mines, Dorsey A. Lyon being named as the first incumbent.

Aug. 17—New mining experiment stations authorized at Minneapolis for the iron industry and at Columbus, Ohio, for the ceramic industry.

Aug. 19—Arrest by U. S. military authorities of 27 I. W. W. leaders including James Rowan, district secretary at Spokane, who issued orders for a general strike of workers in Montana, Idaho, Washington and Oregon, which threatened to retard necessary war materials.

Aug. 21—President Wilson fixes base price of bituminous coal at about $2 per ton of 2000 lb., at mouth of mine.

Aug. 24—Dr. H. A. Garfield, president of Williams College named as Coal Administrator.—Price of anthracite fixed at $4 to $5.30 (except for buckwheat) according to locality and size.

Aug. 27—Shutdown of Anaconda Copper mines in Butte, Mont., followed closing of smelteries by labor strike.

Aug. 30—Price of silver in New York reached 90⅜c. the highest in 25 years.

Personals

Harold C. E. Spence has left Duncan, Ariz., for Newfoundland.

W. H. Cunningham has been elected president of the Lake Superior Corporation.

Ralph Benedict, recently with the Sullivan Manufacturing and Drilling Co., is now in France.

W. E. Firth, safety engineer with the Midvale Steel Co., Philadelphia, has resigned to take a long vacation.

J. Parke Channing recently left New York for Lake Superior, to inspect mining properties, including the Naumkeag mine.

G. M. North, Jr., recently with the Keweenaw Copper Mining Co., as engineer, has enlisted as machinist in the Navy.

C. Erle Wuensch, formerly superintendent of the Placerville Gold Mining Co., recently examined mines at Placerville, California.

Henry Orlando, owner of the Yellow King mines, South Dakota, has been examining mining property, recently, in Placer County, California.

William Anthony Burr, late mill engineer with the Moose Mountain, Ltd., Sellwood, Ont., has set out on a trip to South America and France.

S. J. White of the engineering staff of the Quincy mine in northern Michigan is now at the officers' training camp at Fort Sheridan, Illinois.

Prof. A. J. Houle, of the Michigan College of Mines, has been engaged in private work at the Shattuck mine, in Bisbee, Ariz., during the summer.

Jay A. Carpenter, former superintendent of the Nevada Packard mines in the Lower Rochester district, Nevada, was in San Francisco recently.

John W. Gebb, deputy state mine inspector of California has been giving especial attention to mines in the Grass Valley and Nevada City districts.

M. C. Drake, recently appointed mining engineer at the Mass mine, in Michigan, has been called to the officers' training camp at Fort Sheridan, Illinois.

Ward Royce, lately engineer at the Quincy mine in northern Michigan, went to Fort Leavenworth, Kan., on Sept. 5, as captain of engineers.

Francis A. Thomson has resigned from the faculty of the State College of Washington to become dean of the School of Mines at the University of Idaho.

Mark L. Requa is one of the volunteer workers on the staff of the Food Administrator. His position is that of chief of the division of commercial relations.

F. P. Botsford, general superintendent for Pickands, Mather & Co. at Gilbert, Minn., has been inspecting new methods at mines in the Houghton district of Michigan.

E. M. Rabb, superintendent of the Tom Reed mine, Oatman, Ariz., recently inspected the company's property at Gold Reef, San Bernardino County, California.

W. A. Sanger and associates, operating the Santa Rosa mines in Inyo County, Calif., have been prospecting for molybdenum ores in Kern and San Bernardino Counties.

A. E. Place, a mining engineer recently returned from Mexico, has been prospecting for molybdenum in the desert region between Johannesburg and Wild Rose canyon, in San Bernardino and Inyo Counties, California.

J. I. Bullard of the engineering staff of the Quincy mine in northern Michigan, has become superintendent of the Cable Mining Co., a reorganization of the Cable Consolidated Mining Co., at Cable, Deer Lodge County, Montana.

Edwin Higgins, mining engineer in charge of safety and efficiency for the California Metal Producers Association has recently been in Amador County and will be engaged in Amador, Calaveras and Nevada Counties in September.

John Ballot, president of the Minerals Separation North American Corporation, is now at Houghton, Mich., where the company's mill metallurgist, **O. A. Chapman**, has been demonstrating the adaptability of the flotation process to the native copper ore.

J. Leonard Replogle, chairman of the Wharton Steel Co., has been appointed steel advisor by the war advisory board. He will direct purchases of steel for war purposes and determine the order of priority in filling and shipping war steel. His office will be in the Munsey building, Washington.

Col. T. C. Roberts, chief engineer of the United Verde Copper Co., Clarkdale, Ariz., is visiting New York City for several weeks, after which he expects to go to South America.

H. W. Fesing, of Houghton, has just returned from the Oro Belle mine at Hart, Calif., where he has been inspecting the property with director **T. A. Merritt** of Duluth.

Mortimer North, recently engineer at the Victoria mine in northern Michigan, has been commissioned a lieutenant of engineers and assigned to the duty of raising a regiment of miners for service in France.

R. M. Edwards, president of the Franklin and South Lake mines in northern Michigan, has returned from Ulysses, Ida., where he inspected the Kitty Burton mine, which is also under his management.

W. Elmer Ekblaw, geologist and botanist of the MacMillan Crocker Land Expedition, arrived in New York on Aug. 30, having returned by a different route from that taken by MacMillan who recently reached Sydney, N. S. He left North Star Bay with Dr. Harrison J. Hunt in December, 1916, and reached South Upernavik in January last. From here Dr. Hunt went on alone as there was not enough food for both. Mr. Ekblaw made his way to the coast and thence to Godhaven, Greenland, in the motor boat of a Danish official. There he was picked up by the relief ship Neptune on which he returned. Mr. Ekblaw is an instructor in the University of Illinois.

Obituary

Major Henry Souther, senior officer, aircraft engineering division, United States Signal Corps, and vice president of the Henry Souther Engineering Corporation, Hartford, Conn., died Aug. 15 in the post hospital at Fortress Monroe, Va., following an operation. He was born at Boston in 1865 and was graduated in 1887 from the Massachusetts Institute of Technology, where he specialized in mining and metallurgical subjects. After studying abroad the manufacturing methods and processes employed in the German iron and steel industry, he entered the employ of the Pennsylvania Steel Co. at Steelton in 1888 and was made assistant foreman the following year. He was engineer of tests for the company from 1890 to 1893, resigning to take a similar position with the Pope Manufacturing Co., which he held for six years. In 1899 he engaged in business as an independent consulting engineer and established a metallurgical and testing laboratory and did consulting work for the automobile industry. He was president and treasurer of the Henry Souther Engineering Corporation from 1899 to 1909 and became president in 1911; he was vice president and general manager of the Ferro Machine & Foundry Co., Cleveland, from 1913 to the outbreak of the war. Latterly he had charge of the aircraft development of the army and created a corps for the inspection of aircraft. He was a member of the American Society of Mechanical Engineers and was prominent in the Association of Licensed Automobile Manufacturers. He was a founder member of what is now the Society of Automotive Engineers.

Societies

University of Arizona, at Tucson, has completed the work of excavating and laying the foundation of the new mining building. This will be ready for occupancy in 1918 and will cost $175,000.

Massachusetts Institute of Technology has rearranged the regular college course to permit the continuance of courses in army and navy aëronautics and of the school for ensigns begun early in the summer.

Arizona State Bureau of Mines has projected a campaign of education for the miner and prospector to facilitate the discovery of minerals. Frequent non-technical bulletins are to be issued as the means to this end.

American Chemical Society—A committee has adopted a plan for a memorial to Joseph Priestley, requiring subscriptions of at least $2000 to provide for a bust portrait of Priestley to be placed as a loan in the National Museum in Washington, and, second, for the award of a gold medal at intervals for superior achievement in chemical research, the recipient to deliver an address before the general meeting of the society.

Mining and Metallurgical Society, New York Section, will hold a meeting at the Engineers' Club, 32 W. 40th St., New York, on Wednesday, Sept. 12, at 8 p.m., preceded by an informal dinner at 6.30 p.m. This is the annual business meeting of the Section at which officers will be elected for the ensuing year.

New Patents

United States patent specifications listed below may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

Alkali Perborates—Electrolytic Process of Making Alkali Perborates. Otto Liebknecht, Frankfort-on-the-Main, Germany, assignor to the Roessler & Hasslacher Chemical Co., New York, N. Y. (U. S. No. 1,235,905; Aug. 7, 1917.)

Briquettes—Art of Compressing Fine Ores and the Like Substances into Blocks or Briquettes. Otto Kippe, Osnabrück, Germany. (U. S. No. 1,238,022; Aug. 21, 1917.)

Calcium Hypochlorite — Manufacture of Calcium Hypochlorite. Gustav Pistor and Heinrich Reitz, Griesheim-on-the-Main, Germany, assignors to The Firm of Chemische Fabrik Griesheim-Elektron, Frankfort-on-the-Main, Germany. (U. S. No. 1,236,978; Aug. 14, 1917.)

Concentration—Improvements in or Relating to the Concentration of Ores. Henry Livingstone Sulman, Edwin Edser and Minerals Separation, Ltd., London, England. (Brit. No. 105,627.)

Copper—Improvements Relating to the Obtainment of Copper from Its Ores. Alfred Andrew Lockwood, London, S. E., England. (Brit. No. 105,772.)

Dredge. Samuel Dickens Waysman, Nome, Alaska. (U. S. No. 1,237,845; Aug. 21, 1917.)

Drill—Pressure-Fluid Tool. George H. Gilman, Claremont, N. H., assignor to Sullivan Machinery Company, Boston, Mass. (U. S. No. 1,236,702; 1,236,703; 1,236,704; Aug. 14, 1917.)

Drilling—Rock-Drill Fastening. Charles J. Borgeson, Syracuse, N. Y., assignor to The Pneumelectric Machine Company, Syracuse, N. Y. (U. S. No. 1,236,664; Aug. 14, 1917.)

Dust-Separator. Milton F. Williams, St. Louis, Mo., assignor to Williams Patent Crusher and Pulverizer Company, St. Louis, Mo. (U. S. No. 1,236,805; Aug. 14, 1917.)

Electrodeposition—Process of and Apparatus for Densified Electrodeposition. Nathaniel Huggins, New York, N. Y., assignor, by mesne assignments, to Copper Products Company. (U. S. No. 1,236,438, Aug. 14, 1917.)

Excavating-Machine. John G. Fogarty, Rochester, N. Y., assignor to John Fogarty Co., Inc., Rochester, N. Y. (U. S. No. 1,236,418; Aug. 11, 1917.)

Filtration—Filter-Press and Method of Preventing the Oxidation of the Filtrate in the Containers Thereof. Louis David Mills, San Francisco, Calif., assignor to Merrill Metallurgical Company. (U. S. No. 1,236,737; Aug. 14, 1917.)

Flotation—Ore Concentration. Rhetherford B. Martin, New York, N. Y., assignor to Minerals Separation North American Corporation, New York, N. Y. (U. S. Nos. 1,236,856 and 1,236,857; Aug. 11, 1917.)

Flotation—Concentration of Ores. Arthur Howard Higgins, London, England, assignor, by mesne assignments, to Minerals Separation North American Corporation. (U. S. No. 1,236,933; 1,236,934; Aug. 11, 1917.)

Manganese—Depolarizing Agent. Carleton Ellis, Montclair, N. J., assignor, by mesne assignments, to National Carbon Company. (U. S. No. 1,236,693; Aug. 14, 1917.)

Metallurgical Furnace. Utley Wedge, Ardmore, Penn. (U. S. No. 1,237,129, Aug. 11, 1917.)

Potash—Process for Rendering Available the Potash of Feldspar and Similar Materials. Walter Glaeser, Brooklyn, N. Y., assignor to George T. Bishop, Macedonia, Ohio. (U. S. No. 1,237,197; Aug. 14, 1917.)

Potash—Recovery of Potash. Frank G. Breyer, Palmerton, Penn. (U. S. No. 1,236,903; Aug. 11, 1917.)

Titanic Oxide—Composite Titanic-Oxide Pigment and Method of Producing the Same. Louis E. Barton, Niagara Falls, N. Y., assignor to The Titanium Alloy Manufacturing Company, New York, N. Y. (U. S. No. 1,236,655; Aug. 14, 1917.)

Zinc—An Improved Method of Apparatus for Recovering Zinc from Zinc Bearing Ore. David Benton Jones, Lake Forest, Ill. (Brit. No. 106,050.)

Editorial Correspondence

SAN FRANCISCO—Aug. 30

Acquittal for William S. Noyes, president of the Presidio Mining Co., was the result of the recent trial upon instruction of the superior court in San Francisco. The charge of embezzlement of $5000 was brought by Capt. W. S. Overton, a stockholder, who complained that Noyes had diverted money from the sale of stock to his own use. In the trial in the last of June the directors of the company testified that the money was voted to Noyes for services. Upon that evidence the court could do nothing else than instruct for acquittal.

Transportation of Mine Timbers to the mines at Bodie, Mono County, is dependent on the railroad operated by the Mono Lake Lumber Co., the mills of which are 35 miles distant. The company purposes selling the road and equipment and it is stated that the purchasers intend removing the rails. Thomas Cain, mine operator of Bodie, has filed with the Railroad Commission a complaint that the sale and removal of the rails will be a violation of the public utilities act and asks the commission to prevent the sale and compel the Mono Lake Lumber Co. to continue operation, on the ground that this is the only means of transportation of timbers necessary for the operation of his mining property; that the company is a common carrier and should be compelled to continue to serve the public.

Lincoln Consolidated Mining Co., of Amador County, has made application to the commissioner of corporations for authority under the amendment to Sec. 309 of the "blue sky" law, similar to that of the Pinal Dome Oil Co. The Lincoln Consolidated asks authority to distribute $60,655.50 as a dividend of 10c. per share to stockholders. The company has on hand $57,000 in cash and $68,000 in marketable bonds, resulting from payments upon the purchase price of the mining property owned by the company at Sutter Creek, recently sold to Eastern men said to be of the same crowd that purchased the Old Eureka, and who are stockholders in United States Steel. The Lincoln Consolidated includes the Lincoln and Wildman-Mahoney mines, which in the early days of Mother Lode mining were among the great gold producers of California. Within the past four years an effort was made to reopen this property with apparent success; but the problem of handling the large volume of water was said to be beyond the resources of the company and development was discontinued and the mine closed down. Enough work was done, however, under the management of W. J. Magee, of Sutter Creek and San Francisco, now assistant U. S. Treasurer at San Francisco, to make the present physical showing which induced the sale of the property. The mines adjoin the Old Eureka on the north and are in such position that the two properties could be operated under one management.

New Drilling of Oil Wells is evidently decreasing. In the week ended Aug. 11, only 5 new wells were started In the preceding week the number was 6. The State Mining Bureau attributes the present inactivity to the difficulty in obtaining material, particularly casing. No doubt this is true, to a great extent; but it is hardly likely that it is the whole reason. The unsettled condition of national legislation has much more to do with the inactivity in oil-well drilling and operation than is generally supposed The price of crude oil at the wells is increasing. The Standard Oil Co., the largest buyer of crude, has been setting a rapid pace in the bidding for oil in the fields, and apparently has been striving hard to increase production by advancing prices paid at the wells. This action of the Standard is rather a puzzle to some of the producers who are not quite sure what the result will be, whether the increasing prices will prevail for a period long enough to induce them to increase their investment, or whether after the Standard and other large marketers shall have obtained a desired amount of oil the price may drop. These large concerns, which produce, refine and market crude oil and byproducts, make the price at the wells. Supply and demand has not in the present crisis a great deal to do with it. To be sure the production is not great enough at present and has not been for several months to insure an increase in stocks on hand, but even this condition of the oil industry does not wholly control the price. The fear of untoward legislation respecting the Federal oil land reserves has been the greatest influence in retarding new drilling and production.

Safety Appliances for Gold Dredges were studied by Inspector F. L. Lowell for the Industrial Accident Commission, prior to the preparation of the "Tentative Safety Rules for Gold Dredges in California," recently published in full in the "Journal." Mr. Lowell incorporated his observations and suggestions in a bulletin, No. 5, just issued by the commission. At the time of Mr. Lowell's visits there were 58 gold dredges actively operating in various parts of the state. Since then one has been dismantled and there are others which have practically worked out their fields and will no doubt be dismantled within the next year or so. But other dredges are in the course of construction and the number will remain about the same probably for the next two or three years, and if conditions improve so that material may be obtained promptly and at less cost than has prevailed recently, there should be a noticeable increase in gold dredges. The bulletin is well illustrated with photographs showing various safety equipment on dredges, particularly in the American River and Yuba River fields. The various appliances for safeguarding dredges are mostly fine examples of safety appliances and the suggestions made in the bulletin are worthy the attention of all superintendents and dredgemasters. In the initial organization of mine inspection by the mines department of the commission some criticism was offered because the commission did not immediately apply inspection to dredges. The organization at that time was new and in some respects working under inadequate laws. The inspectors were unacquainted with conditions and it was necessary to undertake no more work than the prescribed number of inspectors could take care of properly and with a measure of satisfaction to mine owners and operators. Altogether, the mine inspection department of the Industrial Accident Commission has become a useful adjunct to the commission and of great benefit to those employed in the mining industry of this state.

BUTTE—Aug. 31

The Shut-Down at Butte, in spite of all the efforts on the part of the mining companies and the conservative element of the workingmen to turn the mining industry of Butte back into its normal channels after a long and costly interruption, the I. W. W. agitators, headed by Tom Campbell and Joe Shannon at last succeeded in completely paralyzing the industry. Realizing that their cause in Butte was about to collapse, they directed all their energies to Anaconda where they succeeded in splitting the sheltermen's union. As a result only 110 men out of a total of 2500 reported for work at the Washoe works for the 11 o'clock shift on Aug. 24, and it was then seen that a complete shut-down was inevitable. This was effected at 3 o'clock in the afternoon, no further efforts in the direction of negotiations being made on either side. Since then only a few men needed to protect the property have been employed at the smeltery. The closing of the smeltery made the closing of the Butte mines a natural necessity and all men excepting those required to keep the mines unwatered and otherwise protected, were dismissed Eleven thousand men in Butte and Anaconda are affected by the shut-down, and about 2000 will be retired at the Great Falls smeltery; other men in other branches of the industry in different parts of the state will bring a total of 15,000 men who will be idle, all because of the activities of a handful of radicals who have succeeded in bringing about this shutdown. The Butte & Superior company, the Elm Orlu, the East Butte and a few other concerns who are not affected by the closing of the Anaconda company's smelteries, are still carrying on operations. Butte is quiet and no disturbances that can be attributed to the shut-down have been reported. No one is able or willing to predict how long the mines will remain closed and under what conditions they will be reopened Rumors that the Federal Government will take a hand in bringing about resumption of operations cannot be confirmed and while the Government may ultimately furnish protection to those who are willing to work, the operation of the mines by anyone but the companies themselves seems a very remote possibility. At all events it does not seem clear how Government officials, inexperienced in the game could cope with the labor problem with greater success than the local companies and their trained staff of engineers and legal talent who have for years studied the problem from all angles. While Butte hopes that a satisfactory solution of the problem will ultimately be found, it has settled down resignedly to await a brighter day.

DENVER—Sept. 1

New Wage Scale, in Telluride district became effective Aug. 15, as follows: While monthly average New York quotation for silver is 70c. or over, machinemen in drifts, $4.75; machinemen in stopes, $4.50; timbermen, $4.50; timber helpers, $4; shovelers, trammers, trackmen and miscellaneous mine labor, $4. Men not working full month will be paid 50c. less per shift unless absent on account of sickness, accident or upon request Occupations not listed have special rates at the different mines. The companies announcing this schedule are: Tomboy, Smuggler-Union, Liberty Bell, Black Bear, Primos Chemical Co., Alta., Humboldt and Tomboy Tramway and Tunnel Company.

Colorado School of Mines' presidential turmoil calls for abundant consideration. Daily papers carry editorials as well as news items. In general, the comment is decidedly adverse to the appointment of Victor C. Alderson. He accepted his position upon the authority of three of the trustees acting individually and not officially. This appointment has been passed upon by the state's attorney-general and declared void. Two of the three trustees who invited him to return to Golden will remain firm for his election, while the third, A E. Carlton, of Cripple Creek, states that he will alter his position in the matter if he can be convinced of Alderson's lack of fitness. Last night (Aug. 31), a meeting of declared "anti's" was held in Denver and specific charges were formulated for presentation today to Governor Gunter, who will hold a council with the trustees. Owing to the brevity of time available, some charges were ommitted. Witnesses or sworn documents to substantiate the charges are to be offered today. Among the accusations are the following: Disloyalty to the school; disloyalty to the faculty; lowered standards of scholarship by compelling faculty members to give fewer conditions, by compelling them to raise marks of poor students, and by compelling professors to pass students in order to render such students eligible for intercollegiate athletic contests; loss of numerous professors of ability; and, finally, exercising presidential authority before official election.

SALT LAKE CITY—Aug. 31

Coal-Mine Insurance—under the workmen's compensation act—is to be offered by 10 large companies from outside the state representing a large aggregate capitalization and working under the name of the Associated Companies. This organization will compete with the state insurance fund, offering insurance at the same rate—$7.81 per $100 of payroll.

Large Government Reservoir may be built in Carbon County, just below Scofield in Pleasant Valley, possibly taking the place of the mammoth reservoir of the Price River Irrigation Co., the breaking of which about six weeks ago flooded the Rio Grande tracks between Kyune and Helper tying up coal transportation for a period, causing large monetary loss to the railroad, and forcing the coal mines to hold down their output for a time. Following the request for immediate investigation by the Utah delegation in Congress, L. M Winsor of the United States Department of Agriculture has been in Carbon County looking into the question. The proposed site just below Scofield in Pleasant Valley appears advantageous The water backed up into this valley before passing down the narrow canyon, when the dam broke

Mines Information Bureau will be established by the Utah Chapter of the American Mining Congress according to plans now under consideration. The bureau will serve as a guide to prospective investors in mining properties and others in this state. It is proposed to collect and file information—obtained from public records and from owners and promoters—the object being to give support to worthy undertakings and to discourage fraudulent promotions, and to make reliable information readily accessible, free of charge. Companies and promoters will be asked to fill out question blanks as to stock issues, debts, obligations, physical value, acreage, development, equipment, transportation, working forces employed, water, etc.

TONOPAH, NEV.—Aug. 30

Price of Silver being around 90c. per ounce has a great effect upon low-cost producers such as Jim Butler, which cost is about 25c., but whereas the effect on high-cost producers such as West End is equally important. West End's cost of production last year was 45c., with price of silver at slightly more than 62c., and at present price of 90½c. the profits will show an increase of almost 100%, or nearly double.

HOUGHTON, MICH.—Sept. 2

Montana Copper Labor has started to flow into the Lake Superior district, because of the shut-down in Butte. Men commenced to arrive on Aug. 25, and each train brings in more. Most of these men are men of families who formerly resided in the Michigan district but were lured to the Montana copper fields by the high wages paid. They all claim that the Michigan district has advantages for the home-loving, peaceable miner that cannot be found in any other copper-mining camp in the world. Many Detroit machinists are coming to the copper country now. These are men who went to Detroit to work in automobile factories. They too are returning, convinced they say, that there are few places in the world where labor is treated as squarely as in northern Michigan.

Calumet & Hecla's Flotation Tests proved successful, having been tried out on a sufficiently large scale to give positive results at the White Pine plant of 50 tons capacity. A license has been granted by the Minerals Separation company to the Calumet & Hecla Mining Co., to use the process at its own mill, Lake Linden, and at the White Pine, the construction to be done by the Calumet & Hecla, for which plans are now being made. Negotiations were concluded on Aug. 27, during the recent visit of Chairman John Ballot, of the Minerals Separation, Ltd. It is likely that this license is only the precursor of others that will be granted in the near future. The success of the process on this ore warrants its use elsewhere in the district.

Mining Costs have risen so much within the last two years that the present cost of production of the smaller producers—Hancock, Winona, La Salle, Old Osceola, and possibly the Franklin and Mass—averages at least 20c. a lb. and they feel that they possibly will have to close down if 20c. or less is declared as the price by the Government, and are, therefore, protesting, especially when they learn that wheat, for which 80c. to a dollar have been hitherto considered good prices is to have a Chicago base price of $2.40. The tonnage for August will be little better or about the same as for July, though there were two more working days, the daily tonnage having averaged somewhat less.

Cost Of Production of copper at the mines of the Lake Superior district will be higher in 1917 than it was in 1916 by at least 10% on the average and higher by 20% in many specific instances. The thing that now is bothering most of the copper producers here is the price to be fixed by the Government on copper output. If that figure is 25c. a pound there can reasonably be expected a continuance of copper mining prosperity in this Michigan district. If it is under 20c. a number of smaller mines will be forced to close down. In fact orders to that effect already have been received at some of the properties. Costs last year were higher than they have been in quite a period, but this year everything that enters into the production of a pound of copper has gone up still higher. Labor is not efficient, although there is little doubt that the Michigan copper district has less to complain about on that score than any other district in the copper-production business. The cold truth of the matter is that the mining corporations here would add still further bonuses to the pay of employees if they believed it would bring about greater efficiency or increase the number of men on the payrolls, but the fact is that the men now are making so much money and making it so easily that they want an average of two day's vacation a week now to enjoy the ideal autumnal climatic conditions for automobile journeys. And they take what they want.

JOPLIN, MO.—Aug. 31

Highest Grade Ore produced in the Joplin district has long been a disputed point. Recently it was noted that A. C. Ihlseng, local manager for the Metal Ore Corporation, in 1898, bought and shipped to Antwerp, Belgium, 100 tons of zinc concentrates that assayed 65.70% Zn. This is better than any shipment in recent years of as much as a carload of zinc concentrates, and beats the recent record of over 64% made by the Admiralty Zinc Co., from Century, Okla.

JOHANNESBURG—July 25

Geology of Reitfontein Reefs has been elucidated by the publication of the "Geological Map of the Witwatersrand Goldfield" and the accompanying explanatory pamphlet by the government geological survey. Ever since the discovery of the Rand, the true age of the Reitfontein Reefs has been a geological puzzle and many thousands of pounds have been fruitlessly spent in attempting to trace their continuation east and west. Draper considered that they were inverted Elsburg reefs, others that they constituted a separate series of reefs, and still another geologist held the view that they belonged to the Main Reef series. Dr. Mellor, however, shows that the Reitfontein series is contained in a faulted outlier of the Upper Witwatersrand beds, containing both the Kimberley and Main Reef, as well as other series. Being cut off south, east and west by faults, this remnant of the Upper Witwatersrand formation is essentially local in occurrence and this will explain why its extension has been impossible to trace. The Reitfontein gold mine, situated on this faulted outlier, recently closed down on account of mining operations becoming unprofitable after considerable sums for many years had been expended in prospecting operations. This affords another instance of how much useless expenditure of capital, and dependence on quack geologists, might have been avoided had a geological survey of the Rand been earlier undertaken by the government.

The Mining News

ARKANSAS

Boone County

DEEP DRILLING will be done in Zinc camp by Sidney Aumick and associates of Tulsa, Okla. Work will start as soon as sufficient acreage has been acquired.

BROOME COUNTY MINING CO. (Zinc)—Mrs. S. H. Everett of Indianola, Miss., purchased this zinc mine, which is equipped with mill. A. R. Van Mater, of Springfield, Mo., superintendent.

McCURRY MINING AND MILLING CO. (Zinc)—W. S. McQuain and H. H. Banta, of Rupert, Idaho, joined W. A. McCurry in forming new company. Properties controlled are the Coker Hollow, Zinc camp; Rhodes-Manchester, Zinc camp, Haulk, Dodd City camp, Keys Gap, Newton County camp, and a custom mill at Zinc.

Marion County

CONTINENTAL (Yellville)—W. O. Krueger, who lately leased the Bear Hill mine in Dodd City and the Beulah mine in Rush, incorporated the two properties under name of Continental Mining Company of Oklahoma. Both are blende mines and in operation.

ARIZONA

Mohave County

PAYROLL (Chloride)—Leased to L. F. Martin, is shipping between 25 and 35 tons of lead-zinc ore daily to the Needles, Calif., mill. A. W. Henning, superintendent.

RATTLESNAKE (Chloride)—Has carload of silver-gold-lead ore in the bins. Will probably ship to Selby smeltery. F. E. Brady, superintendent.

SCHENECTADY (Chloride)—Owned and operated by the Chloride & Telluride Mining Milling and Leasing Co., taking out ore from north and south drifts on 175-ft. level. Shows much wire silver. Will soon have carload for shipment to smeltery. H. L. Heath, superintendent.

MARY BELL (Chloride)—Under lease and bond to J. P. Ryan, Chloride, is opening up into shipper. More than 2 ft. good ore struck in tunnel in 260 ft. Half carload each of zinc ore and of silver-lead-gold ore piled on dump. Road building in progress preparing for steady shipments. J. P. Ryan, superintendent.

COPPER AGE (Chloride)—Owned and operated by Arizona Ore Reduction Co., has found ore in new working tunnel, also opening up reserves of good ore in upper workings. New mill started up Aug. 23, ran few hours when clutch broke, necessitating shutdown of several days. Lead concentrates will be shipped; other concentrates treated in furnace department now building. E. E. Northrup, superintendent.

McCRACKEN SILVER-LEAD MINES CO. (Yucca)—Situated in Owens district, consists of nine claims, 29 miles east of Havaland, a station on Santa Fe railroad. Wagon road permits hauling at cost of $6.50 per ton. Lead ore exposed on opencuts on Galena claim, carrying silver, and tunnel driven to cut vein at 150-ft. depth. Ore also found on Swastika No. 1 claim on surface and in opencuts and tunnels. Discovery shafts being sunk on Atlanta Extension claim, which is only one now being developed. W. H. Van Horne, of Indiana Harbor, Ind., president.

Pinal County

RAY CONSOLIDATED (Ray)—Output for July was 7,808,766 lb. copper, comparing with 7,611,111 in June and 6,831,492 in July, 1916.

Yavapai County

UNITED VERDE EXTENSION (Jerome)—Stated that future policy will be to produce 4,000,000 lb. of copper monthly until new smeltery is in operation.

CALUMET & JEROME (Jerome)—It is announced that crosscut is in 50 ft. Ore will be handpicked to average over 10%. Drifting started. John Rauber, superintendent.

JEROME VERDE (Jerome)—Alleged drill-hole strike reported last April now announced to have been a "frame-up," drillers having been bribed by some local interests.

Yuma County

GLORY HOLE BONANZA MINES CO. (Salome)—Owns Glory Hole group of seven claims and Cobrita Pay Streak group of five claims. Expect to start development campaign in autumn.

CALIFORNIA

Amador County

OLD EUREKA (Sutter Creek)—Enlarging shaft below 1600-ft. level and shaft repairs still in progress. New change house constructed. New Electric hoist and other equipment recently installed operating satisfactorily.

CENTRAL EUREKA (Sutter Creek)—Full capacity, 40 stamps, dropping, the last 10 starting for the first time since shaft was deepened to 3350 feet. The development necessary to deepening shaft reduced the per ton value of ore in May and June to average of ore milled $2.78. This value is below normal but believed the mining and treatment of the ore as extracted in future will reach a payable value.

PLYMOUTH CONSOLIDATED (Plymouth)—Just completed sinking main shaft to 2600 ft. and will start Sept. 1 to deepen to 2900 ft. before opening another level. Physical and other conditions satisfactory. Two new Hardinge mills being installed in mill with purpose of finer grinding of tailings and thus increasing extraction which at present is not equal to possibilities afforded by development. Fine grinding mills now are overloaded and not capable of taking care of all the ore that can be mined. C. F Parks, superintendent.

KEYSTONE (Sutter Creek)—Report for first half of 1917 shows 39,896 tons of ore milled, yielding an average of about $2.03 per ton on the plates: concentrates about 1505 tons. Bullion valued at $14,281; concentrates, $84,893; total production, $99,174, less $18,061 freight and smelting charges, leaving net value of ore treated, $81,113. The 40-stamp mill was idle only 296 hr. in the 6 mo. Greater portion of ore hoisted came from 1200- and 1400-ft. levels; 900-, 1000- and 1800-ft. levels also yielded good production. Station at 1800-ft level completed and crosscut driven 550 ft. east, cutting vein at 500-ft. point, where drifts on vein were driven north and south, the latter a distance of 100 ft. and the north drift now well started.

Butte County

HUNTER DREDGE (Oroville)—Taken out of commission after operating for about 10 years. In 120 mo. operation, 11,600,000 cu.yd. of gravel was dug, yielding approximately $1,500,000. Boat owned by American Gold Dredging Co., successor to Oro Electric Power and Water Co. Recently employed in reclamation work for Federal Government, on Feather River.

GOLDEN FEATHER MINES CO. (San Francisco)—Property known as Robinson Mine, in Granite Basin, developed by the United States Exploration Co., taken over by the operating company. Reported that drift from 320-ft. point disclosed vein 10 in. wide, carrying good ore. Ore also at 80-ft. point in shaft.

Calaveras County

CALAVERAS (Murphys)—Reported about to be unwatered and if development warrants will be equipped with electric hoist and other machinery. Is an old mine with record of $500,000 production. Los Angeles men are in charge.

DUNTLEY-COTTON MINES CO. (Railroad Flat)—Known formerly as old Keystone mine. W. O. Duntley, president, and W. J. Cotton, vice-president and general manager. Mr. Cotton reports that stamp mill has been completely overhauled, boiler and engines installed, also Chicago Pneumatic Tool compressor. Main shaft is 270 ft. deep with working levels at 100, 200 and 250 ft., both north and south. On latter level good shoots of ore have been uncovered. W. H Armstrong, assistant manager and mill superintendent. Report that R. L. Gunn is mine engineer and superintendent denied.

Colusa County

CERISE (Williams)—Pipe line being installed to carry water from Bear Valley to new mill. Installation of other machinery and equipment in progress. Property situated near Wilbur Springs.

Eldorado County

HUGHES RANCH (Folsom)—William P. Steincamp and L. C. Metto installing pump to unwater shaft. Had disclosed high-grade ore when driven out by water. In addition to gold also found chrome on another part of ranch. On adjoining ranch, J. Fleischam, of Mormon Island, is mining and shipping good chrome ore.

RISING HOPE (Placerville)—Gold-bearing gravel reported tapped by 14-ft. raise from face of 2000-ft. tunnel under construction last several months. Gravel is about 12 ft. thick, cemented and hard and will require a stamp mill to crush it. Revolving-barrel gravel mill now in operation reducing loose "bench gravel."

Nevada County

FRANKLIN AND FORD (Grass Valley)—Reported that order placed for electric pump of 75 hp. and 10-drill compressor. Mine will be unwatered and extensive development undertaken. Mine was a producer in early days. Salt Lake men have optioned the property.

OAK TREE (Grass Valley) — Situated within city limits, being reopened by M. J. Brock. Shaft being cleaned out and timbered, 40 ft. of the 200-ft. depth having been made ready for further repair. Mine worked in early days, but pumping plant not equal to demands and operators quit when poor zone was reached. Development will follow if money is obtained.

GOLDEN CENTER (Grass Valley)—Permit to sell remaining 14,785 shares of capital stock at 25c. per share to prior investors who paid more than $1 per share, to dispose of the present capital stock, then increase and consolidate the capital stock and use the money resulting from the sales for further development and installation of new hoisting and pumping equipment. The mine is situated in the approximate center of the town and in the early days was a producer. The old hoist is a monument to the memory of the old timers who made money as long as the pay ore lasted and who quit when it required large expenditure to develop new orebodies. Recent development discontinued until sufficient money can be obtained to explore new ground and develop the ground already opened up.

Shasta County

MAMMOTH COPPER MINING (Kennett)—Estimated production of smeltery copper for July is 1,750 000 lb.

KEYSTONE (Kennett)—Under development by Mammoth Copper Mining Co. Diamond drill equipment being installed. Situated near Stowell mine owned by the Mammoth.

COLORADO

Boulder County

ILLINI MINES CO. (Boulder)—Recently organized by Boulder and Denver men, will operate Wood Mountain mine, at Wall Street.

Clear Creek County

ONONDAGA (Georgetown)—Ventilation greatly improved, and larger crew now employed.

CONSOLIDATED MINES CO. (Alice)—Stated 100-ton mill will be built. Company operating Alice and Yukon groups.

Custer County

BROWNING (Westcliffe)—Shoot of good-grade copper ore opened at Boneyard Park.

Gilpin County

BEZANT (Central City)—New electric motor will be installed to operate pump and mine unwatered to 160-ft. level where shoot of ore containing gold and pitchblende opened. Electric drill will be used in driving west toward Wood mine. Mine in pitchblende producing area on Quartz Hill.

STAR OF THE WEST (Central City)—Ore increasing in value as drift on 300-ft. level extended west. Oreshoot opened for length of 150 ft. in drift, and to depth of 25 ft. in winze, shows 6-ft. width of milling-grade ore and small shoot smelting-grade ore. Gibson shaft of company, to west, is 385 ft. deep with levels at 125, 225 and 385 ft., all in ore.

San Miguel County

OPHIR GOLD MINING AND REDUCTION CO. (Ophir)—Will install flotation plant.

CARRIBEAU (Ophir)—Boiler purchased from dismantled Junta mill being installed to operate additional machinery. Flotation plant completed and expected other equipment will be installed in time to commence operations early in September.

Summit County

NEW GOLD STRIKE made in Montezuma district on Independence Mountain on ground adjoining Ida Belle mine.

JESSIE (Breckenridge)—Mill completely overhauled and will be in operation soon. Mine-development work continues to open good-grade ore.

MOLLY B (Breckenridge)—Good-grade gold-silver-copper ore being shipped High-grade gold-bismuth ore being sacked by lessees.

MOZART (Montezuma)—Adjoining Bullion group, taken over recently by A E Carlton, of Cripple Creek. Stated Carlton's holdings now include 30 patented claims.

TONOPAH PLACERS CO. (Breckenridge)—Railroad tracks of Colorado & Southern railroad laid around No. 1 dredge temporarily while dredge cuts through right-of-way. When dredge passes, tracks will be returned to old place, using tailings as road bed.

Teller County

COPELAND SAMPLER (Cripple Creek)—Improvements being made.

GOLD PINNACLE (Cripple Creek)—Vein 3 ft. wide, of good-grade, opened in surface trenching on Flying Cloud claim.

BIG TOAD (Cripple Creek)—Overhauling Reed mill of Dante Gold Mining Co. Will treat dump and low-grade mine ore under lease.

LAST DOLLAR (Cripple Creek)—Masonry work on new shaft house completed; foundations laid for change house and blacksmith shop.

C. O. D. (Cripple Creek)—Surface discovery on this Poverty Gulch mine, made by lessee just south of El Paso end line; 20-ft. shaft down in ore.

IDAHO

Shoshone County

HILL MINING CO. (Kellogg)—Situated near Wardner. Josiah Hill, president, states company is drifting to strike vein which has been traced from Yankee Boy, on Big Creek. Tunnel driven over 900 ft. in last year. Outcropping shows three distinct veins of white quartz with galena

LOMBARDY (Kellogg)—Consists of 15 claims now being surveyed for patent. Outcrop is chiefly oxidized iron. Being developed by tunnel just high enough above creek to allow for dump. Diabase dike struck by tunnel short distance from portal and vein of iron ore cut at 480 ft.

YUKON GOLD (Murray)—Dredge being installed on Prichard Creek near Murray is nearly completed as frame work is now in position and also much of the machinery. I. W. W. laborers caused delay in the work by unreasonable demands after they had obtained employment. Dredge will be completed before power line is finished.

ILLINOIS

ALUNITE CHEMICAL CO. (East St. Louis)—Will be incorporated in Missouri and manufacture a fertilizer with good percentage of potash. F. H Thwing, president, also of Evans Thwing Refining Co., of Kansas City, states that alunite ore will be shipped from southern Utah.

MICHIGAN

Copper

MASS (Mass)—Owing to labor shortage only shipping 700-800 tons.

NEW ARCADIAN (Houghton)—Shaft down 160 ft.; excellent speed being made, 5 ft. being the daily average.

NEW BALTIC (Houghton) — Eastern drift recently passed through narrow unidentified lode, carrying copper.

WINONA (Winona)—Likely to adopt flotation process: only working King Philip shaft No. 1 night shift, and getting splendid ground at its lowest levels.

VICTORIA (Rockland)—In August, will probably for first time in months, fall below 100 tons of mineral; great shortage of labor; mill improvements completed in another month.

BEAR LAKE "POOL" (Calumet)—Owing to delay of laying 4000 ft. of water pipe did not get started in diamond drilling first hole at angle of 55° until Aug. 29; deepening of pit disclosing excellent copper.

CHEROKEE (Houghton)—Usual good grades in western drift on 320-ft. level until discontinuing work there, Aug. 27; not much change in ground opened by sinking, copper showing constantly.

CALUMET & HECLA (Calumet)—Daily tonnage for week ending Aug. 25 was 9200; for that ending Sept. 1. 9600; increase due more to favorable circumstances than to increase of labor. Production of all mines for July was 11,933,433 lb. of copper.

MINNESOTA

Cuyuna Range

KENNEDY (Cuyuna)—Drifted through 1500 ft. of rock to open a new ore lens.

PENNINGTON (Ironton) — Removing 130,000 yd. additional overburden. Will forward 125,000 tons of ore this season.

NORTH THOMPSON (Crosby)—State lease, has removal of overburden well advanced and made first shipment to docks. Operated by Inland Steel Co.

KENNEDY (Cuyuna)—Fire in sub level. Shaft sealed three days to smother fire. Michigan state mine-rescue car squad with oxygen helmets entered mine after third day of fire and sealed all drifts leading to sub level. Idle on account of smoke and gas from burning timbers. Operated and owned by Rogers-Brown Ore Co.

Mesabi Range

SARGENT LAND CO. (Hibbing)—Has three drills at work prospecting its properties west of the St. Paul mine at Keewatin.

PETTIT (Gilbert)—Republic Iron and Steel Co is sinking new hoisting shaft to take place of one sunk in center of orebody several years ago

NORTH EDDY (Hibbing)—This mine, operated by the Dean Iron Co., sinking second hoisting shaft to 300 ft. Will be electrically equipped, power to be obtained from Great Northern Power Co.

MESABI MOUNTAIN (Virginia)—This Oliver Iron Mining Co. property plans to install an electric pump at Virginia Lake to furnish 100 gal. of water per minute for the steam shovels and locomotives in this pit. Permission asked of the city council for installation; lake shore is within city limits.

PICKANDS MATHER (Gilbert)—Belgrade and Corsica mines, which have been closed down for the last two weeks on account of sympathetic strike, caused by Finns walking out in sympathy with the I. W. W. of the Gogebic Range, have reopened. Strikers returned voluntarily.

MONTANA

Mineral County

ST. LAWRENCE (Saltese)—Eight cars copper-gold ore shipped up to present to Washoe smeltery at Butte. Hauling five miles to Saltese. Producing 10 tons per day.

Silver Bow County

OPHIR MILL (Butte)—E. H. Giberson, on Aug. 9, started suit asking for injunction to prevent further operation of mill. Claims it is a nuisance to tenants renting his houses adjoining and that vibrations impair foundations of his houses, wherefore he asks for $3000 in addition to injunction. Order to show cause why injunction should not be issued against Davis-Daly and Butte-Detroit companies will be heard Sept. 11.

NORTH BUTTE (Butte)—Foundation Co. of New York, under direction of W. I. Johnson, started concreting Granite Mountain shaft, beginning at the 3000-ft. level and working upward to 2400-ft. level. Balance of work will be carried on from various levels. Expect concreting between surface and 3000 level will be completed within four months. Lining of structural steel and concrete, and is absolutely fireproof. First shaft of its kind in Butte camp and experiment being watched with unusual interests by all companies in district. Another damage suit for $10,000 filed against company by Martin Gerrity, survivor of recent fire. Claims having been injured by exposures in the mine during 48 hours before being rescued.

NEVADA

Clark County

BIG CASINO MINING CO. (Searchlight)—Drifting east and west on 550-ft. level, struck orebody about 200 ft. long.

Lynn County

MASON VALLEY MINES CO. (Mason)—Report of W. H. Aldridge, president, for period of 4½ months, beginning Feb. 13, shows only one blast furnace in continuous operation, because of coke shortage; gross operating profit, $342,214, with net of $244,601, charging off six months' depreciation and deferred charges. Ore smelted was, Mason Valley 50,645 tons and other ores 80,666 tons. Blister copper produced was 5,877,682 lb., yielding 5,822,130 lb. copper, 436 oz. gold and 21,345 oz. silver.

Mineral County

NEVADA RAND (Rand)—Owns about 3000 ft. along vein, two miles northwest of Golden Pen mine, on same fissure, and adjoining property now operated by Queen Regent Co. Worked by vertical double compartment shaft, 450 ft. deep, with crosscuts and drifts at 150-, 250- and 450-ft. levels. Intermediate level run from winze, 30 ft. below 150-ft. level. Enriched zones on hanging- and foot-wall sides vary from 1½ to 13 ft. wide and oreshoot shown by present development is 210 ft. long. Expect to erect 40- to 50-ton mill, operating at cost of $4 to $5 per ton, using cyanidation and amalgamation. Charles Huber, Tonopah, president.

Nye County

TONOPAH ORE PRODUCTION for week ended Aug. 25 was 9107 tons, valued at $164,622, comparing with 8999 tons the previous week. Producers were: Tonopah Mining, 2600 tons; Tonopah Extension, 2380 tons; Jim Butler, 900 tons; West End, 913 tons; Rescue, 126 tons; Montana, 78 tons, and Cash Boy, 55 tons.

White Pine County

NEVADA CONSOLIDATED (McGill)—Production for July amounted to 7,253,337 lb. as compared with 6,850,186 in June and 8,537,231 in July, 1916.

NEW MEXICO

Grant County

CHINO COPPER CO. (Santa Rita)—July output was 7,343,757 lb. copper, against 7,193,262 lb. in June and 6,883,103 in July, 1916.

OREGON

Josephine County

FLEMING (Gold Hill)—O. M. Rasean, of Seattle, has crew of men at work on this manganese property. Could ship at once, but extent of ore will be first determined.

QUEEN OF BRONZE (Takilma)—In July, 1600 tons of copper ore shipped. Ore hauled by teams and trucks to Waters Creek railroad terminus, then to Tacoma via Grants Pass. R. C. Crowell, manager.

GREENBACK (Grants Pass)—Modern machinery being installed at this gold mine; entire plant electrified. Will be in operation by autumn. F. F. Childers, manager.

MEAD (Grants Pass)—Collins McDougall, of this place, leased this gold property on Jones Creek, five miles east. Ore is free milling. Vein is 12 ft. wide and opened for 1200 ft. Lessee is negotiating for 5-stamp mill to be operated by gasoline engine. Expects to crush 15 tons daily.

MANGANESE (Wilderville)—Michael G. Womack, of Medford, Ore., and M. A. Clark, of Ashland, Ore., are developing manganese, 2½ miles west of their recent manganese strike, 10 miles west of the Josephine Caves, on Buck Peak. Is 22 miles away from Wilderville, on the Grants Pass-Crescent City R.R.

PENNSYLVANIA

Lehigh County

BIRKENBINE ENGINEERING CO. (Phila.)—Has leased several farms at Zionsville, Penn.; Giles Drilling Co., New York, is exploring for iron ore. The land leased covers some old mines operated many years ago, but long abandoned.

UTAH

Juab County

VICTORIA GOLD (Eureka)—Option reported taken on this ground in north Tintic by large company. Bunches of lead ore on surface.

SIOUX CONSOLIDATED (Eureka)—Stringer of copper ore cut on 800-ft. level, where drifting east for continuation of Iron Blossom copper ore.

CHIEF CONSOLIDATED (Eureka)—Three new belt-driven, triplex pumps delivered; to be installed on 1800, 1200 and 600-ft. levels. Capacity, 300 gal. per min., each pump having own 75-hp. motor.

Salt Lake County

UTAH COPPER (Garfield)—Production for July was 18,127,154 lb. copper, comparing with 19,909,097 in June and 20,302,228 in July, 1916.

BINGHAM AMALGAMATED (Bingham)—Shaft on east side free of water below 300-ft. level, and ore being mined on that level. Two cars shipped from here in June.

ALTA-UTAH MINES (Alta)—Company to have capitalization of 1,000,000 shares, par value 10c., 600,000 shares in treasury, owns 150 acres of ground, adjoining South Hecla on west, Sells on north and Peruvian on south. George Watson, of South Hecla, president. Ground to be opened starting from western and eastern ends of property. Dwyer tunnel of the South Hecla will be extended easterly into the Alta-Utah ground; 100 ft. of work being necessary to reach the latter and work will be started at the same time in the tunnel on the Native Copper property—a part of the Alta-Utah—at the eastern end, driving toward the west. Work from the South Hecla side will give a depth of 900 ft. vertically from surface.

Summit County

ONTARIO SILVER (Park City)—Ore opened on the 1600-ft. level and drifting being done on levels above and below for upward and downward extension of the ore.

CALIFORNIA-COMSTOCK (Park City)—Ore in raise from stope above Walker drift opening up satisfactorily, and 50 ft. further along another raise being driven for same orebody. Since beginning work July 20, thirteen cars of ore shipped. Hampered somewhat by lack of men and railroad cars.

Tooele County

POLE STAR COPPER (Gold Hill)—New equipment working satisfactorily. Bismuth ore opened in floor of tunnel followed downward for 35 ft., up to 3 to 4 ft. wide; ore carries silver, gold, lead and copper as well as bismuth.

WESTERN MINES DEVELOPMENT (Gold Hill)—Big Chief mine, in Ferber district, owned by this company being developed. Ore, lead-silver. Shipments, held back by lack of teams, being made by autotruck to railroad station at Erickson's ranch.

VERMONT

Rutland County

KINNEY KOBBLE MANGANESE (South Wallingford)—This property, reopened in June by William C. Bull, of Danby and Bennington, Vt., has produced about 1200 tons of manganese ore. Recent analysis showed manganese 11.33%, iron, 12.07%, phosphorus, 0.09% and silica 4.16%. Feldspar and kaolin deposits also being opened on this property, which is about one-half mile from railroad. From former workings, about 20,000 tons of manganese ore was produced. Over 200 ft. of new work has been done.

WISCONSIN

Zinc-Lead District

FRONTIER (Galena)—New Hird No. 3 mill is completed at Benton.

C. S. H. (Platteville)—Two-jig mill has been constructed at G. O. P. mine, at Cuba City, with equipment moved from the Roosevelt.

OLD MEXICO (Platteville)—Bell mine equipment being installed on James Tracey lease, 6 miles west of Platteville. Chicago men financing the work.

LAURENCE MINES CO. (Dubuque, Ia.)—New run of zinc ore developed at Indian Mound property, on Murphy land, at New Diggings, since company took it over six months ago.

CANADA

Alberta

NICKEL DEPOSITS of considerable extent, said to have been found in Fond du Lac district by H. V. Dardier, mining engineer for Vickers-Maxim interests, and party, sent into the Athabasca country. Supplies and equipment were freighted and floated 2800 miles north of Edmonton, and three shafts sunk, according to current report.

British Columbia

CANADA COPPER CORPORATION (Greenwood)—Production of copper for June amounted to 178,976 lb. Plant closed down on June 26, owing to coke shortage, and operations resumed on Aug. 15.

Manitoba

TASH-ORN (Tashota)—Closed down pending reorganization.

PITTSBURGH LORRAIN (South Lorrain)—Force of 30 men employed and considerable quantity of high-grade ore being bagged for shipment.

Ontario

ORE SHIPMENTS over the Temiskaming & Northern Ontario Ry. for July were 1724 tons from properties in the Cobalt district, 1746 tons from Miller-Lake-O'Brien, in Elk Lake district, and 489 tons of nickel ore from Alexo mine, at Porquis Junction.

IMPERIAL (Porcupine)—Crosscut driven 136 ft. at the 200-ft. level is stated to be in ore of commercial grade for the last 58 feet.

NORTHERN PYRITES CO. (Northpines, via. Graham)—Shipping from 16 to 20 cars of ore per day. Expected that the total shipments for this season will amount to 100,000 tons.

MURRAY MOGRIDGE (Wolf Lake)—Shaft is down to near the 200-ft. level, where station will be cut and sinking continued to 300 ft. Drifting progressing on 50-ft. level.

PETERSON LAKE (Cobalt)—Quarterly statement for term ended July 31 shows cash on hand $43,122. Operations on Susquehanna section lead to belief that looked-for orebody will be found but if not search will be continued in other directions.

TEMISKAMING (Cobalt)—In reply to criticism, President F. L. Culver issued statement, showing that at time control was assumed in March, 1914, assets were placed at $116,304, the mine being considered as about exhausted. Since then several thousand dollars have been spent in betterments, $525,000 paid in dividends, and on Aug. 1, cash on hand was $216,560, and ore valued at $287,788. Deducting balance as of Mar. 31, 1914, shows net profit of $913,044.

SCHUMACHER (Schumacher)—Report to shareholders on occasion of reopening property states that mill has been overhauled and with additional tank capacity is expected to handle 150 tons per day, to be increased to 180 tons as soon as new tanks are completed. With new compressor installed, giving 25-drill capacity, one Hardinge mill and one tube mill will be installed to give 300-ton daily capacity. Additions allow lower-grade ore to be profitably mined. Decided to sink main shaft from present 600-ft. level to 1000 ft., and put down No. 1 shaft to 100 feet.

MEXICO

MINING TAXES, according to dispatch dated Sept. 4, will be the same that were assessed by decree by President Carranza as First Chief, prior to the constitutional period. The Chamber of Deputies have passed a bill to this effect. These taxes are progressive, taxing large holdings more than small ones.

CHILE

BRADEN (Sewell)—Production for July amounted to 6,015,000 lb. of copper.

The Market Report

Metal Markets

SILVER AND STERLING EXCHANGE

Aug. Sept.	Sterling Exchange	Silver New York, Cents	Silver London, Pence	Sept.	Sterling Exchange	Silver New York, Cents	Silver London, Pence
30	4 7556	90¾	46	3	. . . .	. . .	47
31	4 7556	90¾	46	4	4 7550	93⅝	47[illegible]
1	4 7556	90¾	46	5	4.7550	95⅝	48½

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

DAILY PRICES OF METALS IN NEW YORK

Aug. Sept.	Copper Electrolytic	Tin Spot.	Lead N. Y.	Lead St. L.	Zinc St. L.
30	24¼ @ 24¾	61¾	10¼ @ 10½	10 20 @ 10 40	7 70 @ 7.80
31	24¼ @ 24¾	61¾	10 @ 10¼	10 00 @ 10 20	7 70 @ 7 80
1	24½ @ 25	61¾	10 @ 10¼	10 00 @ 10 20	7 70 @ 7 80
3	.	. . .	. . . . .	. .	.
4	24¾ @ 25⅜	61⅓	10	9⅞ @ 10.00	7 70 @ 7 80
5	24¾ @ 25⅜	61	9¾ @ 10	9.70 @ 9.90	7½ @ 7¾

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

The quotations for electrolytic copper are for cakes; ingots and wirebars. Electrolytic copper is commonly sold on "regular terms" (r.t.), including freight to the buyer's works and is subject to a discount for cash The difference between the price delivered and the New York cash equivalent is at present about 0.25c. on domestic business. The price of electrolytic cathodes is 0.05 to 0.10c. below that of electrolytic. Quotations for spelter are for ordinary Prime Western brands. We quote New York price at 17c. per 100 lb. above St. Louis.

Some current freight rates on metals per 100 lb. are: St. Louis-New York 17c.; St. Louis-Chicago, 6.3c.; St. Louis-Pittsburgh, 13.1 cents.

LONDON

Aug. Sept.	Copper Standard Spot	Copper Standard 3 Mos.	Copper Electrolytic	Tin Spot	Tin 3 Mos.	Lead Spot	Zinc Spot
30	120	119½	137	244	242½	30½	54
31	120	119½	137	244½	243¼	30½	54
1							
*3							
4	120	119½	137	242	241	30½	54
5	120	119½	137	241	240	30½	54

* No cables received on this date.

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2,240 lb. For convenience in comparison of London prices, in pounds sterling per 2,240 lb., with American prices in cents per pound the following approximate ratios are given, reckoning exchange at 4.80. £15 = 3.21c.; £20 = 4.29c.; £30 = 6.43c.; £40 = 8.57c.; £60 = 12.85c. Variations, £1 = 0.21⅜c.

NEW YORK—Sept. 5

The same conditions continued to prevail in the metal markets, the uncertainty respecting action by the Government being the dominating factor. The only ameliorating condition was the general idea that things are coming to a head and that the trade will not be much longer delayed in knowing where it stands.

Copper, Tin, Lead and Zinc

Copper—As to business with domestic manufacturers, there was probably none, for barring an occasional inquiry nobody is disposed to enter into buying contracts so long as the present uncertainty continues. Rather has it been the policy of manufacturers to use the last pound of copper in their yards, down to the limit of safety, for keeping their works going. There is some reason to believe that not a few have carried the thing too far, and notices that have been issued this week by certain important refiners of inability to make deliveries owing to strikes are likely to be something of a shock.

In view of the small amount of business transacted the quotation of the market is largely nominal. There are reports of offers of fourth-quarter copper at as low as 23½c. net, cash, and of September copper at 24@25½c Yet the largest single transaction reported for the week was at 26c. cash, New York, for October. It is certain, however, that producers are willing to enter into large contracts at 25c., which may be considered the market.

All of the copper mines and metallurgical works of the Anaconda company in Montana, including the electrolytic-zinc plant, are now closed. The Tooele plant, in Utah, is operating at full capacity. The Raritan refinery is running about 50% rate. There is prospect that smelting will soon be resumed at Miami. As to the prospects in Montana, nobody is willing to prophesy. Our own belief is that the price-fixing controversy in Washington is at the root of all the trouble, and that if Washington is willing to pay the market price for copper the labor troubles in Montana and elsewhere will quickly clear up.

Copper Sheets are quoted at 35c. per lb. for hot rolled, and 1c. higher for cold rolled. Wire is quoted nominally at 31c. per lb., f.o.b. mill.

Tin—This market was very dull and a shade weaker. At the close Straits tin was quoted at 61c. and Banka tin at 59c.

Lead—The volume of business was very small. The American Smelting and Refining Co. reduced its price to 10½c. on Aug. 30, and was immediately undercut by other smelters. On Sept. 4, the price was further reduced to 10c., and some business was taken. The second cut was not generally known until Sept. 5. Hearing of it then, other producers and dealers offered at further concessions, but even those did not serve to attract buyers. The situation of lead, respecting September delivery, has now become fairly easy, while as to future deliveries sellers are bearish, October being reported offered at 9½c. and November at 9¼c.

The labor difficulties in southeastern Missouri are clearing up, but now a strike of miners in the Cœur d'Alene, on the subject of recognition of the union, is threatened

Zinc—Business was very small at unchanged prices up to Sept. 5, when sales were reported as low as 7½c. The best opinion in this market is that the bottom is not far away, if not already reached, and important interests have withdrawn, awaiting events. Although the unsold stocks of spelter are large, the curtailment of production is also large, the present rate being estimated at about 55,000 tons per month, or 10,000 tons less than the maximum.

Zinc Sheets—Price of zinc sheets has not been changed. Market is still at $19 per 100 lb. f.o.b. Peru, Ill., less 8% discount.

Gold, Silver and Platinum

Gold exports noted for the week were $1,000,000 to Peru and $1,000,000 to Japan

Silver—This market has been an excited and advancing one during the past week, owing to the urgent demand and short supplies both here and in London. China banks are bidding a premium over the yield of a London shipment on account of the lower cost of shipment by the Pacific route. Supplies of producers have been well sold ahead and demand continues in excess of offerings. Market closes firm.

Mexican dollars at New York: Aug. 29, 71c.; 30, 71c.; 31, 71c.; Sept. 1, 71c.; 4, 73c.

Recent shipments to China from San Francisco have been 4,670,000 oz. silver. China has also been a considerable buyer in London and in Australia.

Platinum—Steady at $105.

Palladium—In good demand at $120@125.

Other Metals

Aluminum—This market continues inactive with quotations nominal at 46@48c. for No. 1 ingots at New York. Price would probably be shaded for actual business.

Antimony—This market was stagnant, with a nominal quotation of 14½c. for spot, and 13¼@13½c., c.i.f. in bond for futures. It is reported that the antimony supply is contracting. Chinese production and shipments both falling off.

Bismuth—Unchanged at $3.50 per pound

Cadmium—Unchanged at $1.40@1.60 per pound.

Nickel—Steady at 50c. per lb., premium of 5c. per lb. for electrolytic.

Quicksilver—Unchanged at $115. San Francisco reports, by telegraph, $114, firm.

Zinc and Lead Ore Markets

Joplin, Mo., Sept. 1—Blende, per ton, high, $78.75; basis 60% Zn, premium, $75; medium to low, $70@65; calamine, per ton, basis 40% Zn, $40@38; average selling price, all grades of zinc, $66.40 per ton.

Lead, high, $98.90; basis 80% Pb, $100@90;; average selling price, all grades of lead, $96.21 per ton.

Shipments the week: Blende, 8023 tons, calamine, 500 tons, lead, 1091 tons. Value, all ores the week, $670,810.

Several zinc-ore buyers reduced their purchases one-half and one buyer reduced his 75%, causing a drop in shipment of 5975 tons of zinc ore less than last week Premium and low prices remain unchanged, but intermediate grades suffered a cut of $1 to $2.50 per ton. Lead was cut another $10 per ton, a drop of about $40 in three months.

Platteville, Wis., Sept. 1—Blende, basis 60% Zn, unchanged at $70 for premium ore down to $65 base for second grade. Lead ore, basis 80% Pb, reduced to $100 per ton. Shipments reported for the week are 2959 tons of zinc ore, 377 tons of lead ore, and 432 tons of sulphur ore. Shipments during the week to separating plants amount to 3307 tons of zinc ore. For the year to date the figures are: 95,560 tons of zinc ore, 4715 tons of lead ore, and 19,130 tons of sulphur ore.

Other Ores

Manganese Ore—Unchanged at $1 for high-grade metallurgical ore.

Molybdenum Ore—Molybdenite unchanged at $2.10@2.20.

Pyrites—Spanish lump quoted at 15½c per unit on basis of 10s. ocean freight, buyer to pay war risk, excess freight and any duty. Ocean freights are 32s. 6d. for northern ports, and 40s. for southern ports.

Tungsten Ore—High-grade wolframite was quoted at $23@24, while low grade was reported around $18.50. Scheelite was quoted at $26 for ore of 60% grade, with a premium of 30c. per unit above 60%.

Iron Ore—Season prices for Lake Superior iron ore remain on the basis of $5.05 for Mesabi non-bessemer, on Lake Erie dock, but advances over the season Lake rate of $1 are added. Bethlehem's recent purchase being at 50c. above the schedule, based on a Lake rate of $1.50. Predictions are made of a Lake rate of $2 before the close of navigation

Iron Trade Review

The magnitude of the Government's task in fixing steel prices is shown in repeated postponement of action, says "Iron Age." In the past week prominent producers have been called upon for additional data, and there is still no appointment for the expected meeting of the War Industries Board and the general committee of steel manufacturers.

The markets for pig iron, semi-finished steel and rolled products continue to drift Indications of coming readjustments are chiefly those given by resale transactions which are but meager basis for conclusions.

The August pig-iron statistics emphasize again the little success of blast furnace operators in the face of coke scarcity. The output was 3,247,947 tons, or 104,772 tons a day, against 3,342,438 tons in July, or 107,820 tons a day. New modern blast furnaces were started last month at five steel plants—Midvale, Bethlehem, Donner, Republic and Whitaker-Glesner—yet with all this reinforcement production declines. Many furnaces were banked for days at a time for lack of coke.

On Sept. 1, 357 furnaces were in blast, with daily capacity of 110,165 tons, while 351 furnaces with daily capacity of 109,248 tons were active on Aug. 1. The situation is well indicated by the fact that 25,660,000 tons of pig iron was produced in the first eight months of the year, or 175,000 tons less than in the first eight months of 1916, and yet 38 more furnaces were in blast at the opening of this month than on Sept. 1, 1916.

PITTSBURGH—Sept. 4

It is claimed there are specific advices from Washington that the prices the Government is to pay for steel products will be finally fixed within a week, but there is no hint as to what the schedule will be. In some quarters the declines in Wall Street the last few days are attributed to expectations that the prices will be lower than anticipated, but in other quarters the declines are attributed chiefly to the great excess profits taxes being considered in the Senate

The fixing of bituminous-coal prices a fortnight ago at a general average of about $2 created an impression that the steel prices would be low, but private advices received today from Washington are to the effect that the coal limits are likely to be raised within a week

The finished-steel market continues extremely quiet and almost devoid of transactions. Export demand is keen in some directions, but much of the business is held up by uncertainty as to the freedom with which export licenses will be granted

The plate market has undergone a definite decline. While until recently tank plates were strong at 9@10c., there have been sales lately at 8c. and even at a trifle less, and 8c. is the maximum of the market, though hardly the minimum. New capacity to the extent of 125,000 tons a month is expected to be brought in during the next six months approximately doubling the capacity for making plates suitable for shipbuilding and large tanks In other finished-steel products prices are not quotably changed, but an easier tone is in evidence in spots. Mills are sold up, as to the full output, for from two to four months, rarely for a longer period, and the general readjustment in finished-steel prices, which has been a certainty for some time past, cannot be delayed long. Perhaps the fixing of the Government's prices will be a signal for the readjustment in the general market to begin

Pig Iron—Average prices realized on sales of Valley iron in August are reported by W P Snyder & Co at $53 221 for bessemer, a decrease of $3 279 from the July average, and $49 122 for basic, a decline of $3.426, making the August averages not far from those of June The basic sales entering the average were made chiefly late in the month, and there was one of 5000 tons at $18, now the quotable market, although a firm bid at $17 might bring out iron Bessemer remains quotable at $52, while foundry and malleable are quotable at $53 instead of $53@55 as formerly Prices delivered Pittsburgh are 95c higher

Steel—A middle interest has been offering billets at $75, the lowest mill quotation apparently being $75 There is practically no demand, and the general trend of the market in billets, forging billets, sheet bars and rods is downward

Ferroalloys

Ferromanganese—Usual quotations remain at $375@400 for prompt and balance of year and $350 for first quarter or first half of next year, but these quotations are sometimes shaded Sale of a round lot for near-by delivery is reported at $350 Prices are with freight allowed

Coke

Connellsville—There is no news as to the Government fixing prices on coke but the expectation remains that the action will be taken, under the provision in the Food Control law which covered coal and coke The market is about 50c easier in the week, at $13@13.50 for spot furnace and $13.50@14.50 for spot foundry per net ton at ovens

STOCK QUOTATIONS

N. Y. EXCH.†	Sept. 4
Alaska Gold M	5
Alaska Juneau	3
Am Sm & Ref ,com.	91
Am. Sm. & Ref , pf	109
Am. Sm. Sec , pf , A	98
Am. Sm. Sec., pf B	‡93
Am. Zinc	17
Am Zinc, pf	53
Anaconda	65
Batopilas Min	1
Bethlehem Steel	107
Bethlehem Steel, pf.	98
Butte & Superior.	28
Cerro de Pasco	32
Chile Cop	16
Chino	50
Colo Fuel & Iron	43
Crucible Steel	66
Dome Mines	9
Federal M & S	15
Federal M. & S., pf	43
Great Nor , ore ctf.	32
Greene Cananea	39
Gulf States Steel	97
Homestake	108
Inspiration Con	51
International Nickel	35
Kennecott	40
Lackawanna Steel	77
Miami Copper	32
Nat'l Lead, com.	52
National Lead, pf	102
Nev. Consol	21
Ontario Min	6
Quicksilver	1
Quicksilver, pf	1
Ray Con	25
Republic I &S.,com.	77
Republic I & S , pf	101
Sloss-Sheffield	45
Tennessee C. & C.	15
U. S. Steel, com	104
U. S. Steel, pf	116
Utah Copper	93
Va Iron C. & C.	55

N. Y. CURB†	Sept. 4
Big Ledge.	1
Butte & N Y.	1
Butte C. & Z	9
Caledonia	.69
Calumet & Jerome.	1
Can Cop. Corpn	2
Carlisle	4
Cashboy	07
Con. Ariz. Sm.	1
Con. Coppermines.	8
Con. Nev.-Utah.	.06
Emma Con	‡1
Ferber.	‡ 60
First Nat. Cop	2
Goldfield Con.	51
Goldfield Merger.	.06
Greenmonster.	.75
Hecla Min	8
Howe Sound	5
Jerome Verde	1
Kerr Lake	5
Magma	44
Majestic	36
McKinley-Dar-Sa	63
Milford	1
Mohican	‡37
Mother Lode	31
N. Y. & Hond	13
Nipissing Mines	8
Ohio Cop	1
Ray Hercules	3
Richmond	56
Rochester Mines	53
St Joseph Lead.	18
Standard S. L..	[illegible]
Stewart	.34
Success	21
Tonopah	6
Tonopah Ex	2
Tribullion	[illegible]
Troy Arizona	.19
United Cop	[illegible]
United Verde Ext.	36
United Zinc	4
Utica Mines	28
White Knob, pf.	‡1
Yukon Gold	2

SAN FRAN.*	Sept. 4
Alta	03
Andes	10
Best & Belcher.	02
Bullion	02
Caledonia	12
Challenge Con	01
Confidence	05
Con Virginia	11
Gould & Curry	‡ 02
Hale & Norcross	02
Jacket-Cr Pt	08
Mexican	08
Occidental	60
Ophir	07
Overman	01
Savage	03
Seg Belcher	1 02
Sierra Nevada	07
Union Con	27
Utah Con	02
Belmont	4 90
Jim Butler	90
MacNamara	11
Midway	11
Mont -Tonopah	10
North Star	10
Rescue Eula	10
West End Con.	68
Atlanta	12
Booth	06
Comb Frac	03
D'field Daisy	03
Florence	14
Jumbo Extension	26
Kewanas	12
Nevada Hills	15
Nevada Packard	31
Round Mountain	25
Silver Pick	06
White Caps	1 47
Big Jim	‡ 69
United Eastern	4 37

BOSTON EXCH.*	Sept. 4
Adventure	2
Ahmeek	97
Algomah	50
Allouez	62
Ariz Com., ctfs	11
Arnold	25
Bonanza	21
Butte-Ballaklava.	50
Calumet & Ariz	77
Calumet & Hecla	540
Centennial	17
Copper Range	53
Daly West	1
Davis-Daly	4
East Butte	10
Franklin	6
Granby	77
Hancock	13
Hedley	17
Helvetia	25
Indiana	2
Isle Royale	28
Keweenaw	1
Lake	8
La Salle	3
Mason Valley	6
Mass	10
Mayflower.	1
Michigan	1
Mohawk	78
New Arcadian	2
New Idria	‡13
North Butte	15
North Lake	1
Ojibway.	[illegible]
Old Dominion	52
Osceola	[illegible]
Quincy	82
St. Mary's M. L.	70
Santa Fe	1
Seneca	7
Shannon	7
Shattuck-Ariz.	22
So. Lake	2
So. Utah	.16
Superior	7
Superior & Bost	3
Trinity	5
Tuolumne	1
U. S. Smelting	57
U. S. Smelt'g, pf	48
Utah Apex	3
Utah Con	15
Utah Metal.	4
Victoria.	3
Winona	3
Wolverine	45
Wyandot.	.85

BOSTON CURB*	Sept. 4
Alaska Mines Corp	50
Bingham Mines	12
Boston Ely	65
Boston & Mont	62
Butte & Lon'n Dev	15
Calaveras	‡3
Calumet-Corbin.	01
Chief Con.	2
Cortez	10
Crown Reserve.	23
Crystal Cop	.78
Eagle & Blue Bell	2
Houghton Copper	75
Intermountain	1
Iron Cap, Com	15
Iron Cap Cop , pf	15
Mexican Metals	.32
Mines of America	1
Mojave Tungsten	40
Nat Zinc & Lead	36
Nevada-Douglas	98
New Baltic	99
New Cornelia.	17
Oneco.	‡ 35
Pacific Mines	34
Rex Cons	.16

SALT LAKE*	Sept. 4
Bannack	55
Big Four	05
Black Jack	‡ 06
Cardiff	5 10
Colorado Mining	10
Daly-Judge	8 45
Empire Copper.	1 30
Gold Chain	18
Grand Central	50
Grand Gulch	‡ 19
Iron Blossom	87
Lower Mammoth	03
May Day	06
Moscow	15
Prince Con	97
Silver-King Coal'n	3 00
Silver King Con.	3 05
Sioux Con	11
So. Hecla	1 20
Uncle Sam	04
Wilbert	20
Yankee	07

TORONTO*	Sept. 4
Bailey	03
Beaver Con	31
Buffalo Mines	‡1 00
Chambers Ferland	11
Coniagas	3 80
Hargraves	13
La Rose	50
Peterson Lake	10
Right of Way	1 05
Temiskaming	28
Wettlaufer-Lor	07
Dome Exten	16
Dome Lake	17
Foley O'Brien	‡ 60
Hollinger	4 60
McIntyre	1 57
Newray	81
Porcu Crown	41
Schumacher	1 42
Teck Hughes	45
Vipond	32
West Dome	16

STOCK QUOTATIONS—Continued

COLO. SPRINGS	Sept. 4
Cresson Con	5 87
Doctor Jack Pot	04
Elkton Con	05
El Paso	26
Gold Sovereign.	04
Golden Cycle	2 03
Granite	45
Isabella	10
Mary McKinney.	12
Portland	1 40
United Gold M	16
Vindicator	.60

LONDON	Aug 20		
Alaska Mexican	£0	10s	0d
Alaska Tre'dwell	1	2	6
Burma Dorp.	4	0	0
Cam & Motor.	0	9	6
Camp Bird.	0	7	9
El Oro.	0	10	6
Esperanza.	0	9	9
Mexican Mines.	5	0	0
Nechi, pfd.	0	12	6
Oroville	0	15	9
Santa Gert'dis.	0	11	6
Tomboy.	0	18	6

* Bid prices. † Closing prices. ‡ Last Quotations.

MONTHLY AVERAGE PRICES OF METALS

Silver	New York			London		
	1915	1916	1917	1915	1916	1917
January	48.855	56.775	75.630	22.731	26.960	36.682
February	48.477	56.755	77.585	22.753	26.975	37.742
March	50.241	57.935	73.861	23.708	27.597	36.410
April	50.250	64.415	73.875	23.709	30.662	36.963
May	49.915	74.269	74.745	23.570	35.477	37.940
June	49.034	65.024	76.971	23.267	31.060	39.0[illegible]5
July	47.519	62.940	79.010	22.597	30.000	40.110
August	47.163	66.083	85.407	22.780	31.498	43.418
September	48.680	68.515		23.591	32.584	
October	49.385	67.855		23.925	32.361	
November	51.714	71.604		25.094	34.192	
December	54.971	75.765		26.373	36.410	
Year	49.684	65.661		23.675	31.315	

New York quotations cents per ounce troy, fine silver. London, pence per ounce, sterling silver, 0.925 fine

Copper	New York		London			
	Electrolytic		Standard		Electrolytic	
	1916	1917	1916	1917	1916	1917
Jan	24.008	28.673	88.083	131.921	116.167	142.895
Feb.	26.440	31.750	102.667	137.895	133.167	148.100
Mar	26.310	31.481	107.714	136.750	136.000	151.000
April	27.895	27.935	124.319	133.842	137.389	147.158
May	28.625	28.788	135.457	130.000	152.522	142.000
June	26.601	29.962	112.432	130.000	137.455	142.000
July	23.865	26.620	95.119	128.409	125.500	140.409
Aug	26.120	25.380	110.283	122.391	126.304	137.000
Sept	26.855		113.905		[illegible].071	
Oct	27.193		122.750		142.523	
Nov	30.625		134.659		155.432	
Dec	31.890		145.316		162.842	
Year	27.202		116.059		138.281	

Tin	New York		London	
	1916	1917	1916	1917
January	41.825	44.175	175.548	185.813
February	42.717	51.420	181.107	198.974
March	50.741	54.388	193.609	207.443
April	51.230	55.910	199.736	220.171
May	49.125	63.173	196.511	245.114
June	42.231	62.053	179.466	242.083
July	38.510	62.570	168.357	242.181
August	38.565	62.681	169.870	243.978
September	38.830		171.345	
October	41.241		179.307	
November	44.109		186.932	
December	42.635		183.368	
Av. year	43.480		182.096	

Lead	New York		St. Louis		London	
	1916	1917	1916	1917	1916	1917
January	5.921	7.626	5.826	7.530	31.167	30.500
February	6.246	8.636	6.164	8.595	31.988	30.500
March.	7.136	9.199	7.375	9.120	34.440	30.500
April	7.630	9.288	7.655	9.158	34.368	30.500
May	7.463	10.207	7.332	10.202	32.967	30.500
June	6.936	11.171	6.749	11.123	31.011	30.500
July	6.352	10.710	6.185	10.644	28.137	30.500
August	6.244	10.594	6.088	10.518	29.734	30.500
September	6.810		6.699		30.786	
October	7.000		6.898		30.716	
November	7.042		6.945		30.500	
December	7.513		7.405		30.500	
Year	6.853		6.777		31.350	

Spelter	New York		St. Louis		London	
	1916	1917	1916	1917	1916	1917
Jan	16.913	9.619	16.745	9.449	89.810	48.329
Feb	18.420	10.045	18.260	9.875	97.762	47.000
Mar	16.846	10.300	16.676	10.130	95.048	47.000
April	16.695	9.459	16.525	9.289	99.056	54.632
May	14.276	9.362	14.106	9.192	94.217	54.000
June	11.752	9.371	11.582	9.201	68.591	54.000
July	8.925	8.643	8.755	8.473	50.750	54.000
Aug	8.730	8.360	8.560	8.190	51.587	54.000
Sept	8.990		8.820		52.095	
Oct	9.829		9.650		54.159	
Nov	11.592		11.422		56.023	
Dec	10.665		10.495		55.842	
Year	12.804		12.634		72.071	

New York and St Louis quotations, cents per pound. London, pounds sterling per long ton

Pig Iron, Pitts.	Bessemer†		Basic†		No. 2 Foundry	
	1916	1917	1916	1917	1916	1917
January	$21.60	$35.95	$18.78	$30.95	$19.70	$30.95
February	21.16	36.37	18.93	30.95	19.51	30.95
March	21.81	37.37	19.20	33.49	19.45	35.91
April	21.65	42.23	18.95	38.90	19.45	40.06
May	21.78	46.94	19.11	42.84	19.58	43.00
June	21.95	54.22	18.95	50.05	19.34	50.14
July	21.95	57.45	18.95	53.80	19.20	53.95
August	21.95	54.17	18.95	50.37	19.22	53.95
September	22.88		19.58		19.53	
October	24.61		21.26		21.51	
November	30.07		28.18		26.55	
December	35.16		30.95		30.79	
Year	$23.88		$20.98		$21.15	

† As reported by W P Snyder & Co

Current Prices—Materials and Supplies

IRON AND STEEL

SHEETS—Price in cents per pound:

Blue Annealed	Large Lots. Pittsburgh	St. Louis	Chicago	San Francisco	New York Sept. 1. 1917	New York One Yr. Ago
No. 10	8.00 to 9.00	10.05	10.00	11.00	10.00	4.25
No. 12	8.05 to 9.05	10 10	10.05	11.05	10.05	4.30
No. 14	8.10 to 9.10	10.15	10.10	11.10	10.10	4.35
Black						
Nos. 18 and 20	7.80 to 8.80	10.15	9.80	11.07	10.30	3.45
Nos. 22 and 24	7.85 to 8.85	10.20	9.85	11.12	10.35	3.50
No. 28	8.00 to 9.00	10.35	10.00	11.37	10.50	3.65
No. 26	7.90 to 8.90	10.25	9.90	11.12	10.40	3.55
Galvanized						
No. 10	9.00 to 10.00	10.95	10.70	....	....	....
No. 12	9.10 to 10.10	10.95	10.70	12.15	....	....
No. 14	9.10 to 10.10	10.95	10.70	12.15	....	4.10
No. 16	9.10 to 10.10	10.95	10.70	12.15	....	4.10
Nos. 18 and 20	9.40 to 10.40	11.15	11.00	12.45	11.40	4.40
Nos. 22 and 24	9.55 to 10.55	11.30	11.15	12.59	11.55	4.55
No. 26	9.70 to 10.70	11.45	11.20	12.74	11.70	4.70
No. 28	10.00 to 11.00	11.75	11.50	13.03	12.00	5.00

STEEL RAILS—The following quotations are per ton f.o.b. Pittsburgh and Chicago for carload or larger lots. For less than carload lots 5c. per 100 lb. is charged extra:

	Pittsburgh Sept. 1. 1917	Pittsburgh One Year Ago	Chicago* Sept. 1. 1917	Chicago* One Year Ago
Standard bessemer rails..	$38.00	$33.00	$38.00	$33.00
Standard openhearth rails.	40.00	35.00	40.00	35.00
Light rails, 8 to 10 lb....	83.00 to 84.00	50.00	95.00 to 100.00	43.00
Light rails, 12 to 14 lb...	82.00 to 83.00	49.00	95.00 to 100.00	42.00
Light rails, 25 to 45 lb...	75.00 to 80.00	47.00	95.00 to 100.00	40.00

*Activity in rails principally governmental.

TRACK SUPPLIES—The following prices are base per 100 lb. f.o.b. Pittsburgh for carload lots, together with the warehouse prices at the places named:

	Pittsburgh Sept. 1 1917	Pittsburgh One Year Ago	Chicago	St. Louis	San Francisco
Standard railroad spikes, 9/16-in. and larger.......	$7.00	$2.65	$5.00	$5.75	$5.75
Track bolts	7.00	3.25	6.25	Premium	7.30
Standard section angle bars	3.65	2.00	4.50	Premium	4.65

STRUCTURAL MATERIAL—The following are the base prices f.o.b. mill, Pittsburgh, together with the quotations per 100 lb. from warehouses at the places named:

	Pittsburgh	New York Sept. 1. 1917	New York 1 Yr. Ago	St. Louis	Chicago	San Francisco	Dallas
Beams, 3 to 15 in........	$4.50	$5.25	$3.25	$5.05	$5.00	$7.75	$6.00
Channels, 3 to 15 in.......	4.60	5.25	3.25	5.05	5.00	7.75	6.00
Angles, 3 to 6 in., ¼ in. thick	4.50	5.25	2.50	5.05	5.00	7.75	6.25
Tees, 3 in. and larger.....	4.50	5.30	3.30	5.05	5.05	7.75	6.00
Plates	10.00	10.00	4.00	10.05	10.00	10.00	9.00

RIVETS—The following quotations are per 100 lb.:

STRUCTURAL

	Mill. Pittsburgh	Warehouse New York	Warehouse Chicago	Warehouse St. Louis	Warehouse San Francisco	Warehouse Dallas
¾ in. and larger....	$5.25	$7.00	$5.50	$5.55	$7.15	$8.40

CONE HEAD BOILER

	Mill. Pittsburgh	New York	Chicago	St. Louis	San Francisco	Dallas
¾ in. and larger....	5.35	7.10	5.60	5.65	7.25	8.50
⅝ and 11/16.........	5.50	7.25	5.75	5.80	7.40	8.65
½ and 9/16..........	5.85	7.60	6.10	6.15	7.75	9.00

Lengths shorter than 1 in. take an extra of 50c. Lengths between 1 in. and 2 in. take an extra of 25c.

HORSE AND MULE SHOES—Warehouse prices per 100 lb. in cities named:

	Mill. Pittsburgh	Cincinnati	Chicago	St. Louis	Denver	Birmingham
Straight	$4.75	$6.75	$7.00	$7.00	$7.75	$6 75
Assorted ...	4.90	7.25	7.00 to 7.50	7.15	8.00	7.25

WIRE ROPE—Discounts from list price on regular grades of bright and galvanized are as follows:

	New York	St. Louis	Chicago	San Francisco
Galvanized	10—2½%	10—2½%	10—2½%	15%
Bright	20—2½%	20—2½%	20—2½%	10%

SWEDISH (NORWAY) IRON—This material per 100 lb. sells as follows:

	Sept. 1, 1917	One Year Ago
New York	$14.00	$6.00
Cleveland	13.30	6.30
Chicago	13.00	5.50

In coils an advance of 50c. usually is charged:
Note—Stock scarce generally.

PIPE—The following discounts are for carload lots f.o.b. Pittsburgh, as per basing card of July 2, 1917:

BUTT WELD

Steel Inches	Black	Galvanized	Iron Inches	Black	Galvanized
¾ to 3.......	49%	35½%	¾ to 1½......	33%	17%
LAP WELD					
2	42%	29½%	2	26%	12%
2½ to 6......	45%	32½%	2½ to 4......	28%	15%
7 to 12.......	42%	28½%	4½ to 6......	28%	15%
13 and 14.....	32½%	....	7 to 12.......	25%	12%
15	30%	....			
BUTT WELD. EXTRA STRONG PLAIN ENDS					
¾ to 1½......	47%	34½%	¾ to 1½......	33%	18%
2 to 3.........	48%	35½%			
LAP WELD. EXTRA STRONG PLAIN ENDS					
2	40%	28½%	2	27%	14%
2¼ to 4......	43%	31½%	2¼ to 4......	29%	17%
4½ to 6......	42%	30½%	4½ to 6......	28%	16%
7 to 8........	38%	24½%	7 to 8........	20%	8%
9 to 12........	35%	19½%	9 to 12........	15%	3%

From warehouses at the places named the following discounts hold for steel pipe:

	Black New York	Black Chicago	Black St. Louis
¾ to 3 in. butt welded...........	38%	42.8%	42.8%
3½ to 6 in. lap welded...........	18%	38.8%	38.8%
7 to 12 in. lap welded............	10%	35.8%	.....

	Galvanized New York	Galvanized Chicago	Galvanized St. Louis
¾ to 3 in. butt welded...........	22%	27.8%	27.8%
3½ to 6 in. lap welded...........	List	24.8%	24 8%
7 to 12 in. lap welded............	List	20.8%	.....

Malleable fittings, Class B and C, from New York stock sell at 5 and 5% from list prices Cast iron, standard sizes, 34 and 5%.

MISCELLANEOUS

FLOTATION OILS—Prices of oils for flotation, in cents per gallon, in barrels:

	Nek York	Chicago	Denver In Bbl. Lots	Denver In Carload Lots
Pure steam-distilled pine oil........	$0.50½	$0.45	$0.30	$0.27
Pure destructively distilled pine oil	.40	.43	.30	....
Pine tar oil	.26	.30	.22½	.19
Crude turpentine	.37	.47	.44	.38
Hardwood creosote	.19½*	.....	.34½	.31

*F.o.b. Cadillac, Mich.

SODIUM CYANIDE—New York price is 30c. per lb.; Denver, 46c. to 48c.; in Chicago, 65c.

SODIUM SULPHIDE—In New York the price per pound is 3¾c. for concentrated, 2c. for crystals. The Denver price for concentrated is quoted at 3½c. The Chicago price is 3½c. Concentrated comes in 500-lb. drums, the crystals in 400-lb. barrels.

ZINC DUST—New York price is 18c. per lb. in 1600-lb. barrel; Denver, 14c.; Chicago, 18c.

CALCIUM CARBIDE—Price f.o.b. cars at warehouse points east of Mississippi River (except in Alabama, Georgia and Florida) is $90 for Cameo, $95 for Union. In territory between Mississippi River and the Rockies and in Alabama, Georgia and Florida, add $5; west of Rockies, add $10 to $15.

HOSE—

Fire

	50-Ft. Lengths
Underwriters' 2⅝-in.	70c. per ft.
Common, 2½-in.	40–10%

Air

	First Grade	Second Grade	Third Grade
¾-in. per ft.	$0.55	$0.30	$0.25

Steam—Discounts from list

First grade... 30% Second grade... 30-5% Third grade... 40-10%

RUBBER BELTING—The following discounts from list apply to transmission rubber and duck belting:

Competition	50–10%	Best grade	25%
Standard	40%		

LEATHER BELTING—Present discounts from list in the following cities are as follows:

	Medium Grade	Heavy Grade
New York	40%	35%
St. Louis	50%	40%
Chicago	40—5%	35—10%
Birmingham	35%	35%
Denver	40%	45%

RAWHIDE LACING—40%

MANILA ROPE—For rope smaller than ⅝-in. the price is ½ to 2c. extra; while for quantities amounting to less than 600 ft. there is an extra charge of 1c. The number of feet per pound for the various sizes is as follows: ⅝-in., 8 ft.; ¾-in., 6; ⅞-in., 4½; 1-in., 3½; 1⅛-in., 2 ft. 10 in.; 1¼-in., 2 ft. 4 in. Following is price per pound for ⅝-in. and larger, in 1200-ft. coils:

Boston	$0.34	Kansas City	$0.31½
New York	.33½	New Orleans	.31
Chicago	.31½	Los Angeles	.30
Denver	.34		

PACKING—Below are prices each per pound in cities named:

Asbestos

		St. Louis	New York	Denver	Birmingham
Valve pump Stuffing Box	Twisted plain, 25-lb. cartons	$1.25	$0.65@0.70	....	$1.50
	Twisted graphite, 25-lb. cartons	1.25	.90	$1.40	1.50
	Braided plain, 25-lb. cartons..	1.50	80	.60	1.50
	Braided graphite, 25-lb. cartons	1.50	1.00	.60	1.50

Asbestos wick in balls, ¼-, ½-, 1-, 25- and 50-lb. cartons, $0.65@0.70, New York; $1, Chicago.

Rubber asbestos, compressed sheet, medium grade about $0.80, New York, 45c., St. Louis; $1 Chicago.

STEAM

Following in 25- and 50-lb. cartons:

	New York	Denver	Birmingham	St. Louis
First grade	$0.83	$0.80	$1.00	$0.80
Second grade	55	.80	.90	....

RUBBER AND DUCK

High grade	$0.50	....	....	$0.60
Cold water	30	....	....	.40

PISTON

Asbestos, duck and rubber....	$1.75	$0.80	$0.90	$1.50
Flax, first grade	.94	.60	.32	.75
Rubber and duck	.90	.60	.60	.60

RAILWAY TIES—For fair-size orders, the following prices per tie hold:

	Material	6 in. x 8 in. by 8 Ft.	7 in. x 9 in. by 8 Ft. 6 In.
New York	Yellow Pine	$1.06 to 1.11	$1.25
St. Louis	No. 1 White Oak	1.00	.75
Chicago	White Oak	.97	.82
San Francisco	Green	.77	1.01
San Francisco	Creosoted	1.20	1.62

GREASES—Prices are as follows in the following cities in cents per pound for barrel lots:

	New York	Denver	Chicago	Birmingham	St Louis
Cup	5 to 7	8	7½	5½	5.6
Fiber or sponge	5 to 7	15	7¾	12½	5.9
Transmission	5 to 7	9	6¼	12½	5.9
Axle	3 to 7	5	5	4¼	3.3
Gear	4 to 5	5	6¼	10½	6
Car journal	5½ to 7¼	4½	6	9	3.75

WIPING CLOTHS—In Cleveland the jobbers' price per 1000 is as follows:

13¼ x 13¼ .... $35.00 13¼ x 20½ $45.00

In Chicago they sell at $30 to $33 per 1000.

COTTON WASTE—The following prices are in cents per pound:

	New York			
	Sept. 1 1917	One Year Ago	Cleveland	Chicago
White	11.00 to 12.00	12.50	16.00	14.00 to 15.00
Colored mixed	8.50 to 12.00	9.00	14.00	10.00 to 12.00

LINSEED OIL—These prices are per gallon:

	New York		Cleveland		Chicago	
	Sept. 1. 1917	One Year Ago	Sept. 1. 1917	One Year Ago	Sept. 1. 1917	One Year Ago
Raw in barrels	$1.26	$0.75	$1.30	$0.75	$1.27	$0.75
5 gal cans	1.35	.85	1.40	85	1.37	85

WHITE AND RED LEAD in 500-lb. lots sell as follows in cents per pound:

	Red				White	
	Sept. 1, 1917		1 Year Ago		Sept 1 1917	1 Yr Ago
	Dry	In Oil	Dry	In Oil	Dry and In Oil	Dry and In Oil
100-lb keg	13.25	13.50	10.50	11.00	13.00	10.50
25- and 50-lb kegs	13.50	13.50	10.75	11.25	13.25	10.75
12½-lb keg	13.75	14.00	11.00	11.50	13.50	11.00
1- to 5-lb cans	15.25	15.50	12.50	12.50	15.50¾	12.50

NUTS—From warehouse at the places named, on fair-sized orders, the following amount is deducted from list:

	New York		Cleveland		Chicago	
	Sept 1 1917	One Year Ago	Sept. 1 1917	One Year Ago	Sept 1 1917	One Year Ago
Hot pressed square	List	$1.50	$1.65	$2.75	$3.00	$3.25
Hot pressed hexagon	List	1.50	1.50	2.75	3.00	3.25
Cold punched square	List	1.00	1.25	2.50	1.60	3.00
Cold punched hexagon	List	1.50	1.25	3.00	2.00	3.50

Semifinished nuts sell at the following discounts from list price:

	Sept 1, 1917	One Year Ago
New York	50%	50—10%
Cleveland	15%	60%
Chicago	50%	65%

MACHINE BOLTS—Warehouse discounts in the following cities

	New York	Cleveland	Chicago
⅜ by 4 in. and smaller	30%	35—5%	40—10%
Larger and longer up to 1 in. by 30 in.	15%	20—5%	35—5%

WROUGHT WASHERS—From warehouses at the places named the following amount is deducted from list price:

New York $5.00 Cleveland $1.50 Chicago $1.00

For cast iron washers the base price per 100 lb. is as follows:

New York $2.25 Cleveland $1.50 Chicago $3.50

EXPLOSIVES—Price per pound in small lots at cities named:

	Low Freezing	Gelatin		
	20%	40%	60%	80%
New York	......	$0.26½	$0.33½	......
Boston	......	......	.33¼	$0.40¾
Kansas City	$0.10	.25¼	.39¼	.42¼
New Orleans	......	.24¼	.32¼	......
Chicago	.18¾	.22¾	.32	......
St. Louis	.15¼	.19¼	.28½	.38½
Los Angeles	.10	.25	.32¼	.....
Denver	.18	.24¼	.31¼	.41¼
Dallas	.24	.28	.38	.48
San Francisco	.17½	.23½	.30½	.40½

FUEL OIL—Price variable, depending upon stock. New York quotations not available owing to this fact. In Chicago and St. Louis the following prices are quote:

	Chicago	St. Louis
Domestic light, 22-26 Baume	7¾c.	8.5c.

Note—There is practically no fuel oil in Chicago at present time.

OILS—Price per 50-gal. bbl. is as follows:

City	Fuel	Black	Red Engine	Steam Cylinder	Gasoline
New Orleans	$5.00	$7.75	$9.50	$16.30	$11.25
Seattle	4.40	6.25	11.00	21.00	10.25
Denver	2.87	8.25	15.50	23.00	12.00
Los Angeles	1.45	6.50	12.00	26.00	10.00
Denver	2.87	8.25	15.50	23.00	12.00
St. Paul	3.00	5.50	11.00	17.50	10.05
Cincinnati	5.00	5.50	10.50	17.00	12.00
Boston	5.25	8.00	12.50	18.75	12.50
Kansas City	6.95	4.35	10.35	17.35	10.15

Note—Standard prices of oil are necessarily difficult to give. Those above are for average grades.

CONSTRUCTION MATERIALS

ROOFING MATERIALS—Prices per ton f.o.b. New York or Chicago:

	Carload Lots	Less Than Carload Lots
Tar felt (14 lb. per square of 100 sq.ft.)	$61.00	$62.00
Tar pitch (in 400-lb. bbl.)	15.00	16.50
Asphalt pitch (in barrels)	29.00	30.50
Asphalt felt	60.00	62.00

PREPARED ROOFINGS—Standard grade rubbered surface complete with nails and cement costs per square as follows in New York and Chicago:

	1-Ply		2-Ply		3-Ply	
	c.l.	l.c.l.	c.l.	l.c.l.	c.l.	l.c.l.
No. 1 grade	$1.25	$1.40	$1.45	$1.60	$1.75	$1.90
No. 2 grade	1.10	1.25	1.25	1.40	1.50	1.65

Asbestos asphalt saturated felt (14 lb. per square) costs $5.35 per 100 lb.

Slate-surfaced roofing (red and green) in rolls of 108 sq.ft. costs $1.85 per roll in carload lots and $2.10 for smaller quantities.

Shingles, red and green slate finish, cost $4.75 per square in carloads, $5 in smaller quantities, in Philadelphia.

HOLLOW TILE—

	4x12x12	8x12x12	12x12x12
Boston	$0.0957	$0.171	$0.2266
Kansas City*	.0595	.1125	.1575
Denver	.09	.17	.25
New Orleans	.0892	.1417	.1863
Los Angeles*	.05	.10	.165
Chicago	.07	.135	...

*In quantities of 1000.

LUMBER—Price per M in carload lots:

	1-In. Rough, 10 In. x 16 Ft. and Under			2-In. T. and G 10 In. x 16 Ft	
	Y P	Fir	Hemlock	Y P.	Fir
Kansas City	$44.00	$41.50	$43.00	$52.00	.
Seattle	18.50	18.50	18.50	18.50	$18.50
New Orleans	38.00		...	36.00	.
St Paul	....	51.00	33.50	50.00	37.50
San Francisco	....	22.00	22.00	....	22.00

	8 x 8-In. x 20 Ft. and Under				12 x 12-In. 20 Ft. and Under	
	Y P	Fir	Hemlock	Spruce	Y P	Fir
Kansas City	$30.00	$35.00	$35.00	...	$45.00	$35.00
Seattle	18.50	18.50	18.50	18.50	$18.50	18.50
New Orleans	38.00		.		38.00	
St Paul	.	40.00	31.50	32.00	....	45.00
San Francisco		22.00	22.00	....	22.00	22.00

PORTLAND CEMENT—These prices are for barrels in carload lots, including bags:

	Sept 1 1917	One Month Ago	One Year Ago
New York	$2.22	$2.22	$1.72
Jersey City	2.16	2.16	1.68
Boston	2.77	2.77	1.92
Chicago	2.21	2.31	1.86
Pittsburgh	2.31	2.31	1.81
Cleveland	2.14	2.14	1.94
Denver	2.39	2.39	..
Los Angeles	2.10	2.40	...

LIME—Warehouse prices

	Hydrated per Ton		Lump per 300-Lb. Barrel	
	Finished	Common	Finished	Common
New York	$16.50	$13.25	$2.10	$1.00
Chicago	15.00	12.00	1.90	....
St. Louis	12.00	10.75		....
Dallas	20.00	15.00	....	....
San Francisco—				
Washington brand	17.00	....	....	1.65
California brand	14.50	....	....	

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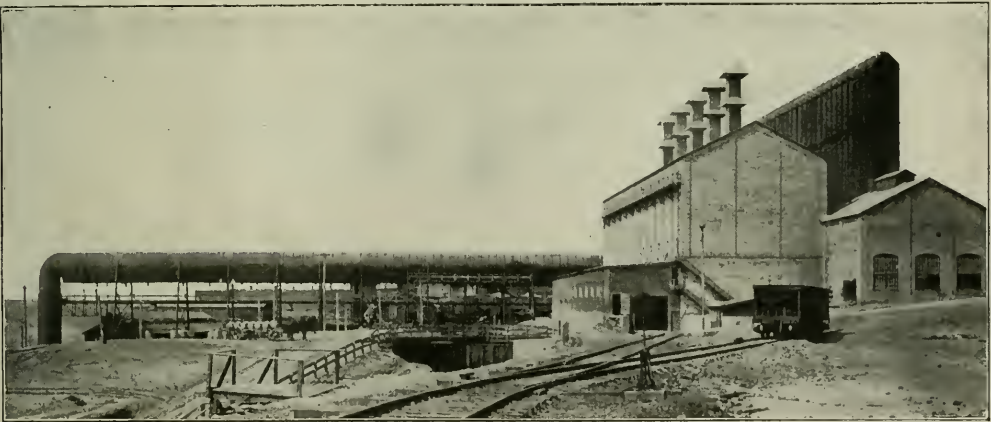
Zinc Burning as a Metallurgical Process*

BY W. R. INGALLS

Zinc burning is suggested as a designation of the practice of igneous concentration of zinc ores. This began with the development of the Wetherill process but seems destined to receive a wider application than the mere making of zinc-oxide pigment.

THE manufacture of zinc oxide directly from the ore is one of the most important contributions that America has made to the metallurgy of zinc. Heretofore, this has been done chiefly for the production of zinc and zinc-lead pigments, and the method has been known as the Wetherill process. While that term may properly be applied to the process for pigment manufacture, it must be recognized that the principles of the process are of far wider application; and that there is going to be wider application in the immediate future is more than an expectation. I have in mind the use of the process as a method of igneous concentration.



FLUE, COOLING PIPES AND BAGHOUSE OF THE ANACONDA COMPANY'S PLANT AT GREAT FALLS, MONT.

Igneous concentration is broader in its scope than the Wetherill process, for it may be done in the blast smelting furnace, or in the reverberatory, or by other means. Igneous concentration is a rather clumsy term, and I prefer to introduce the new generic expression of "zinc burning," which is convenient, readily understood and precise, for in all cases the zinc oxide is reduced to metallic form, is volatilized and is then burned to zinc oxide, the latter happening, however, after the zinc has been separated from the residue of the ore.

As previously indicated, zinc burning may be done either in blast or reverberatory smelting, the gangue of the ore being scorified and drawn off as slag, while other metallic minerals are reduced to matte or metal. Such processes have heretofore been practiced on fairly large scales. Thus, F. L. Bartlett smelted zinc ores at Canyon City, Colo., in specially designed blast furnaces, wherein the smelting column was only about 18 in. high. Such a limitation was necessary in order to prevent zinky accretions in the shaft of the furnace, which in course of time would have interfered with its operation. In running the Bartlett furnaces it was easy to bar them off, indeed, to poke right down into the smelting zone, and keep things going freely. Some iron blast furnaces in Virginia and the spiegeleisen furnaces of the New Jersey Zinc Co. afford other examples of zinc burning in blast-furnace smelting, although in their cases the happening is incidental rather than a primary purpose.

Just as zinc may be burned off in a blast furnace, so also may it be done in a reverberatory. Indeed, there is less trouble, in some respects, in a reverberatory, for therewith there is no shaft in which accretions

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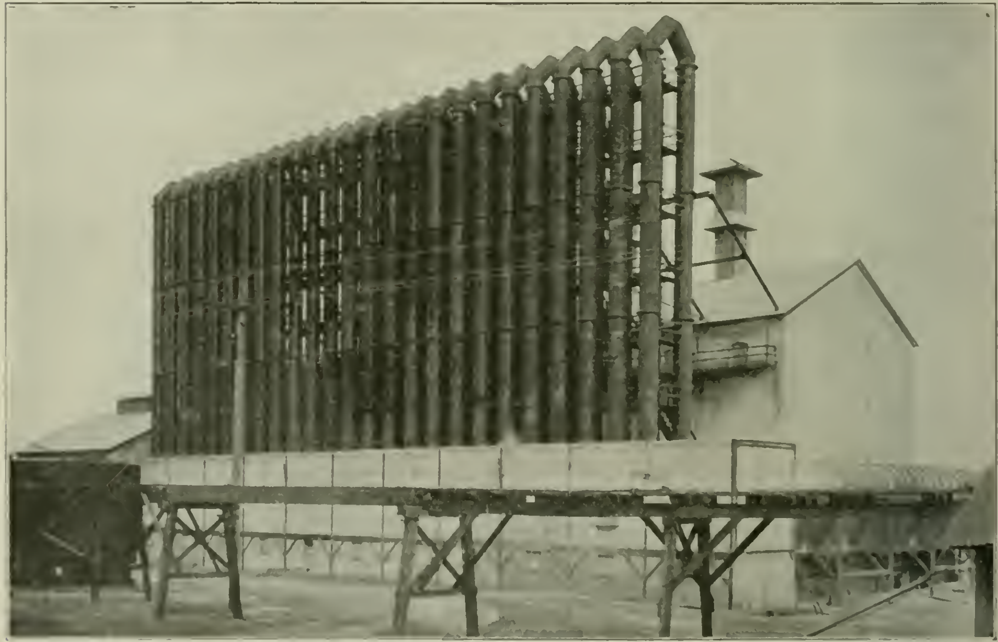
*This is a republication of a paper appearing in the *Bulletin* of the American Institute of Mining Engineers for September, 1917, to which the author has made some additions in both text and illustrations.

may form and hang. The first attempt to burn off zinc in a reverberatory furnace on a large scale whereof I know was made with the Fry process, first in a works at Swansea and later in a large plant on the Manchester Ship Canal. Trial of the process was also made by the Anhältische Blei und Silberwerke in Germany. In this process the roasted ore was first smelted with about 25% of salt cake in a blast furnace, yielding silver-lead and a zinkiferous slag. The slag mixed with 10 to 20% of coal was then smelted in a reverberatory furnace, wherein the zinc was reduced and burned off. Although something like 25,000 tons of Broken Hill ore was treated by this method, the process did not prove a commercial success. About the same time Ellershausen was working on similar ideas at Angoulême, in France. He began by burning off zinc in a reverberatory, but he abandoned it in favor of a blast furnace.

About the same time, also, three European metallurgists—Pape, Witter and Babe—were working together on the same problem and took out certain patents in common, but subsequently they separated. Pape developed a method of burning zinc out of the Oker slags, developing a special furnace of the blast-furnace order, and made a great commercial success of it, his zinc fume being a large source of zinc supply to the smeltery near Hamburg. Babe did further experimental work with apparatus conforming to the principles of the Bessemer converter. Witter took up the idea of reverberatory smelting and about 1908 carried on some rather extensive experiments at a works in Germany. However, neither Babe nor Witter developed a commercial method. It remained for Frederick Laist, at Anaconda, Mont., to make zinc burning in the reverberatory furnace a successful large-scale process. This was done early in 1917 for the extraction of the zinc remaining in the residues of the leaching for electrolytic zinc extraction.

The blast furnace and the reverberatory furnace are both smelting furnaces. A smelting furnace may be defined as one in which reduction, fusion and scorification are performed. The Wetherill-grate furnace is a blast furnace in which reduction is performed but no fusion and no scorification, or to but a slight degree. There is no run of slag, but merely enough formation of it to clinker the residuum. Anything more would clog the grate and the furnace could not be worked. We have here a combination of conditions that exist in the retort for zinc distillation and in the blast smelting furnace. The zinc is distilled and the residue remains in somewhat the same physical condition as in the former. The product can not be metallic zinc, however, for just as the carbon dioxide and excess of air act oxidizingly in the blast furnace, they act more intensively in the Wetherill furnace. That the reduction of zinc oxide to zinc takes place is well known for the beautiful bluish-green flames of burning zinc may be observed immediately above the charge but it is quickly converted into zinc oxide by the carbon dioxide and excess of oxygen that are present and what leaves the furnace is gas laden with zinc oxide (and lead oxide and sulphate if lead be present in the ore).

Heretofore the process of zinc burning on Wetherill grates has been confined to the manufacture of pigment. In that are involved problems in collecting a product of the requisite physical properties, especially



CLOSER VIEW OF COOLING PIPES OF THE ANACONDA ZINC-BURNING PLANT, GREAT FALLS, MONT.

purity of color. It is necessary to effect a perfect combustion of coal dust mechanically carried over, a perfect separation of all mechanical impurities, and the ore that is treated must be free from certain impurities, such as cadmium, which affect adversely the color of the zinc oxide. In accomplishing these things much skill, that can be gained only from practice, is necessary. As a means of concentrating zinc, however, no great skill is required, the color of the product being no consideration, and the process then becoming so simple that attention is being increasingly directed to it. There are several directions for its application, the most important of which seem to be as follows:

POSSIBILITIES OF ZINC BURNING

1. As a simple means of concentrating low-grade ore, especially calamine, to save freight and treatment charges on worthless gangue. Thus, the calamine of Leadville might be taken to Canyon City, Colo., the zinc might there be burned off and the zinc oxide shipped to distillers or to electrolytic refiners. This is in fact being done on a small scale.

2. The residues from lixiviation in electrolytic zinc works, containing a large quantity of zinc owing to the formation of insoluble zinc ferrite in roasting may be burned on Wetherill grates for the extraction of that zinc. This is going to be done. An ore containing 48% of zinc and yielding 83% of it to sulphuric acid may have a residue assaying 20% zinc, the proportion of residue to original ore (roasted) being about one-third, and that 20% of zinc is well worth extraction.

3. It is possible that it may be found most economical in the electrolytic process to roast the ore, burn it on Wetherill grates and leach the fume.

4. The production of zinc fume in this way affords an excellent supply of zinc for the manufacture of lithopone and other chemical purposes.

All of the above are important opportunities for the process of zinc burning and within the next few years extensive applications of it are going to be witnessed. Whether the application will be by means of the Wetherill grate or of the reverberatory smelting furnace (I think the blast furnace may be dismissed from consideration) will depend upon the nature of the gangue, the precious-metal content of the ore, and the commercial and metallurgical conditions that prevail at any given place. Before undertaking to analyze the factors that will govern, let attention be directed to the behavior of silver and lead. Gold may be disregarded, as it rarely occurs in zinc ores.

Lead is even more easily burned out of an ore either in reverberatory furnace or Wetherill than is zinc. In my own experience, the extraction of lead has almost always been higher. In treating a lead-zinc ore, therefore, the product will inevitably be a lead-zinc fume. If the ore that is being burned contains sulphides there will be sulphur in the fume, for lead sulphide is volatile as such. The behavior of silver is variable. With some ores the larger proportion will go into the fume. With other ores it may remain in the residue. It would be preferable if it would all stay in the residue or all go into the fume; that is, preferable in consideration of subsequent steps for its extraction, but that never is to be expected. As to what determines the behavior of silver I am not prepared to pronounce. I imagine that if the ore contains a little copper, enough to form a matte as collecting agent, more silver will remain in the residue than otherwise. Anyway, that is the experience in blast-furnace smelting.

As between Wetherill-grate burning and reverberatory-furnace smelting and burning, I think it impossible to lay down any hard and fast rules. The subject has been insufficiently studied and analyzed. Reverberatory smelting follows the same lines as for the treatment of copper ore, but sufficient carbon is mixed with the charge to reduce the zinc oxide. No great excess over the theoretical quantity is needed, the conditions being very different from those of the retort for distillation. Nor does it appear that the quantity of coal that must be burned in the firebox is greatly in excess of what is used in smelting an ordinary copper ore, although it is, of course, somewhat larger per ton of charge, for the endothermic reactions that are to be effected are more severe. It will be interesting to make comparison of the fuel consumption in this kind of smelting with the fuel consumption in zinc burning on Wetherill grates. I am not sure that there is yet sufficient reliable data to permit such a comparison to be made with any safety. Of course, the idea must not be entertained that zinc reduction is effected in a reverberatory furnace with no consumption of fuel beyond what is required for scorification of the gangue, formation of matte, etc.

ZINC TENOR OF THE SLAGS

It might be feared that the loss of zinc by scorification in reverberatory smelting would be high. It is rather hard to keep zinc out of the slag in any kind of smelting. Even in electrothermic smelting it is common to have 5 or 6% of zinc in the slag, with good work, while the percentage may be very much higher. If, then, in order to make a proper slag for the running of the furnace, it is necessary to flux the ore so that the proportion of slag to ore is high, the zinc loss in the slag may be uncomfortably large, although the assay of the slag may be moderately low. However, by maintenance of proper conditions the zinc tenor of the slag may be reduced to rather surprisingly low figures and the extraction of zinc as fume may compare favorably with what would be obtained in burning on Wetherill grates. Among the conditions that should be maintained are, in the first place, the figuring of a charge high in silica, according to the well-established theory that highly siliceous slags are the poorest zinc carriers. The lead smelter who has to slag off a high percentage of zinc aims to make the slag low in silica and high in iron. One who is going to conduct smelting and zinc burning in a reverberatory furnace must plan just the opposite. Among other necessary conditions is the maintenance of a neutral or reducing atmosphere in the furnace.

Bearing on the latter subject, the *Metalbank und Metallurgische Gesellschaft* in German patent, No. 290,013, Oct. 8, 1913 (addition to No. 252,195), says that the driving off of the zinc from the mixture of ore and fuel has been found to proceed more satisfactorily the smaller the excess of air in the heating gases entering the reaction chamber. Ordinarily, in smelting a charge, a portion of the zinc is held back by the slag which forms, while the reduced zinc vapor is reoxidized by the excess of air to ZnO, which is dissolved in the molten slag. In order to overcome this difficulty, the process should be carried out in a reducing atmosphere, avoiding fusion. In order that the highest possible temperatures may be used, the charge is mixed with ores or additions so that only a sintering results, without fusion. The CO_2 present in the heating gases has been found sufficient to oxidize the zinc vapors without excess of air.

W. Troeller, in German patent No. 291,853 (Apr. 2, 1913) reports that experiments have shown that the expulsion of zinc and other metals from liquid slags or melts is dependent upon the degree of oxidation of various metals contained in the slags; for example, iron, and that such expulsion is practically complete only when these metals have reached their lowest degree of oxidation or are maintained in that condition. In view of this fact, a current of reducing gas, for example, illuminating gas, water gas, or the like, may be conducted through the slag or melt of ores, maintained in a liquid state at the reaction temperature in a directly or indirectly heated furnace, whereby volatile metals such as zinc, bismuth, antimony, etc., are reduced from their compounds and are driven out with the escaping gases.

In other words, once the oxide of zinc is reduced, the zinc vapor must be given the best possible chance to be volatilized and be reoxidized above the slag bath, not in it. If slagging be prevented, the scorification of zinc oxide will be reduced. It should be theoretically possible, for this reason, to burn the zinc more completely out of an ore on a Wetherill grate than in a reverberatory furnace, and I believe the results of practice are in line with this idea, but, as I have previously indicated, good work with the reverberatory furnace may discharge slag with only 3% Zn and that is not far behind in zinc assay of the cinder from the best grate burning.

In reverberatory smelting and zinc burning the charge must be computed, just as for ordinary smelting, figuring, of course, that the major part of the zinc is going to be eliminated. If the material to be smelted is basic, there must be added sufficient silica to form the highly siliceous slag that is required. Unless such silica can be added in the form of ore, the charge is likely to be loaded unduly with barren, and consequently costly, flux. There must be sufficient sulphur and copper in the charge to form matte as collector of the gold and silver. The smelting may not go with perfect smoothness. There may be trouble from accumulations of zinc scum just above the matte. It may be difficult to control the slag and prevent it from going higher in zinc than desired. In spite of the volatilization of the major part of the lead, there may be reduction to the metal of a small part, probably high in silver, attention to which is a nuisance. In short, many of the metallurgical phenomena that are observed in the blast-furnace used for smelting zinky ores are to be witnessed in the reverberatory furnace.

INTERIOR VIEW OF FURNACE BUILDING, EAST PLANT, NEW JERSEY ZINC CO., PALMERTON, PENN.

In the use of labor and fuel, the large reverberatory of the Anaconda type is far ahead of the best form of the Wetherill furnace. With a small reverberatory the difference will be less, and indeed may disappear. Local conditions will, no doubt, determine the choice of method in all cases. For a small plant to treat ore giving an essentially basic or essentially acid residuum of no value for silver or copper content, the Wetherill furnace would be on the most advantageous terms. If, however, the residuum approximated self-fluxing character and contained silver and copper contents worth recovering by smelting, it would be likely to be most advantageous to smelt at once and be done with it, recovering the zinc incidentally. The latter process will of course suggest itself in connection with the metallurgical treatment of deposits of zinkiferous pyrites containing sufficient copper for matte formation.

Domestic Nitrate Possibility

By Mark R. Lamb
Metallurgical Engineer, New York City

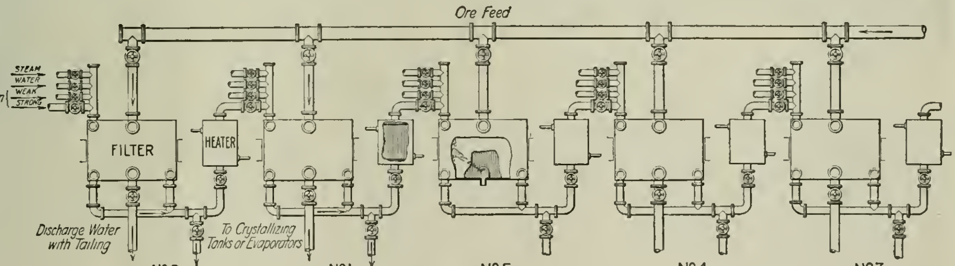
There is, or there is not, a commercially valuable deposit of nitrate on the Colorado Desert in California below the Needles and not far from the Colorado River. Even if this material contained 20% of nitrate it probably would not furnish a basis for profitable work if the usual system of treatment now employed in Chile were followed. Instead of 20% this deposit is said to contain 5%. The material containing nitrate is an impalpable clay which swells and disintegrates immediately upon the application of water. There is a similar deposit at Remiendos, Chile, and so far the Chilean deposit, which contains above 20%, has not been successfully worked.

As perhaps the only readers of this article will be those who are familiar with the technology of nitrate, I omit a history of the nitrate industry from the beginning, with special details of the process at present used in Chile. There are two ways of treating this California material, either of which would extract the nitrate; one being a commercial success and the other a failure. The latter would be as follows: The material would be wet with either hot or cold water in quantities sufficient to dissolve all the nitrate and would then be washed, either by decantation or filtration, the resulting solutions being evaporated. Assuming a content of 5%, at least 25 of water to one of nitrate would be needed for dissolving and washing, and this quantity of water would have to be evaporated, which would be too expensive. More evaporation would be needed if a decantation system of wash were used.

In Chile, and even with material containing 20 to 30% of nitrate, it is found necessary to dissolve the nitrate in a series operation—that is, the solutions are brought up to saturation at high temperatures by being sent through successive new portions of ore, the washing also being carried on as a series operation. In this way, as fast as the solutions become saturated, they are diverted to crystallizing tanks while the weaker wash solutions and water washes, in turn, become saturated. This series operation with coarse, lumpy, rocky gravel and sand, is simple, as the solutions easily penetrate to a depth of 10 ft. of such material. The solutions would not penetrate an inch of the California material except under pressure. In order to give this California material the same treatment that the Chilean ore receives, it is necessary to use filters. Vacuum filters or pressure filters of the Kelly, Sweetland or Burch type are not suitable because they can not be operated in series.

For a number of reasons the ideal filter for this work is the Merrill filter. It can be built with a cake space suited to the ore, it can be built to be kept hot, the raw material can be fed to it as a thick pulp, the dissolution and washing can be carried on as a series operation, either with hot or cold solutions, and the only water which would have to be evaporated would be the wash water, which need not exceed five times the weight of the nitrate. The accompanying illustration shows an arrangement of Merrill filters to operate in series with the respective steam, water, weak-solution and strong-solution piping and heaters. The illustration is self-explanatory, with one exception—the solution drawn from the pipe marked "to crystallizing tanks or evaporators" would also be delivered to a mixer to which the ore would be fed.

If there really is any nitrate in California in the quantities stated, a set of five big Merrill presses, containing 50 tons each of dry slime charged, would complete a cycle of quotations of the five presses in an hour and would, therefore, produce 300 tons of nitrite daily. The cost of the plant would be a mere bagatelle compared with the cost of the proposed "hot-air" nitrate plant, and would have the rather important advantage—besides the fact that it would be erected and in operation in six months—that it can produce nitrate. Is there any nitrate in California?


Ore Feed
STEAM
WATER
WEAK
STRONG
Solution
FILTER
HEATER
Discharge Water with Tailing
To Crystallizing Tanks or Evaporators
Nº2
Nº1
Nº5
Nº4
Nº3

ARRANGEMENT OF PLANT FOR EXTRACTING NITRATE FROM CLAY

Old Tin Cans should be used again when suitable for paints, chemicals, etc., or should be utilized for their metal content, rather than wasted on unsightly dump heaps. A recent Commerce Report emphasizes the importance of the systematic collection of empty cans before rusting renders them unfit for detinning. The detinning process supplies steel scrap for openhearth furnaces, tetrachloride of tin for the silk-dyeing industry, pig tin for making new tin plate, babbitt metal and solder. The two companies now engaged in the detinning industry have indicated a willingness to increase their plants to handle additional tonnage that might result from the creation of a collection organization.

Mine Operation on the Leasing System

By HENRY M. ADKINSON
Mining Engineer, Walker Bank Bldg., Salt Lake City, Utah

In spite of the popular conception that leasing indicates the final phase of mine operation, the system may be applicable to the main period of production. Workers may be transformed from shirking pay grabbers into responsible and serious men, willing and anxious to coöperate in every way with the management.

MANY mine presidents, directors, managers and stockholders are either overlooking or ignoring the advantages of mine operation on the leasing system. The general, and very erroneous, attitude today toward this method of mine operation is that when a mine is tottering to its grave, then comes the proper and accepted time to prolong its life by artificial restoratives in the guise of leasers. Therefore the statement that a mine is being leased is equivalent to hanging crape on the door and announcing that the remains may now be viewed by sorrowing stockholders. I believe that the leasing system may be as advantageously applied to mines in robust health and with long expectancy as to those *in extremis*. I believe that mine operation by the leasing system is our nearest approach to the profit-sharing and bonus-earning plans which are holding the attention of the most broad-minded industrial managers.

INCREASING INDUSTRIAL EFFICIENCY

The industrial problem of today is to increase the efficiency of the workers, and the large industrial companies are struggling to this end through their welfare committees, working toward better living conditions; through piece-work methods; through the efficiency time-studies to eliminate unnecessary efforts; and through bonus-paying and profit-sharing plans. In a recent article telling of his experiences in developing the Bethlehem Steel Co. to its present standard of high production and profit earning Charles M. Schwab describes how he introduced the element of competition into his furnace crews by writing on the floor in front of the furnace the number of heats run by the day shift. When the night shift saw the figure, they asked what it stood for, and the next morning Schwab found his figure 6 erased and 8 in its place. The rivalry was started, and mounting rapidly it revivified the entire organization. It resulted ultimately in the adoption of the profit-sharing system of wages which is now an integral part of the Bethlehem Steel Co.'s operations. Discussing this feature one day, a banker said to Mr. Schwab, "Your profit-sharing scheme works all right in your factory because it is applicable to your business, but it couldn't be used in our bank. Our business couldn't be handled by any such method." Mr. Schwab says that to prove his point of its general applicability he personally worked out the details of a profit-sharing system for bank operation. This holds a lesson for the mining profession. The leasing-system seems the most direct—and the most easily installed—method to get results such as have been accomplished under profit-sharing plans. It puts the intensified efforts of a large body of men into the problem of producing the largest possible tonnage in the shortest possible time; which is, of course, the aim of our business. Just how its application is to be worked out in detail is the problem of the management. This is the management's business.

LEASING SYSTEM STIMULATES PERSONAL EFFORT

I have before me figures, which I am not at liberty to publish, showing how very profitably this method has been applied, both for the company and for the leaser. The company makes more net money per ton, and has a lower cost per foot of development work than it did while operated for many years solely on day's pay basis. The leasers make more money than mere day's pay would give them, and the mine as a whole is larger, better and developing faster than it could without this important factor of personal interest and financial stimulus injected into the whole organization through this profit-sharing system. This result has brought this problem directly home to me, and the possibility of its wide application induces me to suggest these prominent factors for the consideration of my fellow engineers.

The leasing system offers advantages that are not to be had through company operation on a day's pay basis. It brings forth the quality—very essential to any business—of interested, and therefore intensified, development. A leaser has a sense of possession in a part of the mine, and he aims to make his portion as productive as possible. He becomes an interested owner, and he loses all consideration of his former problem of how to put in his daily shift with as little labor as possible. His ownership provides a new and strong mental stimulus. The nearest approach to getting the same result on a day's pay basis is to provide a shift boss for each little group of miners, and even such a system falls far short of the desired object. There is no substitute for a mental interest directly stimulated by a financial participation in the result of personal effort.

MORE WORK ACCOMPLISHED PER UNIT OF CAPITAL

The leasing system makes for the operation of a mine by a force of men often so large that their employment by the company on a day's pay basis would be prohibitive. A hundred miners may be working in a mine whose treasury would not justify the day's pay employment of a tenth the number. This means rapid development and quicker expansion both in exploration and in production. I am reminded of a mine that was put on a leasing basis under conditions which did not permit the company to maintain a large force of miners. In a single month the new development work done by these leasers, by hand-mining alone, amounted to 859 ft. They worked shifts enough to have totaled $17,000 in labor on an arbitrary wage scale of $4 per day. Thus this company, which perhaps could have hired

$2500 worth of labor on a day's pay basis, received $17,000 in labor with no expense to itself, and obtained new development of its property in a ratio out of all proportion to the amount of work its treasury could have paid for. Such figures come directly home to the thinking manager with a force which impels investigation of their application to his particular problem.

The employment of leasers may have a correlative advantage in locations that are comparatively inaccessible. I have in mind a situation where a mine is 40 miles from the nearest railroad and during 6 to 8 months in the year the road to the mine is impassable. The mine is a large one and capable of supporting several hundred leasers, but the company is not affluent and can afford to hire only a small force on day's pay. Were the directors to convert their plan of management into the leasing system the direct result would be the establishment of a large town at the mine. There would then be so much traffic in supplies into the town to support the population, and so much ore would be hauled out, that the road would be open all the year. This would be of great financial benefit to the mine in even this one particular, because its production would be continuous. The company would be freed from the problem of delivering all its ore during the peak load of summer when railroads and smelters are rushed.

SUMMARY OF ADVANTAGES

It is not my purpose to offer an exhaustive discussion of this subject. I am merely pointing out some of the "high lights" which occur to me as advantageous in considering the leasing system as a direct method of mine management for mines with a long and prosperous life ahead of them—and not merely for such mines as obviously have one foot in the grave. Summarizing, some of the advantages are: 1. Intensified effort in each man's portion of the work, which is bound to result in economy of time and money; 2, expanded activity of the mine through increase in number of workers, regularity of production, increased production and exploration, and establishment of towns at mines, instead of small camps; 3, increased income to the company from company stores selling necessary merchandise; income from sale of compressed air, transportation, and such other services as the company can furnish better than the individual leasers.

All these advantages are obvious and others will occur to anyone considering a specific problem in relation to some particular mine. But they will not come of themselves, and *pari passu* with the change of operations from a day's pay basis to that of a leasing system. The success or failure of any plan rests with the management, provided that the plan is sound. In the issue of *World's Work* for July, 1917, this point is emphasized by A. J. Hemphill, chairman of the board of the Guaranty Trust Co., the largest trust company in the world. He says: "In considering employment of funds in any concern the greatest emphasis should be placed on the ability of the management. I would say that the most important consideration in any investment is management, management, management, and again management. It is not enough to know that it is honest, its ability in that particular business should be established. Ninety-five per cent. of the worth of an undertaking, I should say, is in the management." Does that hit home to any of us, or do we calmly apply it to the other manager or superintendent?

Proper management of the leasing system is its *sine qua non.* If it is to be operated in a haphazard, indifferent and careless manner then it will fail as surely as any other method. In order to apply the leasing-system in the effective manner which will make it as highly efficient as it should be the company must maintain accurate records. It goes without saying that the technical data of mine mapping and assay records will be carefully compiled and preserved. But the pulse of the business will lie, as it always does, in detailed accurate accounting. The company must arrange its agreements with its leasers so that it will know the actual working costs of the leasers and the financial condition of each lease account. This information is the basis of the whole relation between company and leaser, and without the detailed data the rate of royalty cannot be adjusted fairly for both parties.

PROPER ADJUSTMENT OF ROYALTY IMPORTANT

The rate of royalty is the adjustable factor which makes the relationship of the two parties endurable. The costs of labor, of supplies, of transportation are all pretty definitely fixed, so far as the leaser is concerned, but the royalty rate is the connecting tie in which a link may be let out or taken up to make the conditions fair to both parties. We know districts where the royalty rate has become fixed through custom, 10% perhaps here, 15% elsewhere, and ignoring individual costs in individual mines, the whole district subscribes to this rate purely as a matter of custom. In other districts the royalty is on a sliding scale based on the metal prices in the New York market, but we may expect to hunt long and hard to find the rare instance where the costs have been thoroughly worked out and the royalty adjusted in a scientific manner from known figures. Proper accounting—proper detailed accounting—is the heart of the leasing system, as of any business, and it must be given first consideration. If you have your system based on proper accounting all else will be added thereto. Such systems have been installed and such systems are working now.

It is easy to soothe our own sense of satisfaction with the present manner in which we are conducting our operations by saying in effect, as the banker did to Mr. Schwab, "In our business it can't be done," but I am satisfied that not only the many mines which are today struggling along on a hand-to-mouth basis, but many other mines which are prosperous and paying handsome dividends will find that a radical change in method will be highly profitable. It is well worth while to put the business under the microscope of self-analysis and examine its possibilities from the viewpoint of intensified operations under the leasing system.

GUATEMALA ISSUED 116 applications for mining rights and patents and three titles for metal mines, in 1916, says *Commerce Reports.* From the zinc mines in Chiquimula 435 tons of ore were shipped to the United States. The Quebradas Gold Mining Co. produced 200 oz. of gold from its holdings in Izabal, the lead mines in Huehuetenango were profitably worked, and the company formed to develop marble quarries near Zacapa will soon be prepared to export its products.

Leadville Mines Again Operating

Leadville Correspondence

Mining throughout the Leadville district, after having passed through a period of comparative inactivity following the strike, is again assuming the proportions and scope of development in force prior to the disturbance when the outlook of the district was the best that had been known for years. With the exception of two large companies—the Yak and the Empire Zinc Co.—all of the big mines have resumed operation, several of them now producing the heaviest tonnage ever extracted. The Yak is active, but on a small scale. Future plans of the company, however, include a number of new developments that will bring the property back into the ranks of large producers. It is reported that the main tunnel is to be advanced into the Vega territory and a big interior shaft put down into the area that has previously been developed through small winzes incapable of accommodating the required draining equipment. This ground is known to contain orebodies. The Empire Zinc Co., which prior to the strike, was operating the Robert Emmet and McCormick shafts in Stray Horse Gulch, has temporarily abandoned its property. New and expensive surface plants were under construction at both mines when the strike was called, and preparations were under way to work the lead, zinc and silver ore opened on the property and the outlook was extremely promising. Officers of the company state that these mines will probably remain idle for at least six months.

Mikado, Wolftone and other Lead-Zinc Properties Producing

The Mikado property of the Iron Silver Mining Co. has undertaken production since the strike and is now shipping 150 tons of lead-zinc sulphide and zinc carbonate daily. Bodies of sulphide ore have been uncovered in the R. A. M. property where the company is now developing at a depth of 1150 ft. On the upper levels carbonate ore is being mined. Draining preparations are about complete at the Mikado with the cutting of a pump station on the bottom level and the installation of machinery. This work is expected to be complete by the end of the month.

The Western Mining Co., operating the famous Wolftone shaft, continues to produce a heavy tonnage of zinc carbonate and lead-zinc sulphide. Development on the lower levels which have only recently been drained has opened bodies of sulphide ore and a number of new carbonate shoots have been discovered through continuous prospecting in the upper contact. This property is now operating on a normal scale and is producing 200 tons daily.

The Greenback property, the third member in the big draining enterprise that has effectively unwatered the Graham Park Basin, is again producing a steady tonnage of lead-silver ore.

Cramer & Co., operating a large tract of territory leased from the Star Consolidated Mining Co. on Carbonate Hill, have a new 200-ton mill for the separation of lead from low-grade lead-iron ores under construction. Ore has been uncovered in the property and the process of separation to be installed has been demonstrated a success. The mill will be put into operation with a 50-ton unit on Oct. 1. The Cramer Co. is also shipping 200 tons of high-grade manganese ore daily.

Buchanan & Co., also leasing from the Star Consolidated, are shipping 100 tons of manganese ore. The same company has recently taken a lease on the Seneca property adjoining the Star to the north and has uncovered new bodies of manganese. These orebodies are now being blocked out and it is expected that shipping will start during the month at the rate of 50 tons daily and will be increased as accommodations for handling the output are prepared.

The Leadville unit of the United States Smelting, Refining, Exploration and Mining Co., operating the Harvard and Jamie Lee shafts on Fryer Hill, has just completed sinking the Jamie Lee through the parting quartzite into the second contact. No ore discoveries have yet been made in the new zone but little prospecting has been undertaken. The cutting of a pump station and the installation of draining equipment are still under way. The unit is shipping 50 tons daily from bodies of zinc-carbonate and silver ore opened on the upper levels of the property.

Price of Silver Creates Unusual Activity

An important strike was made recently at the First National property in Iowa Gulch, where lessees opened six feet of ore, showing good lead and silver contents. The oreshoot is reported as persistent and growing in proportions as development proceeds. The first shipment from the new discovery has just been made, but the returns have not yet been received.

The Tarsus property on Yankee Hill, operated by M. A. Nicholson and associates, is being prepared for the production of a steady tonnage of high-grade silver ore and silver-bearing iron oxide. Silver ore has been opened on the 335-ft. level. It is planned to extract 50 tons daily. On the upper levels iron carrying silver has been uncovered.

The Mt. Champion Co., operating in the Lackawanna district, is sinking an interior shaft on one of the veins opened in the property through the tunnels above. A 4-ft. shoot of gold-copper ore has been cut in the shaft. Sinking will continue to a depth of 300 ft. Shipping from the property has been stopped until the development is finished.

The present high silver market is the cause of unusual activity in the district. The surrounding hills have been thoroughly gone over and carefully examined for silver ore during the past two weeks, and new properties are being started up daily. Small leasing is enjoying a revival that promises to be the beginning of larger operations. A number of big concerns have for some time been waiting for an opportunity to enter the Leadville district and, should new territory be opened up by leasers and found productive of mineral, they will undoubtedly become interested.

The Louisville mine, probably the biggest producer of silver in the district, is now operating at full capacity, extracting 150 tons of ore daily. New shoots of the ore have been opened in different places in the mine.

The Bartlett tunnel on Sugar Loaf is another producer of silver that is deriving the benefit of the high market. A new vein showing good silver assays has just been opened and shipping again resumed. About 200 tons of ore per month is being extracted.

Plans for the erection of a power line across the Sugar Loaf and St. Kevin districts from the Dinero tunnel to the Griffin mine are being completed by Lucien W. Smith, manager of the Griffin. This line would traverse what is now considered to be one of the richest areas in the Leadville district and would enable property owners to secure power easily and cheaply. The coöperation of a number of operators is promised Mr. Smith in the undertaking which, if put through, will mean considerable activity in that section. New bodies of high-grade silver have been uncovered in the Griffin property at St. Kevin and an output of 40 tons daily is being shipped. Lessees at the Dinero are shipping a steady output of high-grade silver ore, and the company is planning new development.

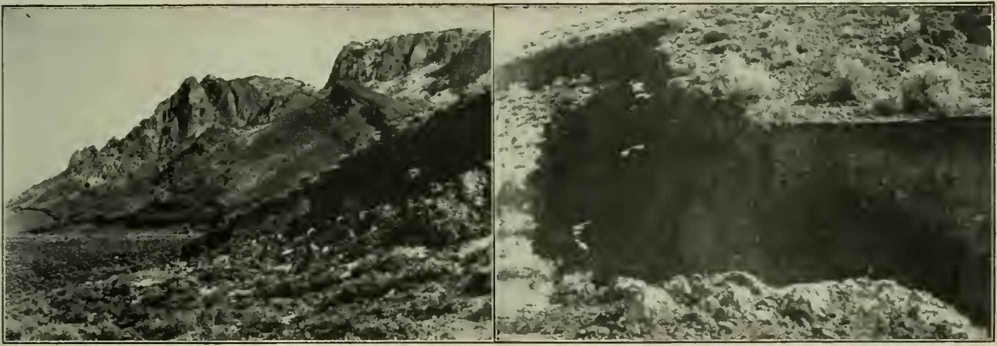
Earthquake Crevices in Nevada

By John T. Reid

Mining Engineer, Lovelock, Nevada

On the second day of October, 1915, several earthquake tremors were observed in the vicinity of Pleasant Valley, situated in the southeastern part of Humboldt County, Nevada. Three distinct shocks were noted; the first, at 3.47 p.m., lasting about 10 sec.; the next at 5.50 p.m., persisting for 30 sec.; while the last, at 10.58 p.m., continued for at least one minute. The last shock undoubtedly accompanied the definite faulting shown in the accompanying illustrations,[1] which were secured a comparatively short time after the earth movement took place.

WATERCOURSE DIVERTED BY EARTHQUAKE



PANORAMIC AND CLOSER VIEWS OF EARTHQUAKE CREVICE IN PLEASANT VALLEY, NEVADA

In numerous places within a radius of a hundred miles of this disturbance a great increase in the flow of water was observed. Creeks came into existence where previously there had been no water at all, though in other instances the flow of springs was noted to have decreased.

Although nearly two years have elapsed since the main earthquake, many lesser shocks have occurred at irregular intervals. Indeed, some persons who reside in the vicinity of the fault state that almost every day they feel a trembling of the earth. By way of corroboration of this, it is interesting to note the behavior of the mules and burros of various prospectors in the neighborhood. These animals manifest an instinctive and emphatic desire, to a degree more than ordinarily characteristc of the breed, to depart to some region remote from the locality of the fault. Appreciating the asinine psychology, the prospectors generally compromise by permitting the beasts to select grazing grounds of their own choice. As to the future outlook, opinion seems to be divided. While some of the four-footed mining experts can be induced to linger in the vicinity of the crevice between tremors, nevertheless some of the prospectors, accepting the majority report, have abandoned their claims and departed with their faithful advisers.

The fault line extends along the east side of Pleasant Valley for a distance of 25 miles, skirting along the western slope of the Golconda or Mount Tobin Range and, at length, fingering out, to the southward, into the Dixie or Fairview Valley.

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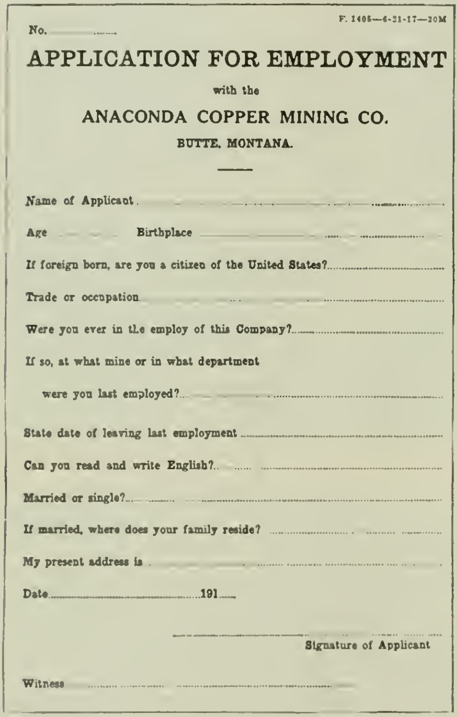
[1] Photographed by P. Blanchard, Kennedy, Nev.

The Rustling Card System at Butte

A great deal of nonsensical "bogie-man" stuff has been written and spoken by opponents of what is called the rustling-card system, adopted by the Anaconda Copper Mining Co. of Butte, Mont. The plain facts of the case are that each holder of a rustling card ought to feel proud of being the possessor of such a certificate of character and merit. Since the Anaconda company maintains no secrecy in the matter, the "iniquities" of the system are hereby exposed. We venture to predict that publication of the details will tend to extend the use of the system, with the unqualified approval of all intelligent and conscientious workmen.



F. 1406—6-21-17—20M

No.

APPLICATION FOR EMPLOYMENT
with the
ANACONDA COPPER MINING CO.
BUTTE, MONTANA.

Name of Applicant

Age Birthplace

If foreign born, are you a citizen of the United States?

Trade or occupation

Were you ever in the employ of this Company?

If so, at what mine or in what department were you last employed?

State date of leaving last employment

Can you read and write English?

Married or single?

If married, where does your family reside?

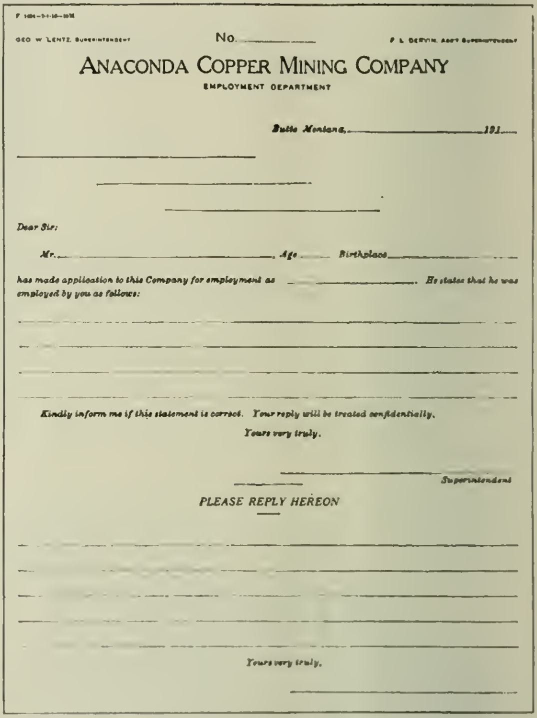
My present address is

Date 191

Signature of Applicant

Witness

The first step is for the applicant to fill out the above blank form



F [illegible]

GEO. W. LENTZ, SUPERINTENDENT No. F. L. DERVIN, ASS'T SUPERINTENDENT

ANACONDA COPPER MINING COMPANY
EMPLOYMENT DEPARTMENT

Butte Montana, *191*

Dear Sir:

Mr. *Age* *Birthplace*

has made application to this Company for employment as . *He states that he was employed by you as follows:*

Kindly inform me if this statement is correct. Your reply will be treated confidentially.

Yours very truly,

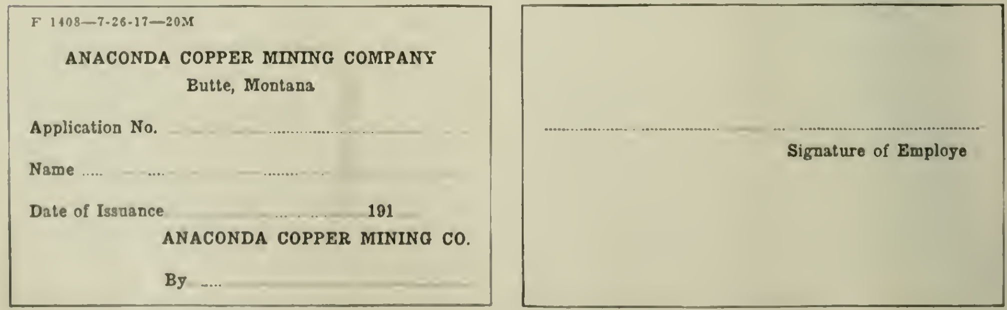
Superintendent

PLEASE REPLY HEREON

Yours very truly,

The second step is to confirm or disprove his statements by using the above blank form

PRELIMINARY STEPS FOR SECURING A RUSTLING CARD



F 1408—7-26-17—20M

ANACONDA COPPER MINING COMPANY
Butte, Montana

Application No.

Name

Date of Issuance 191

ANACONDA COPPER MINING CO.

By

Face

Signature of Employe

Reverse

THIS IS THE FAMOUS "RUSTLING CARD" GIVEN TO THOSE APPLICANTS WHO ARE CONSIDERED TO BE TRUSTWORTHY AND COMPETENT MEN

Ròle of Manganese in Alloy Steels[*]

Manganese steel hardens under deformation, probably due to a renewal of the transformation from austenite to martensite caused by the pressure. Manganese retards the transformation, during heat treatment, from austenite to martensite and pearlite. One effect of the retardation is the production of finer structure.

PASSING by the deoxidizing and desulphurizing effect of manganese as foreign to the present discussion, its effect on the mechanical properties of steel seems to me in the last analysis due primarily to its retarding action both on the transformations and on the coalescense of the micro-constituents into progressively coarser masses which, while increasing the ductility, lessens the cohesion in general, including the hardness and the elastic limit, and thus lessens the effective strength.

Before considering the retarding of the transformations by manganese, let us refresh our memory as to these transformations, and as to the three prominent states of steel, between which they play, (1) the common low-temperature alpha or pearlitic state, (2) the high temperature or nonmagnetic austenite state into which the metal passes spontaneously when heated up through the transformation range, say 725-900° C., Ac1-Ac3, and (3) the intermediate or martensitic state, in which carbon steel is caught in transit from the austenite to the pearlite state by means of a rapid cooling, as, for instance, on hardening by quenching small pieces in water. The alpha state is magnetic and relatively soft and ductile, as in annealed carbon steel, the intermediate or martensitic state is magnetic, hard, and brittle as in hardened steel; while the nonmagnetic high temperature or austenitic state when preserved in the cold, as in manganese steel, combines great ductility with hardness of a peculiar kind to which I will refer shortly.

In carbon steel this transformation is so rapid that it occurs to a very marked degree even in the water quenching of thin pieces, as is familiar to us in the fact that when this steel is made nonmagnetic and austenitic by heating, say, to 900° C., and is then quenched in water, it transforms as far as the magnetic, hard, brittle, martensitic state of common hardened steel even in this rapid cooling.

Austenitic Condition Preserved by Manganese

Most of the alloying elements, and notably carbon, manganese, and nickel, retard this transformation greatly. Thus 2% of manganese plus 2% of carbon retard it so that in the water-quenching of thin pieces the austenitic state is preserved. With 5 to 7% of manganese it is so slow that even in air cooling it goes only as far as the intermediate martensitic state. Hence the brittleness of these steels of intermediate manganese content. With, say, 12% of manganese the transformation is so sluggish that the austenitic state is preserved even through a common slow cooling. The water-quenching of manganese steel in current manufacture is not to prevent the loss of the austenitic state, but to suppress the precipitation of the iron-manganese carbide, cementite, which would occur during slow cooling. The broad plates of this cementite would embrittle the mass by forming partings of low cohesion. It is derived from the large carbon content of the ferromanganese used, the cheapest source of manganese. Carbon-free manganese steel should not need quenching.

The industrial value of this manganiferous austenite or manganese steel seems to be due to its combination of great ductility with great effective hardness. I say effective hardness, because initially it is rather soft. My own experiments indicate[1] that the Brinell hardness of an undeformed specimen is only 125, or that of steel of about 0.22% of carbon when annealed, that of ultro low-carbon steel being about 75. But the hardness increases very greatly on the slighest deformation. Even that incidental to the Brinell test increases the observed Brinell hardness to 223 easily, or to that of 0.60% carbon steel when annealed.

Manganese Steel Hardens Under Deformation

This hardening under deformation is one of the first things that forces itself on the user of this material. The first strokes of the hack saw cut it rather easily, but the deformation thus set up in the path of the saw quickly causes such hardness as to bring the sawing to an abrupt end, thus giving the absolutely false impression that the material has a soft skin. This hardening causes the apparently contradictory combination of effective hardness with very low proportional limit, even as low as 28,250 lb. per sq.in. The proportional limit represents the cohesion of the undeformed material, the effective hardness represents the cohesion as exaggerated by the deformation incidental to service. In the same way the act of tensile rupture may increase the Brinell hardness to 540,[2] or that of about 0.50% carbon steel when hardened.

The surface of the jaw of a manganese-steel rock crusher, deforming under the great pressure, quickly hardens itself, so that the combination of a very hard surface with a ductile back develops spontaneously. As fast as this hard surface wears away it is replaced by a new one made equally hard by the deformation which it at once receives.

This hardening probably represents in part the same cause which leads to the increase of cohesion in general, including the hardness, of all the malleable metals under all forms of deformation, such as wire drawing, and in part the martensitization of the austenite. That is to say, the arrested transformation from austenite through martensite to the alpha state which is due in cooling through the transformation range but is restrained by the retarding action of the manganese, is now stimulated by the deformation sufficiently to cause it to proceed as far as the martensitic state, with consequent hardening and embrittling effect. This martensitization through the stimulation of the arrested transformation by deformation is a common property of austenitic steels which have only a moderate excess of the retarding elements over the quantity needed for causing the retention of the austenitic state. It occurs strikingly in austenitic 20% nickel steel.[3]

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[*] A paper presented by Prof. Henry M. Howe at the twentieth annual meeting of the American Society for Testing Materials, at Atlantic City, N. J., June 26-29, 1917.

[1] "The Metallography of Steel and Cast Iron," p. 464, 1916.

[2] Hadfield and Hopkinson, Transactions, American Institute Mining Engineers, Vol. 50, p. 486 (1914), and Journal, Iron and Steel Institute, Vol. 89, 1, pp. 112 and 124 (1914).

RETARDATION CAUSES FINER STRUCTURE

The retarding effect of manganese on the structural changes of carbon steel shows itself by leading in general to finer structure,[4] to finer ferrite masses, finer network structure, and finer pearlite, indeed probably often to the replacing of lamellar pearlite with sorbite. This greater fineness leads to better quality in general, and to a higher elastic limit in particular, though of course with a corresponding sacrifice of ductility. The great value of manganese for this purpose has not begun to receive the attention which it deserves. It is probable that a manganese content of, say, 1.25%, with a correspondingly lessened carbon content, may be used to lessen the danger of cracking and the residual stresses when a high elastic limit is sought, because this large manganese content in and by itself raises the elastic limit by giving a fineness of structure which otherwise would be sought by increased violence of cooling or by the use of a lower drawing temperature. In other words, the use of 1.25% of manganese lessens the needed violence of cooling and permits the use of a higher drawing temperature, in both ways tending to mitigate the residual stresses, and in the former way lessening the chances of cracking.

Ray Consolidated Report

The twenty-fourth quarterly report of the Ray Consolidated Copper Co. for the quarter ended June 30, 1917, shows 22,255,598 lb. of copper produced in concentrates, compared with 21,813,772 lb. for the preceding quarter. The following is the production by months during the last quarter: April, 7,365,840 lb.; May, 1,652,487 lb.; June, 7,237,271 lb.; an average monthly production of 7,418,533 pounds.

In addition to copper from concentrating ores, a total of 1,276,521 lb. of copper was sent direct to the smeltery. During the quarter 892,200 dry tons was milled, averaging 1.66%, which is the greatest tonnage of any quarter since commencement of operations. This gives an average daily tonnage of 9804, comparing with 9707 for previous quarter.

Mill extraction was 75.48% of total copper in concentrating ores. Underground development was 19,211 ft., bringing the total development to date 608,396 ft. Average mining cost of ore milled was 98.257c. per ton, of which 4.864c. was for coarse crushing, leaving net mining cost of 93.393c. as compared with net cost of 84.792c. for the previous quarter. The increase of cost is due to greater state and Federal taxes, increase in cost of supplies and wages. Average cost per pound of all net copper produced is given at 11.272c., comparing with 11.048c. in preceding quarter.

The net operating profit was $3,664,831, compared with $3,471,698 in previous quarter. The fourteenth quarterly distribution of $1 per share was paid on June 30, and amounted to $1,557,179, being a dividend of 50c. per share from earnings and a capital distribution of 50c. per share.

Butte & Superior Report

The fourteenth quarterly report of the Butte & Superior Mining Co. for the quarter ended June 30, 1917, shows 126,734 dry tons of ore milled, comparing with 148,935 tons in first quarter. The ore averaged 15.304% in zinc contents and 5.583 oz. silver per ton. Zinc concentrates produced amounted to 37,670 tons, containing an average of 46.509% of zinc and 17.676 oz. silver per ton. Mill recovery was 90.329% of zinc in concentrates, comparing with 86.821% in first quarter. Mining cost was $4.7596 per ton and milling cost was $2.4001 per ton. The above does not include 6325 tons of old mill tailings which produced 337 tons of concentrates containing 277,081 lb. zinc.

The tonnage mined fell below the first quarter mainly because of labor troubles. The average recovery in concentration shows an improvement, and total cost of mining and milling, exclusive of taxes, decreased 18c. per ton, due in part to better milling operations. Replenishment of ore reserves by development amounted to 142,489 tons, or a net increase over tonnage mined of 17,500 tons.

The new man-and-timber hoist at No. 2 shaft was put in operation to 1600-ft. level. The hoist at No. 3 shaft is practically completed and also coarse-crushing plant, ore bins and conveyors; the shaft is being sunk below 1600-ft. level.

The profits for the quarter were $1,003,236, comparing with $1,061,020 in the previous quarter. The curtailment of production and decline of the metal market was responsible for the shrinkage of earnings.

Conflicting Grubstaking Contracts

By A. L. H. Street

Attorney at law, 829 Security Building, Minneapolis, Minn.

Plaintiff and an associate grubstake defendant under an agreement for location of any mineral discovery for the benefit of the three persons in equal shares. Setting out to prospect for mineral deposits, defendant was accompanied by one Robinson, who was grubstaked by his mother. It was agreed between defendant and Robinson that the latter should share with defendant in any location made under defendant's grubstake contract.

Under these circumstances it is held by the United States Circuit Court of Appeals, Ninth Circuit, that Robinson was not prevented from locating, free of any right of plaintiff and plaintiff's associate, claims discovered by Robinson, although Robinson was assisted by defendant in making the locations. (Turner vs. Wells, 238 Federal Reporter, 766.)

Output of Steel Ingots in British India in 1916 was 131,092 long tons, all basic openhearth steel. This compares with 103,474 tons in 1915 and 66,603 tons in 1914. The make of finished steel was 68,634 tons in 1915 and 93,469 tons in 1916, an increase of 24,835 tons, or 36%, last year.

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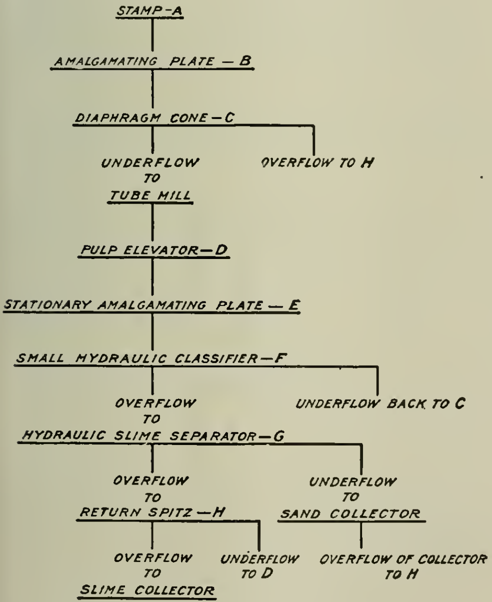
[3] Carpenter, Hadfield, and Longmuir, Seventh Report Alloys Research Committee (British), Institute Mechanical Engineering, 1905, p. 919.

[4] Henry M. Howe, "Life History of Network and Ferrite Grains in Carbon Steel," Proceedings American Society of Testing Materials, Vol. XI, pp. 332 and 365 (1911). Also, Howe and Levy, Proceedings, Cleveland Institute of Engineers, July, 1914, p. 237.

Cyaniding Gold Copper Ores at Pilgrims Rest[*]

The gold in the ore treated at Pilgrims Rest, in the Transvaal, by the Transvaal Gold Mining Estates, Ltd., is so finely divided that amalgamating must be followed by cyaniding to insure good recovery. Copper present in the ore in varying amount compels the use of a weak cyanide solutior necessitating long treatment.

DURING 1916 the Pilgrims Rest district produced gold to the value of over $3,950,000, and forms, after the Rand, the most important gold field in South Africa. The oxidized ore treated by the Transvaal Gold Mining Estates, Ltd., at Pilgrims Rest, may be described as deposits of vein quartz in more or less horizontal sheets in the dolomites. With it is associated much ferruginous matter. Copper exists principally in the form of the carbonates, malachite and azurite; chalcopyrite is only occasionally found and appears to be attacked but slowly by weak cyanide solutions. It is interesting to note, as indicating the finely divided condition of the gold, that panning sometimes shows no colors though the assay may be good. Cyaniding or some other dissolving process is therefore essential.



ORE-DRESSING SCHEME AT CENTRAL MILL

MAIN PLANT KNOWN AS THE CENTRAL MILL

The plant known as the Central mill consists of 60 stamps of 1100 lb. running weight; three tube mills, 16 ft. x 5 ft. 6 in., each fitted with an Osborne liner and a Schmitt feeder, five sand collectors and 20 treatment vats, each of 100 tons' capacity; four slime collectors, and 11 treatment vats, 40 x 12 ft., and the necessary storage. The capacity of the plant is 13,000 tons per month. Ore is delivered to the Central mill from five separate mines in varying percentages. The mill bins and crushers are so arranged that ore from any one mine can be kept entirely separate, thus enabling the management to be informed daily as to the mill heads from any particular mine. The average value of the ore milled is about $9.50 per ton.

THE ORES TREATED ARE SOFT AND FRIABLE

The ore is stamped through 60 stamps with a 500 (about 22-mesh) screen, a duty of just over seven tons being easily maintained, owing to the soft and friable nature of the ore. Lime is added at the bins at the rate of 2 lb. per ton, and has a slightly beneficial effect on amalgamation. Amalgamation presents no great difficulty, an average recovery on the mill plates being 41.5%, at a cost of 44c. per ton, including preliminary crushing. This mill pulp contains 30% slime, and is passed direct to three tube-mill cones, 6 ft. x 4 ft. 6 in. The underflow from the cones, containing 30% moisture, and without any additional water, enters the tubes, while the overflow goes to spitzkasten *H* shown in the flow sheet. The gradings of pulp entering and leaving the tubes will be found in the table.

Tube-mill liners are not a serious item, owing to the soft nature of the ore. A recent liner lasted 520 days, but 470 days is a fair average. The tube-mill rock used is mostly white quartz picked out from the ore at the crushers and conveyed by tramway to the tube-mill ore bins and having an average value of $5 per ton. The average recovery from the five tube-mill plates is 10.5%, bringing the total recovery by amalgamation to 52%. The cost of tube-milling is 12c. per ton milled.

The pulp from the tube-mill plates flows to cone *F* in the flow sheet, the coarser particles returning to the tube-mill circuit, and the overflow to the slime-separating cone *G*, which is fitted with a Brazier washing device and a Bayley regulating gate. The underflow from this cone goes direct to sand collectors and the overflow to the spitzkasten *H*, where any coarser sand is trapped and returned to the tube-mill circuit. The overflow from *H* goes to slime collectors.

The sand delivered from the hydraulic slime-separating cone *G* is very clean, and there are few slimy lumps. The grading of the sand charge may be seen in the table of screen analyses. Sand caught amounts to about 100 tons per day.

COPPER IN THE ORE NECESSITATES A WEAK SOLUTION

The objectionable constituent of the ore is copper, and it is necessary to use as weak cyanide solution as possible, consistent with good recovery and reasonable cyanide consumption. The low strength of cyanide used renders a long treatment necessary. Lime is added to the top treatment vats at the rate of 6 lb. (of 60% CaO) per ton of sand. The strength of the cyanide solution used throughout the sand treatment is 0.04% KCN. The charges are allowed to stand for several hours after each complete draining. The value of the charge does not decrease rapidly during the early part of the treatment; rather is it a steady decrease all the way through. The value of the last sand draining averages 6c. per ton. Sand residues averaging 90c. were recyanided, after regrinding until 80% was —200 mesh, but did not give a lower residue than 70 cents.

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[*] Excerpts from an article entitled "Notes on Treatment of Pilgrims Rest Ore," by Robert Lindsay, published in the Journal of the Chemical, Metallurgical and Mining Society of South Africa, for April, 1917.

The cyanide consumption is seldom under 0.8 lb. per ton and sometimes as high as 2.5 lb., according to the copper content of the ore. A preliminary wash with weak sulphuric acid to remove the copper is prohibitive in cost, the consumption of acid being about 30 lb. per ton, owing to the presence of dolomite and iron oxide. The average recovery for the last 12 months was 83% and the cost 77.98c. per ton.

The slimes are treated by a combination of the decantation and Usher processes. Instead of using sand filters as clarifiers for the solution from the slime plant, the solution is allowed to flow quietly into two settlers (18 x 5 ft.), the first having one and the second two partitions of cocoa matting suspended from iron bars laid across the vats transversely to the flow. The matting is fastened to the sides and rests on the bottom. These settlers deal with 1000 tons of solution per day for 16 months before requiring cleaning out. They are then cleaned out with a fire hose and are ready again for use in three or four hours. The average recovery from slime is 87.5%, and the cost 79.16c. per ton of slime.

precipitation is not recommended. It gives temporary relief, no doubt, by keeping copper in solution, but the gradual accumulation of copper in solution detrimentally affects extraction, and the excess copper has to be got rid of eventually, either by precipitation or running some of the solution to waste.

If the soluble copper content of the ore should become abnormally high, it will be found advantageous to have uncoated zinc in the first compartment to precipitate a proportionally large amount of copper, leaving the remaining compartments of lead-coated zinc to precipitate the gold and a portion of the remaining copper. The first compartment of coppery zinc is taken out every four or five days and immersed in dilute acid for a few minutes, and returned to the box along with some new zinc to fill the compartment. There is an increase in zinc consumption, but the gold precipitation is good.

The precipitation of copper on zinc is, of course, accompanied by a regeneration of cyanide, thus:

$$Cu_2(CN)_2.4NaCN + Zn = 2Cu + Na_2Zn(CN)_4 + 2NaCN,$$

or

$$Cu_2(CN)_2.6NaCN + Zn = 2Cu + Na_2Zn(CN)_4 + 4NaCN,$$

consequently the cyanide strength leaving the extractor box is always higher than that entering it, as shown in the table.

SCREEN ANALYSES WITH ASSAY VALUES OF PULP ENTERING AND LEAVING THE VARIOUS UNITS

A—Stamp Mill, B Amalgamating Plate; C—Diaphragm Cone; F—Small Hydraulic Classifier, G—Hydraulic Slime Separator, H—Return Spitz

Mesh of Pulp	A Screen		B Tails		C Underflow Tube Inlet		C Overflow		Tube Outlet		F Underflow		F Overflow	
	%	$ ton	%	$ ton	%	$ ton	%	$ ton	%	$ ton	%	$ ton	%	$ ton
+60	32.0	3.90	32.0	3.80	45.1	3.30	0.0		2.1	3.80	6.8	3.60	0.7	3.10
+90	14.7	7.40	14.7	5.00	28.8	4.80	1.0		11.1	3.20	23.2	3.20	6.0	
+200	11.2	11.60	11.2	6.20	18.3	6.20	15.2	3.20	23.1	4.30	38.5	3.80	34.0	3.40
−200	11.5	33.90	11.5	10.00	5.8	12.20	23.8	8.50	19.7	8.00	21.8	6.80	22.3	6.00
Slime	30.6	6.20	30.6	4.80	2.0	5.40	60.0	3.90	44.0	3.50	9.7	3.70	37.0	3.50
	100.0	9.43	100.0	5.30	100.0	4.80	100.0	4.90	100.0	4.50	100.0	4.30	100.0	4.00

Mesh of Pulp	G Underflow		G Overflow		H Underflow		H Overflow – Slime Chg		Sand Charge		Sand Residue		Slime Residue	
	%	$ ton	%	$ ton	%	$ ton	%	$/ton	%	$ ton	%	$ ton	%	$ ton
+60	3.1	3.10	nil	—	nil	—	nil	—	3.3	3.10	3.3	1.10	nil	—
+90	23.0	3.70	1.1	3.40	2.5		nil	—	24.6	3.70	24.6	1.15	nil	—
+200	43.0	4.30	19.1	4.00	27.0	3.10	3.5	3.00	45.9	4.30	45.9	0.82	3.5	0.64
−200	20.9	6.50	33.0	6.00	35.7	6.00	26.6	5.00	22.4	6.60	22.4	0.76	26.6	0.57
Slime	10.0	4.10	46.8	3.00	34.8	4.50	69.9	4.10	3.8	4.20	3.8	0.60	69.9	0.46
	100.0	4.60	100.0	4.20	100.0	4.60	100.0	4.30	100.0	4.70	100.0	0.88	100.0	493

Cyanide solutions containing copper deposit this metal readily on clean zinc; the copper forms a closely adherent metallic film or plating, which after a time coats the zinc so completely that the precipitation of gold almost ceases. Here the lead-zinc couple is used with advantage for cupriferous solutions. Lead-coated zinc does not precipitate copper so readily from working solutions as clean zinc, and the object aimed at is not to precipitate all the copper, but to keep the amount of copper in solution more or less constant. If the lead coating be too light, too much copper will be thrown down, and more zinc will have to be added to the extractors before cleanup is due, resulting in unnecessarily high consumption of zinc. The practice in dipping is to regulate the quantity of zinc dipped with the strength of the lead solution so that each 100 lb. of zinc carries 5 lb. metallic lead. That suits the copper content of the solution here and precipitates about one-half of the copper entering the extractors, while the gold value of the effluent is seldom above 3c. even in the cold season. Increasing the cyanide strength as a remedy for bad

The tendency of the copper to remain in the stronger solution of the sand boxes will be noted, the precipitated copper there being 41.7%, as against 44.4% in the case of the weaker cyanide solution of the slime boxes with a lower copper content entering. One cubic foot of zinc is allowed per ton of solution per 24 hours.

STRENGTH OF SOLUTION ENTERING AND LEAVING ZINC BOXES

	Sand Boxes			Slime Boxes		
	% KCN	% CaO	Cu Lb per Ton	% KCN	CaO	Cu Lb per Ton
Entering	032	007	12	022	008	09
After 1st Compt	039	008	11	025	011	07
After 2nd Compt	044	009	08	028	010	05
After 3rd Compt	042	010		029	010	
After 4th Compt	040	010		028	011	
After 5th Compt	039	011	07	028	011	04

The cleanup takes place twice a month. The top compartment only of each box is taken out and treated as usual with sulphuric acid. Bisulphate is not used on account of difficulty of transport and inconvenience of handling, the mine being about 10 miles from the nearest railway station at Graskop. When all the zinc has been dissolved, the copper is attacked by nitric acid, or with sulphuric and nitric acids together.

Over 700 lb. of copper is dissolved out every cleanup. The acids are added in the proportion of 1 part sulphuric to 0.44 part nitric acid, and the temperature should not be under 60° C. if copper is to be kept out of the bullion. The precipitate, kept in suspension by mechanical stirrers, is tested for the presence of copper after each addition of acid, so as to insure no more acid being added than is absolutely necessary. When the copper is all in solution, the vat is filled with water and a few pounds of size added to assist settlement, which usually takes place in five or six hours. The solution containing the zinc and copper is passed through a sand filter to catch any fine gold slime in suspension. The surface of the vat is skimmed every other month and the sand used as flux. The solution now flows through a stoneware pipe to two copper precipitating vats, which are filled with scrap iron. Any old iron is put into these, grate bars, fire doors, worn-out plates, battery screening, etc. Every four months the vats are cleaned out and the precipitate screened to keep out coarse iron. It is air dried, thoroughly mixed, sampled, assayed and bagged in sugar sacks. A shipment of this precipitate assayed 10.99 oz. Au, 123.79 oz. Ag per ton and 40.95% Cu.

There is no gold or silver in the copper vat effluent, and only a trace of copper toward the end of the run. It is found that coarse iron gives a much purer product and by using that exclusively it is hoped to bring the precipitate up to over 60% grade. The copper recovered is equal to 0.13 lb. per ton milled, and agrees fairly closely with the difference between the copper content of originals and residues.

The washed gold slime is filter-pressed and dried. Calcining is not found necessary after using nitric acid. The gold slime assays about 30% Au and is fluxed with 25% borax, 12½% sand and 12½% MnO$_2$. The bullion averages 850 fine. The average total recovery from the plant is 94% and the cost $1.34.

Manganese Ore in the Caucasus

According to a report from the British consul at Batum there was a remarkable revival in the Caucasus manganese industry in 1916. The Russian works, which formerly drew the bulk of their supplies from the Nikopol mines in South Russia, were unable to obtain sufficient ore from that source in 1916, and therefore supplies from the Caucasus deposits were in greater demand. During the 10 years preceding the war these works obtained, through the ports of Poti and Mariupol, an annual average quantity of about 2,000,000 poods (36,000 short tons). In 1916, however, their demands amounted to 12,000,000 poods (217,000 tons). The actual quantity of ore dispatched from Tchiaturi during 1916 was 15,755,250 poods (284,483 tons), of which 9,650,750 poods (174,253 tons) were sent inland by rail via Baku and the remainder went to Poti. Of the latter quantity less than half was for shipment by the Black Sea route to South Russia; the remainder was added to the stocks that were in Poti at the outbreak of hostilities with Turkey, and that at the end of 1916 amounted to nearly 8,000,000 poods (144,500 tons). According to official figures the stock of ore at Tchiaturi at the end of 1916 was 45,000,000 poods (812,500 tons), and 3,000,000 poods (54,000 tons) were calculated to be in stock at Batum. Thus the total stock of manganese ore in the Caucasus at the end of 1916 was 56,000,000 poods (1,011,000 tons), and it would therefore appear that the production of ore in 1916 more than kept pace with the demand from the Russian market.

Notwithstanding the fact that the existing washing plants at Tchiaturi are capable of producing 45,000,000 poods (812,500 tons) of washed ore and that the installation of new plants at present is costly, preparations for an extension of washing plants were proceeded with during the year and several new ones were installed.

A large number of exploration certificates were issued by the Mining Department of the Caucasus in 1916 for prospecting work on petroliferous plots in many parts of Transcaucasia and the northern Caucasus, and also for similar work on manganese-bearing lands in the district of Sharopan in the Government of Kutais.

Antimony in South Africa

A report from United States Consul John P. Bray, at Johannesburg in the Transvaal says that antimony ore is found in the Transvaal at Gravelotte, near the town of Leydsdorp, Pietersburg district. At least four mines were producing in this district during 1916, and their aggregate sales and shipments amounted to 722 short tons, with an estimated value of $73,419. The tenor of the ore ranges from 40 to 70%. This ore also is found near Steynsdorp, in the Barberton district of the Transvaal. As yet no ore has been produced from these mines, but it is understood that some activity took place in 1916 in the surrounding country, and particularly along the Murchison Range, from which more or less regular shipments were made during the year.

With reference to the occurrence of antimony ore in southern Rhodesia, the report of the Rhodesian Munitions and Resources Committee stated in part:

> So far as is known, the occurrence of antimonite (sulphide of antimony) in Rhodesia may be divided into two types: (1) The sporadic gold-bearing type characterized by sporadic distribution in quartz veins and schist bodies. This is of granular texture, and it forms strings, patches and large pockets, or it may be disseminated through a schist body in the form of minute crystals. In the last-mentioned instance the mineral is the double sulphide of lead and antimony. (2) The type which forms definite veins, sometimes free from quartz. It is a coarsely bladed structure resembling that mined in Japan, and it is to be found 4¼ miles southeast of Gatooma, southern Rhodesia. It is a vein of coarse-bladed antimony weathering to a pale yellowish ocher, and it is about 6 in. wide and dips westerly at 60 deg. This vein is now being work for the purpose of obtaining antimony ore.

Antimony ore is distributed through the central part of Southern Rhodesia in the belt of country extending from Hartley to Belingwe and from Gwelo to Selukwe. In this belt it occurs around Gatooma, Que Que, and Lower Gwelo, but apparently has been considered of too little importance to make it profitable to work.

Nitrate Production Costs in Chile have increased in every element since the declaration of war in 1914, according to brokers quoted in Commerce Report No. 194. On a production basis of Spanish quintals of 101.4 lb., labor is 6½d. higher than before the war; petroleum, 7d.; bags, 3d.; explosives, oils, spares, iron, etc., 2d.; export duties, 3½d.; making a total increase of 22d., or about 45c. It is estimated that before the war the average cost of production was slightly below $1.22 and the average selling price between $1.58 and $1.64. These figures indicate a 37% increase of the cost of production.

NEW PUBLICATIONS

Geologic Formations of California with Reconnaissance Geologic Map. By James Perrin Smith. Pp. 47. Bulletin 72, California State Mining Bureau, San Francisco.

Useful Minerals of the United States. Compiled by Frank C. Schrader, Ralph W. Stone and Samuel Sanford. Pp. 412. Bulletin 624, U. S. Geological Survey, Washington.

Production and Value of Mineral Products in Michigan for 1915 and Prior Years, and a Report on Michigan Limestones. Prepared under direction of R. C. Allen. 6 x 9 in., pp. 402; illustrated. Michigan Geological and Biological Survey, Lansing.

Chemical Tests for Minerals. By Arthur J. Burdick. 5 x 7 in.; pp. 93. $1.25. The Gateway Publishing Co., Beaumont, Calif.

This is a book written chiefly for the benefit of the prospector of limited technical training. It gives simple qualtitative tests that cover about everything the prospector is likely to find and is a convenient size for taking into the field.

The Utilization of Pyrite Occurring in Illinois Bituminous Coal. By E. A. Holbrook. Pp. 46; illustrated. Circular No. 5, Engineering Experiment Station, University of Illinois, Urbana, Illinois.

The possible recovery and utilization of pyrite is suggested. Prices as high as $8 per ton are offered in market and a 50-ton plant can be built for about $18,000.

Pulverized Fuel for Locomotives. By John E. Muhlfeld. Pp. 68; illustrated. Locomotive Pulverized Fuel Co., 30 Church St., New York.

Reprint from paper presented at American Society of Mechanical Engineers' meeting, December, 1916. Contains, besides many data, drawings of feeders, fireboxes and drying plants for powdered coal.

The Pan-American Magazine for June, 1917, published at 70 Fifth Ave., New York, N. Y., is devoted chiefly to articles on Bolivia and will be found of much interest and value to all who are interested in that country.

Articles on the following subjects are given: Economic Conditions in Bolivia; How the Industrial Development of Bolivia Should Interest the United States, by Adolfo Ballivian, consul-general to the United States; Transportation in Bolivia, by W. W. Rasor; Oruro Mining Region; and the Uncia Mines. The magazine is well printed and has especially good illustrations. Single copies are 25 cents.

Poor's Manual of Industrials for 1917. Eighth Annual Number. 6 x 9 in.; pp. xliv + 2800; $10. Poor's Manual Co., New York.

We can note no material change in the general arrangement of the regular annual volume of this well-known manual, except a small reduction in the number of pages. The present issue contains a great deal of useful information about all of the important industrial companies, including mining, and gives the latest income accounts and balance sheets, presenting them in most cases in comparative form, so that the growth of the business may be seen at a glance. The general statistical information is revised through Aug. 1, and there is a short section in the back of the book giving later data in some instances.

American Hydro-Electric Practice. A compilation of useful data and information on the design, construction and operation of hydro-electric systems from the penstocks to distribution lines. By William T. Taylor and Daniel H. Braymer. 9¼ x 6 in.; pp. 439; illustrated. $5. McGraw-Hill Book Co., New York.

In the preface the authors state that no attempt has been made to create a textbook on design, but have drawn liberally on the published experience and solutions of system problems.

After a general survey of water-power engineering, in which numerous tables, diagrams and formulas are given, various plants are described, each of which serves as an example of what has already been done, using low, medium or high heads, descriptions being accompanied by plans, sections and general detail.

In the matter of layout and selection of plant equipment, recent installations are compared with former practice, the overcoming of many difficulties having been successfully accomplished, and the general tone throughout the volume is the describing of what is proving successful, rather than the recommending of any cut-and-dried system or apparatus.

After giving general tables, costs, etc., special problems are considered, both in plant and line construction. Very complete reference tables and system diagrams and classified bibliography are appended.

Compressed Air. Theory and Computations. Second edition, revised and enlarged. By Elmo G. Harris. 6 x 9¼ in.; pp. 192; illustrated. $2. McGraw-Hill Book Co., New York.

In the preface to this second edition the author states that it has been prepared "with the view of eliminating errors and ambiguities" of the first edition, and refers the reader to "trade circulars, of which there are many very creditable productions illustrating and describing a greater variety of machines than can possibly be shown in a textbook."

This statement is somewhat contrary to the text of the preface to the first edition, which implies that that edition is not to be taken as a textbook, but more as an authority to those "college-bred men—who only are to be trusted with the designing of compressed-air installations."

For the student mathematically inclined there are many problems to be solved, most of which have already been solved by the manufacturers and are well understood by the operators of compressed-air plants.

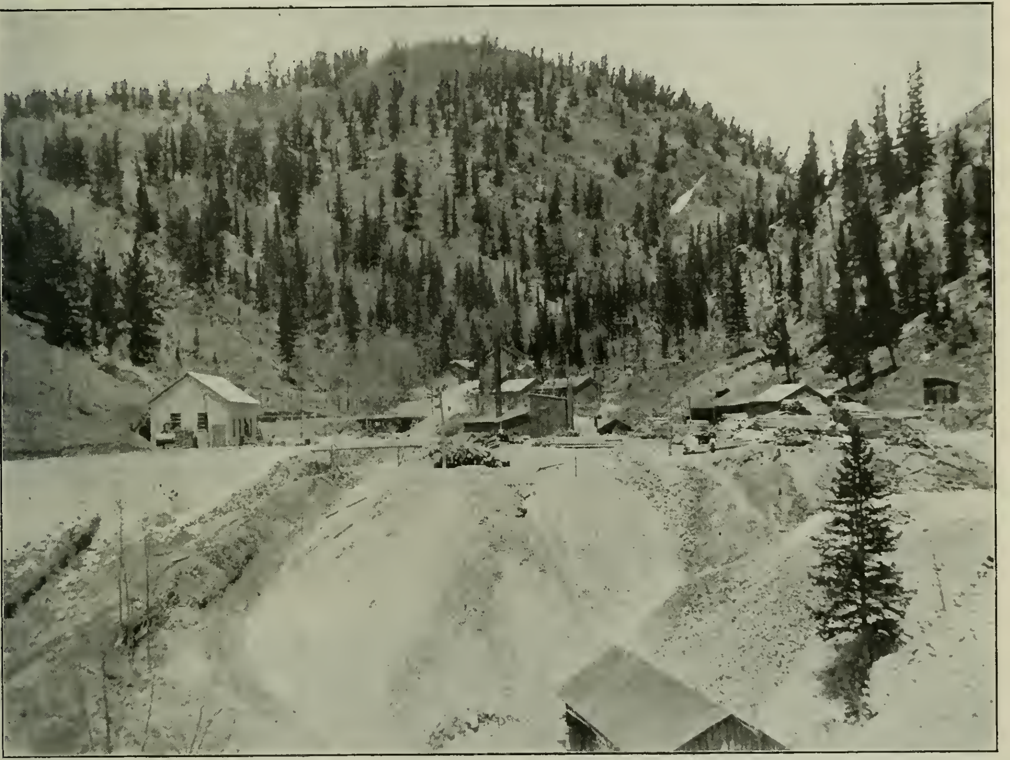
Novelty is claimed for a number of the tables appended, but in each there is something or other which has not been taken into consideration, "causing a slight error."

In the new chapter on fans it is stated that the practice falls far short of theoretical calculations—indicating that mechanics play a more important part in manufacture than mathematics, and the manufacturer is left to his own testing facilities for determining what his fans and blowers will do and the purchasers are taking the best they can get.

The Value of Peat Fuel for the Generation of Steam. By John Blizard, B. Sc. Pp. 42. Canadian Department of Mines, Mines Branch, Government Printing Bureau, Ottawa, 1917.

This report is the third and last of the series giving the results of the investigation undertaken some years ago to determine the value of peat fuel for the production of power. The former reports dealt mainly with the production of power through the media of gas producers and internal-combustion engines, while this volume presents the results obtained with peat when burned on the grate bars of two distinct types of steam generators. The conclusion reached is that under favorable conditions peat fuel can be economically utilized for the production of power by means of the steam generator and steam engine, but the controlling factor is the cost of obtaining the peat and delivering it to the steam power plant in a sufficiently dry state. This cost must be less than that of a quantity of good steam coal equivalent in heating value in order to permit of its competition. Moreover, the fact that peat fuel as manufactured by the only known economic process is much bulkier than coal of equivalent heating value must be borne in mind, and its storage becomes a problem of importance. The maximum cost per ton which peat fuel can stand and compete with coal is governed by the cost of steam coal at the place where the power plant is located. Generally speaking, peat fuel for steam raising cannot compete with good steam coal costing $5 or less per ton. But as the price of coal increases, as it promises to do, peat fuel, wherever large deposits of peat are available, will become a very serious competitor of coal. It is, however, considered hardly likely that in the future any form of fuel will be utilized for steam generation for the production of power, unless steam is indispensable to the carrying out of some chemical process or other industry. So far as the generation of power is concerned the more economical method is the conversion of the peat fuel into a combustible gas, which can in this form be burned in a gas engine, or used for heating furnaces in metallurgical works. Many of the Canadian peats so far examined have a high nitrogen content which can be recovered in the form of ammonia, when the peat is burned in a byproduct recovery producer.

Rawley Mine, Saguache Co., Colorado

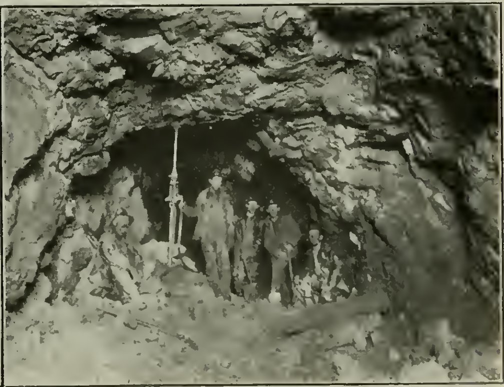


BUILDINGS AND SURFACE PLANT, RAWLEY MINING CO.

The Rawley mine is at the north end of the San Luis Valley and seven miles from the millsite at Shirley, on the narrow-gage branch of the Denver & Rio Grande R.R. A primary silver-copper-lead-zinc-pyrite ore is found as shoots in veins cutting through andesite flows, capping an older granite. The mine is opened by a shaft and over 15,000 ft. of development work, which extends in levels to a depth of 1200 ft. At depth the ore contains more silver and less lead and zinc

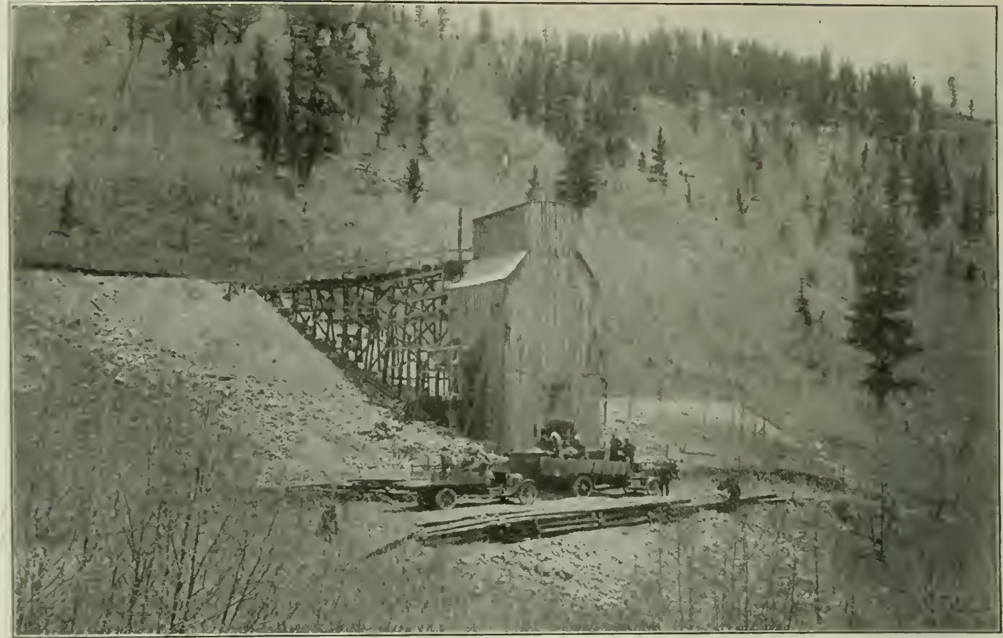
STATIONS OF MAIN RAISE AT THE 1050-FT. LEVEL

This is a three-compartment raise that is being put up to the 600-ft level and will be used to handle the ore from all the levels. Large shaft stations will be cut at all levels



VIEW IN SOUTH STOPE ON THE 1200-FT. LEVEL

The ore on this level occurs in a vein 5½ ft. wide, showing a marked increase in silver and iron content, a disappearance of lead and zinc, and no decrease in the percentage of copper

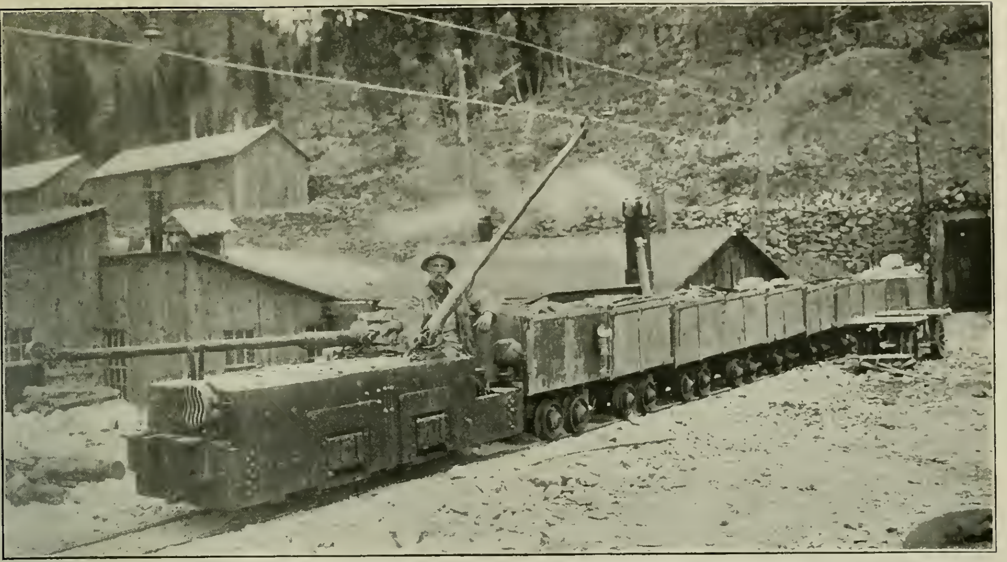


TEMPORARY ORE BINS AND MOTOR TRUCKS LOADING ORE

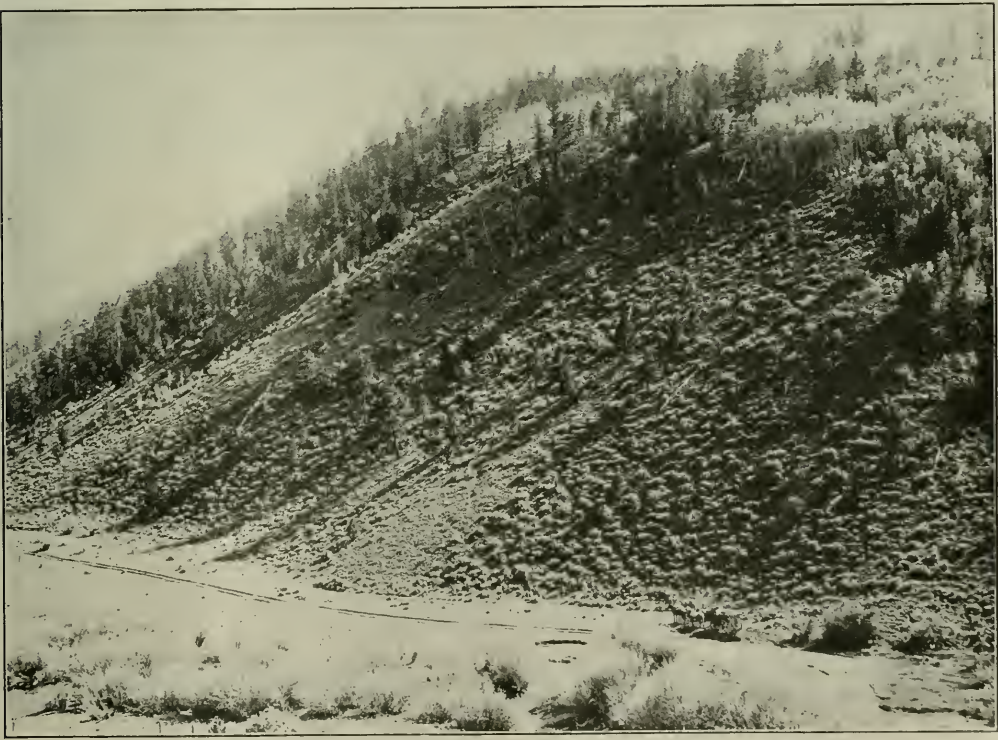
Six-ton White motor trucks were used for hauling ore from the mine to railroad station at Villa Grove, a distance of 18 miles. Climatic conditions are excellent for an altitude of 9700 ft., and the mine accessible throughout the entire year. There are numerous veins on the property, the Rawley vein being the most important. This has been explored by underground workings for over 1000 ft. along the strike and 1200 ft. in depth. The dip of the vein is nearly vertical and the width varies from a narrow seam to 20 ft., averaging about 6½ ft. From the surface to a point below the 400-ft. level lead and zinc predominate, with smaller quantities of iron and copper. Below this point to the 1200-ft. level there is an increase in iron and copper and a decrease in lead, zinc and silica

MAIN HAULAGE TUNNEL ON 1200-FT LEVEL OF RAWLEY MINE, BONANZA, COLO

This tunnel is equipped for electric haulage and has a length of 6250 ft In the tunnel is shown a 12-in. exhaust pipe and alongside, a 3-in compressed-air main



JEFFREY THREE-TON LOCOMOTIVE NOW USED FOR HAULAGE IN RAWLEY MINE



PROPOSED MILLSITE AT SHIRLEY, LOOKING TOWARD THE RAWLEY MINE

The mine is seven miles south and will be connected by aërial tram. The tram will be designed to handle 300 tons per shift and will cost about $150,000. The Denver & Rio Grande R.R. tracks are directly opposite to this millsite and all supplies for the mine will be handled over the tram at a greatly reduced cost. The ore will be coarse crushed at the mine. Further crushing at the mill followed by classifiers, Wilfley tables, regrinding, fine sand tables and flotation complete the treatment. A ratio of concentration of 2: 1 and a 95% extraction is expected. Concentrates will be shipped to the Salida smeltery, where a $200,000 addition is being built to care for the product

Text of Judge Bourquin's Decision in Butte & Superior Flotation Case

UNITED STATES DISTRICT COURT
MINERALS SEPARATION, LTD, et al
vs.
BUTTE & SUPERIOR MINING CO.
No. 8

Herein the court finds the issues in favor of plaintiffs and against defendant—that the patent is valid as to all claims in issue; that defendant has infringed as charged and now infringes by the unlicensed use of the patent process, all claims in issue save 5, 6 and 7. And therefrom the court concludes plaintiffs are entitled to recover of and from defendant in accordance herewith and the prayer of the bill. The decision and opinion attached is made a part hereof.

Aug. 25, 1917. BOURQUIN, *J.*

FOLLOWING is the text of Judge Bourquin's recent decision in the case of Minerals Separation, Ltd., vs. Butte & Superior Mining Co. in the United States district court at Butte:

This is trial on the merits of the suit reported in 237 Fed. 401.

It involves the patent and claims of the Hyde suit wherein the Supreme Court (242 U. S. 261) held the patent valid but some claims invalid. The issues are as in the Hyde suit, viz: Novelty, invention, infringement, and in addition defenses of unreasonable delay and defects in disclaimer of the invalid claims, and estoppel by reason of statements by plaintiffs' counsel to the Supreme Court in arguing the Hyde suit. The evidence herein is that submitted during 25 days and also the record in the Hyde suit. So far as heretofore known the nature and history of the discovery and invention (a process of ore concentration by air flotation) are fairly set out in reports of the Hyde suit (242 U. S. 261; 214 Fed. 100; 207 Fed. 956); of the Miami suit (242 Fed. ———; 237 Fed. 609), and of foreign suits cited in a footnote on page ——— 242 Fed. This suit is an important contribution and yet it discloses that though the use of the process is very wide, extensive and growing, its simplicity, economy and success still surprise and gratify the metallurgical world and its laws or principles of operations still interest and puzzle the scientists. "In the beginning it was very little knowledge and mostly guesswork, and since then there has been every year a little more knowledge and still a great deal of guesswork," testifies one of defendant's experts, Prof. Bancroft of Cornell, a physical chemist of note, acquainted with the process since 1906 and lecturer upon it since 1912. Though speaking for himself alone, the learned doctor's estimate might well be applied to all, practical laymen and expert scientists alike.

At the same time though heretofore somewhat ambiguous and obscure, present knowledge warrants the conclusion that the gist of this remarkable and valuable process and the actual discovery and invention are that whereas theretofore in ore concentration air had been used in desultory and fugitive bubbles as a makeshift incident of and supplement to oil and skin flotation, air can be made to do all the work by creating in water-ore pulp modified by a suitable oily contaminant an infinitude of bubbles.

It is the first of its kind, and the patent sufficiently discloses it and methods to those skilled in the art.

Ambiguity and obscurity were as much due to the extreme simplicity of the process as to the inability then and now to know and explain all its laws or principles. The tendency was to attach prime importance to reduction in amount of oil used, when in fact this is but a necessary incident (for which there are substitutes if not equivalents) to the creation of the infinitude of bubbles that do the work. Despite this tendency and to overlook the simple and obvious, the patent fairly clearly sets out the various ways and means to create this infinitude of bubbles and that they do the work.

The tests to determine which kind and amount of "oily substance yields the proportion of froth or scum desired," that flotation is "mainly from the inclusion of air bubbles," the froth, the agitation, all are so many guides in the patent, pointing the skilled operator to and including the infinitude of bubbles and the degree of agitation and amount of soap or oil to produce such bubbles, as surely as the word "crystalization" points to appropiiate temperature in Commercial Co. .vs . . . . Co. 135 U. S. 189, and the words "uttered sound" by the "human voice," to articulate speech in the Telephone Cases, 126, U. S. 531.

PREFERENTIAL AFFINITY FOR METALLIFEROUS MATTER

Of the new evidence herein are learned dissertations upon the philosophy of the process—upon the philosophy of bubbles, the heart of it, by Professors Bancroft of Cornell, and Taggart and Beach of Yale, and Drs. Sadtler of Philadelphia, and Grosvenor of New York. From these it is gathered that the mere introduction of particles of air into a liquid does not create bubbles, but that they are created by subsequent agitation, either applied or self-agitation. Air particles introduced into pure water are incapable of creating bubbles. The reasons are the surface tension of the water and the lack of viscosity to create a sufficient film about the air particles, compel the escape of the air particles into the atmosphere and no bubble is formed. Some soaps and oils possess the quality to lessen this surface tension of water and to give or increase this necessary viscosity. Their addition in appropriate quantities of water enable air particles introduced therein to create bubbles. Rather, the meeting and co-action of water, oil and air create a film composed of all three and which surrounds the air particles. This film is more viscous than the mass of the water, and rising to the surface, the tension of which (and of the films) has been reduced by the oil, maintains itself as an air bubble. This quality of oil is of first importance in the process. Another of lesser importance and which all oils possess is the "preferential affinity for metalliferous matter over gangue." Of lesser importance, because it is now known (and patented), that given another contaminant than oil, but which possesses the like bubble-making quality though not the said "preferential affinity," the process is equally successfully worked. Air also possesses this "preferential affinity," and in view of the foregoing it well may be that the capture as well as the flotation of the metallic particles is more due to the great volume of air than to the infinitesimal oil. That in this process air without oil cannot capture and retain the metallic particles, seems due to its inability to create bubbles without oil. And why this capture in any case, is still of the unsolved phenomena of the process. On the other hand, water has a preferential affinity for gangue over metalliferous matter. That is, it wets the former more readily than it does the latter. And this contributes to the process in that oil and air displace water from the surface of metalliferous matter more easily and quickly than from gangue, and so more readily capture and float the former than the latter. At the same time, despite these preferential affinities, in successful operation of the process the bubbles generally float more gangue than metal, more in quantity but not in proportion, and why is also unsolved.

Narrow Range in Amount of Oil Required

There are "critical proportions" of any oil used in this process, perhaps not a sharp divide, but rather a broad one. For the amount of oil to produce sufficient and efficient bubbles must depend on many other factors, viz; the working cell space, amount of water, degree of agitation, kind and amount of ore and perhaps on occasion amount of metallic content, kind of oil, etc. For example, if a ton of ore be agitated in a lake of water, doubtless a lake of oil will be necessary to create sufficient bubbles to capture the metal in the ore. But with bona fide operations in a good workmanlike manner —with the proportion of space, water, agitation, etc., such operations and manner dictate—the range in amount of oil will be narrow and well within 1% on the ore. These "critical proportions" are like those known to and solved by every child with its pipe and bowl of suds. Too little soap, the bubbles are few, small, fragile, and break quickly. Too much soap, they flow from the pipe in a torrent, are heavy, and refuse to float. The right amount of soap, the "critical proportions," his bubbles are large, detach readily, and float high, far and for long. So is it with the bubbles in this process. With excess oil but not enough to defeat bubbles altogether, though of fair aspect to the eye the bubbles will not do the work. In the excess oil in the films the metallic particles do not cling but swim or slide to the bubble's lower surface, "neck off"—detach, and sink. The untechnical workman recognizes there are "critical proportions" of oil, and small deviation from the predetermined amount in the feed, whether more or less, manifests itself to him in the appearance of the froth and poorer results; and he knows and remedies the error in oil.

Metallic content of ore seems of little importance—sometimes seems to require oil inversely. For example, a local operator with the process upon ore from the same vein as defendant's, uses 0.7 lb. of oil per ton of ore of 11.23% zinc content, making 50.59% concentrates with 94% recoveries, and in the same plant uses 2.83 lb. of the like oil per ton of tails of 0.97% copper content, making 9.085% concentrates and 0.266% tails. It is apparent it is the air and not at all the oil that floats the mineral, noting that in the first of this example 211 lb. of zinc are floated by air bubbles in the creation of which only 0.7 lb. of oil is used. How the air particles are introduced into the pulp is immaterial. For introduced, they are still particles and not bubbles. Agitation subsequent to introduction is vital and alone can convert air particles into water-oil-air bubbles. It is this subsequent agitation that within the claims of the patent agitates "the mixture until the oil coated mineral matter forms into a froth" or "to form a froth." And it is all one, whether this be applied agitation or self agitation—the agitation set up by the air particles themselves in merely rising through the mass and thereby coming in contact with both water and oil, all coacting to form bubbles which capture the metal. The mineral particles, either oiled before or by contact with bubbles, attach to and enter the viscous film of the bubbles. The particles also increase the viscosity of the bubble films, armor them and increase their stability, perhaps as stays that decreasing the area of unsupported surfaces, increase the latters' ability to resist rupture.

The great mass of new evidence herein is but cumulative of the Hyde suit. The only new publication is the California *Journal of Technology* detailing a suggestive but rather misleading and abandoned experiment, sufficiently referred to and disposed of in the Miami suit.

There is much evidence that progress in the process and methods of operating it, now discloses that with some ores and some oils or mixtures of oils, the process can be fairly successfully operated with 1% and more of oil. This is really admitted by plaintiff and is taken as proven. But it is also proven practically without conflict that in all the operations with this process not to exceed 0.2% of oil is used, save by defendant and others in like situation and only since the decision in the Hyde suit and solely to avoid infringement; that some oils are effective and more are ineffective to operate the process; and that the excess oil used is useless, wasted and harmful.

But the defendant contends that this evidence demonstrates the process lacks novelty and invention, and that because of it the record is substantially different from the Hyde suit the decision there should not control here, and the patent is and ought to be held invalid. This is without support in the patent and Hyde decision.

The Formation of Froth

In describing the invention the patent refers to Cattermole and says that the patentees "have found that if the proportion of oily substance be considerably reduced —say to a fraction of 1% on the ore," after vigorous agitation the metallic particles rise to the surface in a froth; that the proportion thereof varies considerably with different ores and different oils, and so it is necessary to test "to determine which oily substance yields the proportion of froth or scum desired." An example of a particular ore and oil is of oil "say from 0.02% to 0.5% on the weight of ore," wherein on cessation of agitation "a large proportion of the mineral present rises to the surface in the form of a froth or scum which has derived its power of flotation mainly from the inclusion of air bubbles introduced into the mass by the agitation, such bubbles or air-films adhering only to the mineral particles which are coated" with the oil which has "a preferential affinity for metalliferous matter over gangue." It adds that the minimum of that oil "may be under 0.1% of the ore, but this proportion has been found suitable and economical."

The claims are (1) for "oily liquid . . . . to a fraction of 1% on the ore," (2) for oleic acid "to 0.02-0.5% on the ore," and (3) for "a small quantity of oil." These last were held invalid. In upholding the patent the Supreme Court says that "as described and practiced" the process consists "in the use of an amount of oil which is 'critical' and minute as compared with the amount used in prior processes, 'amounting to a fraction of 1% on the ore,' and in so impregnating with air the mass . . . . by agitation . . . . as to cause to rise to the surface . . . . a froth . . . . which is composed of air bubbles with only a trace of oil in them, which carry in mechanical suspension a very high percentage of the metal;" that "it differs so essentially from all prior processes in its character, in its simplicity of operation, and in the resulting concentrate, that we are persuaded that it constitutes a new and patentable discovery;" that the facts are not overstated by Liebmann that "the present invention differs essentially from all previous results. It is true that oil is one of the substances used but it is used in quantities much smaller than was ever heard of, and it produces a result never obtained, before. The minerals are obtained in a froth of a peculiar character, consisting of air bubbles which in their covering film have the minerals imbedded in such manner that they form a complete surface all over the bubbles.

SIMPLICITY OF THE OPERATION IS STARTLING

"A remarkable fact with regard to this froth is that, although the very light and easily destructible air bubbles are covered with a heavy mineral, yet the froth is stable and utterly different from any froth known before, being so permanent in character that I have personally seen it stand for 24 hours without any change having taken place. The simplicity of the operation, as compared with the prior attempts, is startling. All that has to be done is to add a minute quantity of oil to the pulp to which acid may or may not be added, agitate for from 2½ to 10 min. and then after a few seconds collect from the surface the froth which will contain a large percentage of the minerals present in the ore;" that the Court is convinced "that the small amount of oil used makes it clear that the lifting force which separates the metallic particles of the pulp from the other substances of it is not to be found principally in the buoyancy of the oil used, as was the case in prior processes, but that this force is to be found, chiefly, in the buoyancy of the air bubbles introduced into the mixture by an agitation greater than and different from that which had been resorted to before and that this advance on the prior art and the resulting froth concentrate so different from the product of other processes make of it a patentable discovery as new and original as it has proved useful and economical;" that the Court agrees with the House of Lords' decision that the process is not one before described but a new method in which flotation is by the "buoyancy of air bubbles;" that tests to determine the necessary "amount of oil and the extent of agitation," and "the range of treatment within the terms of the claims," satisfy the law; but that while the patentee "discovered the final step, precedent investigations were so informing that this final step was not a long one and the patent must be confined to the results obtained by the use of oil within the proportions often described in the testimony and in the claims of the patent as 'critical proportions' 'amounting to a fraction of 1% on the ore,' and therefore . . . . the patent is valid as to claims Nos. 1, 2, 3, 5, 6, 7 and 12 . . . . but. . . . invalid as to claims 9, 10 and 11." Those held invalid are those heretofore referred to as (3). It seems clear neither patent nor decision undertakes to say the process depends upon less than 1% of oil or is inoperative with 1% or more of oil.

PATENT REFERS TO FRACTION OF ONE PER CENT. OIL

It is true that in the beginning and during the Hyde suit the patentees inclined so to believe, or at least believed better results would be obtained with a fraction of 1% of oil. Perhaps limited investigation and experience with few ores and oils justified the belief. Indeed, all experience to date, plaintiffs', defendant's, strangers', demonstrates that with any ore and any efficient oil, less than 1% of oil gives better results, all circumstances considered. The "critical proportions" referred to seems absent, in terms, from the patent, and ought not to be adversely inferred in disregard of construction in favor of the patentee where the patent is ambiguous. The patent describes oil "considerably reduced," and refers to a "fraction of 1%" by way of example. And though some claims limit oil to such fraction, and a limited range within it, others are for "a small quantity" and for that reason held invalid by the Supreme Court. With the later knowledge of this suit, it is doubted that such would be the decision now. It is to be observed that this limitation of the patent indicates the Supreme Court believed the process might be operative with 1% and more of oil, and contemplated that this would not defeat the patent but might affect infringement. If the patent is limited to the use of a fraction of 1% of oil, that the process can be operated with 1% and more is not material to validity though it may be to infringement. For if a patentee limits his claim voluntarily or because he does not know the extent of his invention, he abandons the excess and the patent is valid to the extent of the claim. If it be conceded that new evidence might warrant and demand that a Trial Court hold invalid a patent by the Supreme Court held valid, such evidence must be unequivocal, clear and convincing, in quality and quantity that inspires confidence and produces conviction that the patent is invalid and that the Supreme Court would so determine beyond a reasonable doubt. Not only does it fail here, but it strengthens the conviction that the patent is valid.

The disclaimer to conform to the Supreme Court's decision that claims 9, 10 and 11 are invalid, was filed 107 days after said decision and after mandate but before expiration of time for rehearing. It was timely filed. In substance it fairly conforms to the language of the decision, disclaiming "from claims 9, 10 and 11 . . . . any process of concentrating powdered ores excepting where the results obtained are the results obtained by the use of oil in a quantity amounting to a fraction of 1% on the ore." The parties differ in its interpretation even as they do in respect to the decision. Written words, not oral claims, control. The patent claims included what the patentees were entitled to and more. The decision pointed out the excess. The patentees disclaim the excess. They can safely rely upon the decision, and a disclaimer conforming to the language of the decision is sufficient. The patent valid, defendant admits infringement from before suit commenced to Jan. 7, 1917, and denies infringement thereafter. During the period of admitted infringement it applied the process to some 1,598,000 dry tons of crushed ore, the tailings from water concentration, of mineral zinc content by yearly averages as follows: 1913, 15.14%; 1914, 14.14%; 1915, 13.66%; 1916, 12.89%. Oil used by yearly averages is as follows: 1913, 5.58 lb.; 1914, 2.22 lb.; 1915, 1.49 lb.; 1916, 1.43 lb. The concentrate grade by yearly averages is as follows: 1913, 47.60%; 1914, 53.03%; 1915, 54.62%; 1916, 53.83%, and recoveries (apparent) likewise, are for 1913, 80.03%; 1914, 86.08%; 1915, 90.18%; 1916, 92.63%. Progress is indicated by leaner ores, less oil, higher grade concentrates, greater recoveries, all coincident with advancing time.

PROCESS MODIFIED BY DEFENDANT

It is noted that the process is responsible for advance in methods, devices and machines for its operation. To describe briefly defendant's operations during admitted infringement, the water-concentrate tailings, oil added, flowed to the head of a pyramid machine of seven cells in series, each cell containing a revolving perpendicular spindle and horizontal blades, and having two opposed spitzkasten. The agitation was very violent. The tails from each cell flowed by gravity to the cell immediately below, those from the last cell flowing to Callow air cells which produced froth middlings returning to the head of the pyramid, and tails, to waste. The first three cells of the pyramid produced froth rougher concentrates which flowed to cleaners, and the other cells produced froth middlings which returned to the head of the pyramid. The rougher concentrates passed through five cleaner cells for washing. This produced concentrates which flowed to and through five re-cleaner cells, and tails which returned to the head of the pyramid. The re-cleaners produced final concentrates, and tails which returned to the head of the cleaner. Commencing Jan. 7, 1917, the defendant's methods are as before, save pneumatic as well as mechanical agitation is employed in the lower four cells of the pyramid, some spitzkasten are blocked, an additional cleaner operation is used and from which for some unexplained reason 8.65% zinc tails go to waste, and oil in amount 1% and more on the ore is used. Defendant, not very insistently, claims results for this latter period are more profitable than for the former, but plaintiffs' analysis (neither denied nor criticized and beyond both) of defendant's reports and tabulations makes manifest the fact is otherwise to the extent of about $1.75 per ton of ore—an enormous loss on 45,000 tons monthly. There is considerable like testimony in reference to operations by other infringers. However, coming as it does after very large operations, investigations and experiments of several years, after the Supreme Court's decision in the Hyde suit, it is incredible that use of 20 lb. of oil per ton results in more profit than 1½ to 4 lb. per ton. If it does, these great concerns would not have waited to discover the fact and employ it, until after the said decision. Defendant practically admits that it now uses the present amount of oil merely to avoid the patent. It is done, says its counsel in argument, "because the Supreme Court has said it is not at liberty to use less than ½%" and "out of abundance of caution" it uses "more than 1%." The evidence likewise persuades. If the excess oil were effective and useful and not inert, useless and harmful, it would be without the claims of the patent, would be of that the patentees abandoned to the public, and would involve no infringement.

PLAINTIFFS' CLAIM THAT WASTEFUL EXCESS OF OIL IS USED TO EVADE PATENT

Plaintiffs somewhat laboriously argue that though the Supreme Court held that the claim for use of "a small quantity of oil" to produce froth is too broad and so invalid, yet since the court identifies the invention by the "results obtained" though confining it to the "results obtained" by the use of oil "amounting to a fraction of 1% on the ore," the import of the decision is that if the results obtained by operation of the process with oil in amount 1% and more on the ore are like and the same results obtained with a fraction of 1% of oil, it is within the patent and is infringement. This is more ingenious than sound, and would deprive the decision of effect. The court does not confine the patent to the like or same results obtained, but to the results obtained by the use of a fraction of 1% of oil on the ore. It is believed, however, that the court employs the word "use" in its or the ordinary sense of beneficial service. Patent law is not concerned with the useless, and a valuable result sought is not "obtained" by but despite the use of an excess of an essential ingredient, which excess renders no or ill service. From the evidence it appears the larger part of the oil used by defendant and all in excess of a fraction of 1% on the ore, if not inert is ineffective, wasted and injurious to the process and results. Before Jan. 7, 1917, defendant used only pine oil and about 1.43 lb. per ton of ore, with excellent results. Since said date it uses a mixture of 20 to 24 lb. of oil per ton of ore, made up of 18% of pine oil, 12% of kerosene oil, and 70% of fuel oil, with poorer results. The kerosene and fuel oil are petroleum.

As before stated many oils are ineffective to operate the process, and that is because they have not the quality that contributes to bubble making. What this quality consists of, wherein it lies, does not appear. With these ineffective oils, agitation will not produce froth and so there is no flotation of the metallic particles. One of defendant's witnesses testifies that in the laboratory and plant of the Utah Copper Co., one thousand oils have been tried, of which but two mixtures give satisfaction. Petroleums seem generally ineffective, by the evidence of both parties, though some of defendant's witnesses testify to sometime successful experiments with them. Incidentally, there is suspicion that with experiments, as with figures, can be done anything for or against, without impropriety in the operator. Some petroleums are used in limited quantities but always in combination with a recognized bubble-making oil, and only, it is said, for a somewhat bubble-stabilizing effect. Defendant's present mixture of oil contains more pine oil on the ore than it used alone before Jan. 7, 1917. The other factors the same, it is obvious the excess petroleums in the mixture are responsible for the poorer results.

Defendant uses the patent process, uses plaintiffs' invention of ore concentration by air-bubble flotation, uses the same elements in the same combination in the same way with the same function to the same but poorer results; and exceeding the patent claims in reference to one ingredient (oil), uselessly, wastefully and injuriously and merely with intent to avoid the letter of the patent, does not avoid infringement. The addition of the excess oil no more adds to or changes the process, no more avoids infringement, than would the addition of milk or other useless substance not a part of the process. The excess oil exercises either no function or less efficiently exercises the same function in the same way as the limited oil, and to the same but poorer results. To secure to patentees their invention, the law looks quite through mere devices and forms, to the substance of things. And if in substance the invention is taken, if the thing that does the work is taken, all devices to evade the letter of the patent avail nothing to escape the consequences of infringement. Neither principle nor authority to the contrary, is cited or known to the court.

In the matter of estoppel affecting infringement, it suffices to say neither in pleading nor proof do the elements of estoppel appear. Although the evidence is of great volume and the arguments of relative length, all have been carefully considered but require no additional reference herein.

The patent is valid in respect to all claims involved. Defendant throughout has infringed and now infringes all said claims save 5, 6 and 7, and decree accordingly.

Gold and Silver Production in 1916

The corrected and revised statement of gold and silver production in the United States in the calendar year 1916, prepared jointly by the Bureau of the Mint and the Geological Survey has just been issued and shows that the preliminary estimate made in January was rather conservative, though the differences were not large. The revised figures give the total production of gold in 1916 at 4,479,057 oz., or $92,590,300 in value, or greater than the January estimate by $273,900; while the output of silver was 74,414,802 oz. fine, which is 1,533,002 oz. more than the January figures.

GOLD AND SILVER PRODUCTION OF THE UNITED STATES

(Gold, Value. Silver, Fine Ounces)

	Gold		Silver	
	1915	1916	1915	1916
Alabama	$5,100	$7,400		
Alaska	16,710,000	16,124,800	1,054,614	1,266,317
Arizona	4,555,900	4,092,800	5,665,672	6,680,252
California	22,547,400	21,980,400	1,689,924	1,936,910
Colorado	22,530,800	19,185,000	7,199,745	7,551,761
Georgia	14,800	20,400	141	
Idaho	1,170,600	1,058,300	13,042,466	11,570,399
Illinois			1,892	5,782
Maryland				153
Michigan			581,874	759,068
Missouri			55,534	128,860
Montana	4,978,300	4,328,400	14,423,173	14,046,054
Nevada	11,883,700	9,064,700	14,453,085	13,682,067
New Hampshire				935
New Mexico	1,460,100	1,350,000	2,337,064	1,729,917
North Carolina	170,700	23,000	1,496	1,738
Oklahoma				606
Oregon	1,867,100	1,901,500	125,499	221,887
South Carolina	3,600	300		
South Dakota	7,403,500	7,471,700	197,569	210,100
Tennessee	6,800	5,700	99,171	93,837
Texas	1,800	500	724,380	664,319
Utah	3,907,900	3,859,000	13,073,471	13,545,802
Vermont		100	150	1,964
Virginia	500	500		508
Washington	461,600	580,600	213,877	294,516
Wyoming	13,900	20,200	2,910	3,407
Continental U. S.	$99,714,100	$91,075,500	74,945,927	74,397,159
Philippines	1,320,900	1,514,200	15,148	17,643
Porto Rico	700	600		
Total	$101,035,700	$92,590,300	74,961,075	74,414,802

As compared with the report for 1915, the gold value showed a decrease of $8,445,400, or 8.36%. The falling off was generally distributed among the more important gold-producing states, being most marked in Colorado and Nevada; while South Dakota showed a small gain. In gold production California again came first, notwithstanding a decrease of $567,000. Colorado was second, Alaska third and Nevada fourth. In a second group, considerably behind the first, South Dakota was the fifth state in amount, Montana sixth, Arizona seventh and Utah eighth. Eleven states produced over $1,000,000 each. The Philippines reported a gain of $193,300 or 14.6%, which was largely due to the extension of dredging operations.

In the total production of silver the change was small, a decrease of 546,273 oz., or 0.73%. The larger decreases were in Idaho and Nevada; Colorado and Utah showing small gains. Montana was the largest silver producer in 1916, Nevada being second, Utah third and Idaho fourth.

Foreign Trade in Copper

Exports of copper from the United States in June, 1917, and the first six months of the year, are reported by the Department of Commerce as follows:

	June Lb.	Jan.-June Lb.
Ore and concentrates, contents	587,357	3,211,188
Unrefined, in bars, pigs, etc.		4,995,699
Refined, bars, etc	89,532,200	577,672,571
Old and scrap	46,974	863,595
Plates and sheets	700,932	17,187,879
Wire	1,961,517	15,336,663
Total	92,828,980	619,267,595

The weight of ore exported in June was 6560 tons; of concentrates, 63 tons.

Imports of copper into the United States in June and the first half of 1917, are reported by the Department of Commerce as follows:

	June Lb.	Jan.-June Lb.
Ore and concentrates, contents	14,466,518	77,873,502
Matte and regulus, etc	1,141,067	10,454,043
Unrefined, in bars, pigs, etc	44,779,479	205,085,123
Refined, in bars, etc	320,935	3,962,735
Old, etc., for manufacture	3,454,978	11,848,422
Composition metal, copper chief value	15,548	162,552
Total	64,178,525	309,386,377

Material imported in June was 39,942 tons ore, 14,207 tons concentrates and 1178 tons matte and regulus, etc.

Minerals Separation vs. Miami

We are informed that there has been a decision in the suit of Minerals Separation against Miami Copper Co., tried in the United States district court at Wilmington, Del. The report of the scope of the decision as sent us by the attorneys for Minerals Separation is declared by the attorneys of the Miami Copper Co. to contain substantial inaccuracies. We therefore refrain from making any announcement until we can get a statement in which the attorneys for both sides can concur.

Dredging in the Nechi Valley

Dredging results of the Pato and Nechi companies in Colombia are reported for the last fiscal period and Chairman Baker of the holding company—Oroville Dredging Co., Ltd.—reviews the peculiar position of the Nechi company with respect to the effect of the British excess-profits tax on a mining company just coming into full production.

THE Oroville Dredging Co., operating the Nechi Valley, Colombia, S. A., in its annual report for the year ending Sept. 30, 1916, states that in Pato fields 1,484,721 cu.yd. of material dredged returned $719,493, an average of 48.5c. per cu.yd. Notwithstanding abnormal costs of repairs and war prices for materials and freights, field costs averaged only 12.46c. per yard.

The Nechi dredge handled 1,617,975 cu.yd. for a recovery of $651,068, an average of 49.27c. per yd. Field costs were 9c. per yd. including 5c. per yd. for repairs which under normal conditions would not have exceeded 2c. With the addition of £1000 per month rental paid to Pato Co. for the use of their plant, the proportion of expenses charged Nechi on the London books plus depreciation, the field costs for the period amounted to 15.20c. per yard.

NECHI DREDGE WORKED ONLY 58% OF TIME

The Nechi dredge commenced operations on Sept. 1, 1915. In consequence of the suspension of operations at various times, owing mainly to the necessity for alterations in the construction of the dredge and the erection of new bucket plant and a shortage of water power for a certain period during the dry season, the dredge was employed for only 58% of the possible running time. In the early days of the Nechi operation, the management decided that it would be prudent to operate the dredge along the banks of the river, so as to create a wall against heavy floods during the rainy season, and it was thought advisable for rapidity in work not to operate the dredge at its greatest operating depth, so that while that work was being done a much lower average per cubic yard was obtained than would have been the case if dredging had been done to bedrock. To this fact may be largely attributed the average of only 49.27c. per cu.yd., while the operating costs were affected by the fact that the dredge only worked 58% of the normal running time, due mainly to certain defects in dredge construction.

Chairman Frederick W. Baker at the annual meeting in London, recently, commented on the peculiar position in which the Nechi company finds itself, as follows:

"Work carried on during the current year has confirmed the high value of the gravels on the Nechi property, and, while I do not think that the results which we are now obtaining during this current year will exceed materially the results for the period under review, I think I can state with the greatest assurance that, were it not for war conditions and the excess-profits situation, we could earn from this property in any year, until we have exhausted the high-grade ground, an amount equal to approximately twice the earnings for the period ended Sept. 30, 1916, and probably at a large reduction in operating cost.

"I now come to a point where it will be necessary to consult with you as to what your wishes may be in operating the Nechi property, judged from the point of view of our position as it will be affected by excess-profits duty. Unfortunately we had no pre-war standard, and we are therefore assessable for excess profits after such allowances as the revenue authorities or the Board of Referees might be willing to give us, at the rate of 60% assessment on our earnings for 1915-16, at the same rate for this year, and at the rate of 80% for 1917-18, and in my judgment it certainly would be a reflection on the good sense of the Treasury authorities if they should show us no special consideration in respect of this form of taxation having regard to the facts which I shall put before you. We can all readily understand that mining companies operating base metals should be assessable for excess-profits tax, having regard to the enormous appreciation that has taken place since the commencement of the war in such metals as iron, copper, tin, lead, zinc, and some of the rare metals, and it is abundantly clear that companies operating this class of mines have had their profits abnormally swollen owing to the large appreciation in the metals produced and sold by them, in addition to which few of these companies have started since the commencement of the war. Most of them have had a pre-war standard, and they are only assessed on the excess over their pre-war standard of profit. Because we, unfortunately, had no pre-war standard we are to be assessed on every shilling earned, subject to certain concessions based on risk, duration of life of the property and interest on capital actually invested.

"Now, what is our position? We are producing a commodity which the government wants. The production of this commodity is costing us more, owing to the increase in price for all supplies, labor, insurance, freight, etc., than before the war. We receive no corresponding premium or appreciation in the market for the product we produce, and on top of this we have to look forward to what you might almost call a confiscation of our earnings, if, as is possible next year, 80% of these earnings are to be paid to the government in the form of excess-profits tax, in addition to the ordinary income-tax deduction.

PRACTICAL CONFISCATION OF EARNINGS THREATENED

"Now, gentlemen, this company, as now equipped, could earn approximately an income of over £200,000 a year until the richer gravels are worked out, and it is for you to determine what policy you want us to follow. Are you prepared to authorize us to work the property at its full capacity in the richer ground and pay from 60 to 80% of our earnings away in the form of excess-profits tax? We as a board have no desire to avoid in any way the reasonable and proper responsibilities that attach to us and to you as shareholders, and we wish—and we feel that you would also wish—that this company should bear its full share of the burden of the cost of this war, providing always that these burdens are borne equally by all. But we feel that our case is one of peculiar hardship, for we are not getting, as operating base-metal mines are, the benefit of the enhancement in value of the metal produced. On the contrary, our gold is costing us more to produce, and, notwithstanding this fact, we are being put on the same basis for taxation purposes as base-metal mines, whose profits have been enormously enhanced by the increase in the cost of the commodity they are producing, so that they can well afford to pay the full burden of excess-profits tax where we should not—anyhow, not in the same proportion—and we as a board feel disposed to recommend that, unless we get some reasonable and fair treatment from the revenue authorities, our clear duty to you is to suggest that the dredge be put to work on the poorer gravels until the relief from inordinate and excessive taxation would enable us to work out the richer gravels, so that in this way you may earn some profit for the risk you have taken and the long patience displayed by you in the past. I am very hopeful that when the peculiar hardships of our case are properly put before the authorities they will take a reasonable view and enable us, by operating at the fullest capacity, to do as well for you as the present circumstances of the war would justify, to do as well for the government as everyone of us would wish to do and, in addition, enable us to furnish as large an output of gold to the country as the means at our disposal would enable us to produce."

REASONABLE TAXES ACCEPTABLE

When a stockholder remarked that he had expected to hear something with regard to the extra sixpence which the Board promised to the stockholders last year, the chairman said that the point raised by the speaker was affected by the excess-profits tax, that the directors hardly knew where they stood in this matter and that there were really two questions involved. Did the shareholders want the directors to pay nothing to the government if they could get out of paying, or did they want the board to pay what they ought to pay in times like these providing that the amount was, in their judgment, reasonable and proper? His own view was that every company and every Englishman had an obligation to his government in these times, and he did not think this company would want to evade that obligation in any way. The directors had placed the whole matter in the hands of a very able accountant, who was taking it up, not with the Board of Referees, but with the Inland Revenue Authorities, and he believed there was a strong inclination on the part of the Treasury to meet the situation in respect of gold mining in a fair way. If they did that and gave the company an allowance for risk—which was a big item—for life—and in the Nechi the life of the property in the richer gravels was a short one—and for capital, the directors would be quite prepared to work to the full capacity. He suggested that the shareholders should give discretion to the Board to operate the property in a way which would be best for the shareholders and at the same time best for the country. They could not get off scot free, and personally he would not be a party to any attempt to do so. They would certainly make no attempt to evade obligations which it was their duty to fulfill. With regard to depreciation, the government never permitted any allowance to be made for mineral areas, but an allowance was made in respect of depreciation of plant.

With reference to the life of the Oroville property in California, Chairman Baker stated that this was practically exhausted. The directors had, however, determined, before definitely abandoning the Bear River property, to have it thoroughly drilled again, and it was possible that, with modern improvements in dredging construction and higher technical knowledge in dredging they might find they could operate some portion of that property which in the earlier history of the company they were unable to work at a profit.

Replying to the question of the possibility of further properties being acquired, so as to give the company a longer life, the chairman said the directors had had that question in view. W. A. Prichard, the company's consulting engineer, had made two trips in Colombia—very hazardous trips—and had written recently to say that there was one district which he thought looked rather promising, and in which he wanted to spend six months for purposes of investigation. This the board had authorized him to do. They had also been looking into a property in South America, but had had to give it up. Then they had examined a gravel property in California. Whether it would come up to the standard they required he could not say, but it looked fairly hopeful. It showed up to the present about 13c., with a fairly large yardage.

Transporting Coal on Ohio River by Artificial Tides

On Monday, Aug. 13, there arrived in Cincinnati 13,000 tons of coal, floated down the Ohio River at low stage on an artificial wave created by order of Col. Lansing H. Beach, Corps of Engineers, U. S. A.

As always at this time of the year, the Ohio River is in extremely low water, and boats drawing more than a couple of feet of water are normally tied up. Under the direction of United States Army engineers 23 dams have been built between the upper waters of the Ohio and a point just below Cincinnati. These dams, which impound large volumes of water in the Big Sandy, Kanawha and upper Ohio Rivers, were opened, allowing water to run out forming an artificial crest 3 to 6 ft. high, and 30 to 60 miles in length. On this home-made floor wave the coal-labor barges made their way to Cincinnati, where the fuel shortage was so pressing that an industrial shutdown was imminent. Colonel Beach is quoted as saying that the saving in economic cost of such a shutdown undoubtedly equaled the cost of all the dams so far built in this project. To ship the 13,000 tons of coal from the West Virginia coal fields to Cincinnati by rail would have required 350 coal cars; in these days of car shortage and freight congestion it is decidedly worth while to transfer such shipments to water-borne traffic, whenever possible.

The water was drawn from only 19 of the 23 dams, and the feat has demonstrated that with proper manipulation these artificial waves with still higher crests can be created every ten days or two weeks, and the tonnage of coal shipped by water can be largely increased

Correspondence and Discussion

American Academy of Engineers

I was much surprised to learn from the article in the issue of the *Journal* of Aug. 18, describing the organization and ambitions of the new American Academy of Engineers, that it had already received a Government charter from the Senate of the United States. I am inclined to the opinion that the reason for not commenting editorially in the same number on this new organization was that it struck the *Journal* much as it will a large proportion of the engineers of our country.

It is difficult to understand why a new organization of engineers should be created, and made to outrank the splendid institutes we now have, unless, indeed, it be intended to give greater professional prominence to the "nucleus of fifty," mentioned in the article, together with the additional 150 members they will elect to complete this "select body of practitioners." The reasons why this academy should receive its Government charter, as set forth by Dr. J. A. L. Waddell, who includes himself in the "select body of practitioners," will not prove at all convincing to the average engineer. There is much reason to believe that the younger members of the engineering professions will be discouraged by having an officially recognized body of engineers placed over them to which they can obtain admission only by the "dead men's shoes" trail.

Doctor Waddell advances as his first reason for a charter that, without it, this small coterie of men will not be recognized by the general public as the "select body of practitioners" they intend to make of themselves, to which our other engineering organizations will have to appeal for help and guidance in all matters relating to their welfare. It will be a shock to most of us to learn that our engineering institutes are to experience crises, in the near future, which will force us to turn tearfully to some other organization for guidance and help even if this other organization is made up of "purveyors to the king by royal charter."

The next reason in the good doctor's argument is that academies for other purposes have already been chartered by European kingdoms and monarchies, and if we do not move rapidly, our great sister republic, France, will "beat us to it" in creating an Academy of Engineers. This seems to be un-American. By the same reasoning we should appoint purveyors to the President by charter and thus follow other dynasties which appoint purveyors to the king by royal charter, a policy which to the average American has always savored strongly of discrimination against other merchants and tradesmen. The granting of a charter to this proposed "select body of practitioners" will surely be a discrimination in its favor if, as Doctor Waddell intimates, it is to arrogate to itself all the professional calls for technical aid from foreign governments as well as all those from our own national, state and municipal governments. It is true that we have a National Academy of Science which, it is generally understood, is organized for the purpose of advancing the sciences and disseminating scientific knowledge. It is not an Academy of Scientists. An Academy of Engineering (not Engineers) for the advancement of engineering knowledge would not present the menace to the engineering profession that appears to be concealed in the organization of a "select body of practitioners" who propose to commercialize the prominence they will obtain from a government charter. Doubtless many of the members of this new organization, if they have yet had time to give it consideration, honestly intend that it shall act merely as a channel through which these various calls for aid from our own and other governments will be transmitted to the already established engineering societies. However, it will doubtless be found in practice that most of these commissions will pass promptly into the hands of some of the "Select Body of Practitioners" who may, of course, find it necessary to favor with subordinate positions some of the engineers from the less select, sub-rank class. An Academy of Engineers with the ideals expressed in your article will not be able to work hand in hand with the National Academy of Science.

The final argument presented for this Government charter is that such a select body could make a much more authoritative appeal in movements affecting the welfare of the commonwealth. The first of these stirring appeals to the commonwealth is to be made through the press to educate every war baby as an engineer of some kind or other. Incidentally the Academy of Engineers is to be a Richard born with teeth in that it is to have at the start a well-designed and thoroughly lubricated press bureau. I cannot speak for the other engineering professions, but there are many of us in the mining-engineering trenches who believe that our profession is nearly recruited up to full strength. It is true that many of the younger members have already volunteered or been drafted into the national service. Doubtless many more will be called, and we fear that, if the great war continues for a considerable period, many of them will give up their lives on the field of honor. However, few of us are so pessimistic as to seriously entertain the idea that our mining enterprises are to be seriously demoralized by the lack of engineering talent either during or after the war. The serious shortage will be in labor and not in engineers.

The objectionable feature of this proposed Academy of Engineers can be summed up in the question, Who is to select this "select body of practitioners"? Who selected the "nucleus of fifty" who have already established the membership at two hundred and will elect the remaining one hundred and fifty and fill the vacancies created by death, resignation and otherwise? Many of them will suspect that they were selected by a very small coterie of organizers who sent out a circular letter of invitation to the illustrious members of our engineering professions and did not fail to include their own names in that "nucleus of fifty." The majority of engineers will doubtless agree that we should all have a voice in selecting the members of any organization which is to represent our professions in dealings with our own and other governments and to which we are to look for leadership and technical aid. It will naturally be charged that this argument represents the view of those members of the professions who cannot hope to be invited to membership in the "select body of practitioners." However, I doubt if all the members of the "nucleus of fifty" seriously believe that our great engineering professions will soberly accept as their representatives and superiors a small coterie of self-appointed men, however eminent and capable some of its members may be. There can be no doubt that the names in the "nucleus of fifty" published in your article include some of our most prominent engineers, but we all know the democratic ideas of some of these gentlemen so well that we can be safe in assuming that they will be the first to admit that this list contains the names of others who cannot rightly claim any such distinction. Also it is quite certain that an academy cannot be made up of 200 engineers without doing grave injustice to some of the ablest and noblest members of our professions.

The American Institute of Mining Engineers is already on record as opposed to such a classification of its membershp as will unduly favor any particular class professionally. This professional preferment was sought to be attained at one time by creating a new and distinctive organization outside of the Institute, but it failed to meet the approval of the engineers themselves for the reason that our profession looks to such organizations as a means of advancing mining engineering and not mining engineers. Our Institute gladly concedes and encourages professional distinction where it is due to professional achievement. Surely there can be no logical objection to the suggestion that if any engineering organizations are to receive the official recognition of the Government of the United States it should be those long-established institutes which can justly claim to represent the engineers of America and not a "select body of practitioners." Every one of the members of those institutes has the right to demand that his Government does not discriminate against him professionally by methods that belong to monarchies. Let us keep our profession safe for democracy.

George Benton Wilson.

Salt Lake City, Utah, Aug. 25, 1917.

Galena Crystals in Mine Water

In a recent issue of the *Journal*, there is communication from Missouri describing an apparently late formation of galena crystals in a ten-year-old deposit of water. I would report a somewhat similar crystallization in the old Tiger mine, in the Coeur d'Alenes. The general manager, the former superintendent of the Tiger mill and myself had occasion to visit the old workings and at the foot of a 500-ft. winze, sunk on the lead to prospect before sinking a vertical shaft, we found crystals of galena and pyrite formed on the surface of the walls upon blasted rock and a few crystals on rock filling behind the lagging. The winze had been driven through the lead at this point and a station cut into the vertical shaft, so that the station was under the foot-wall on the dip. The galena crystals were cubic (not a plentiful form in that lead country) and the pyrites the ordinary bright yellow. We examined enough to satisfy ourselves (from what our eyes told us) that the crystals had been formed since the winze was sunk, a matter then of about six years. The ground was wet from drippings from the worked-out lead above, but had never been under water. The water must have contained excess of the silicic acids, as there were some cedar shingles behind the lagging that rang to the candlestick blows with a clear stony ring. The country is siliceous and not calcareous. That mine has since been abandoned, and filled with water, so that I was unable to get any of the crystals and silicified shingles after they had developed a few years longer, which I intended to do.

D. H. Brien.

Seoul, Chosen, July 24, 1917.

Credits in South America

With reference to the communication in the *Journal* of Aug. 25, under the heading "Credits in South America," the correspondent must surely be describing another transaction; so that we have two Case 3 examples. The circumstances described by "Truthseeker" are in no way detrimental to his New York bank and so my Case 3 should not have hurt his feelings, inasmuch as I did not mention the name of the bank.

When I left Lima in May the "confirmed credit" to which I referred was still "canceled" and upon arriving at New York I confronted the manager of the foreign department of the bank with the statement of the ore buyer in Lima merely as a matter of curiosity. I wanted to know not only whether my Lima acquaintance was telling the truth but, in case he was, what excuse the bank could give. You will be interested to know that the bank manager did not deny that a "confirmed credit" had been "canceled" and, on the contrary, gave as the basis for cancellation the facts that the ore buyer in Lima is a German and had done something to put the bank in a bad light. I was not given details of this. The manager of the foreign department is neither an American nor a German.

Mark R. Lamb.

New York, Aug. 27, 1917.

Winter Gravel Washing in Siberia

In reference to the article, "Winter Gravel Washing in Siberia," appearing in the *Journal* of Dec. 2, 1916, which, owing to my absence in Petrograd, did not come to my notice earlier, the credit for the methods employed in winter washings at the Lenskoi is due to Leon Peret, L. Grauman, A. K. Smith and R. E. Smith, the first three being Russian, the latter an American.

Bodaibo, Siberia, June 19, 1917. W. E. Thorne.

Look at Page 466, John!

The *Journal* ought to describe just what the "rustling-card" system is. As a union advocate, I am opposed to anything that don't give the laboring man a square deal; but I believe in waiting to find out what a thing is all about before getting up and raising a holler.

Mineville, N. Y. Aug. 31, 1917. John Downey.

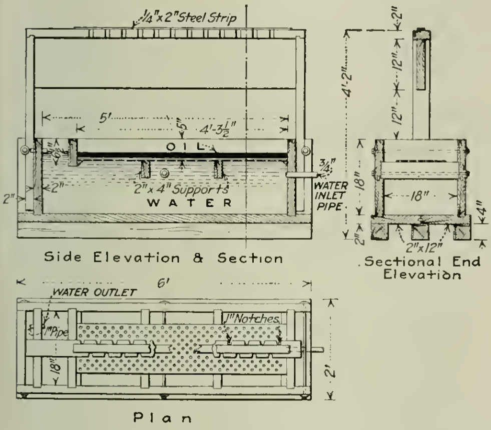
Details of Practical Mining

Oil Tempering Device for Drill Steel

By O. F. Wenz*

A device for tempering tool steel, successfully used in Arizona and northern Mexico, is to be installed at Pilares de Nacozari by the Moctezuma Copper Co.

As shown in the illustration, the construction is very simple, and the principle is very clear. By keeping about ½ in. of water above the perforated iron stand and covering this with from ½ to 1 in. of oil, the too frequent soft bits are avoided. In case of overheating there is less likelihood of the bits being brittle and glassy.



OIL-TEMPERING APPARATUS AT NACOZARI

Record of Accidents as a Basis for Rating Shiftbosses

By D. E. Charlton†

It is generally recognized that the prevention of underground accidents is largely a matter of education, and thereby differs from accidents occurring in shops or other industrial plants by being largely preventable through the use of various safety devices. A great deal of thought and time has been expended in drawing up safety rules, and these vary to a great extent with different mining districts and methods. The degree to which such rules are carried out is entirely dependent upon the interpretation placed upon them by local managements. The old saying, "You can lead a horse to water but you can't make him drink," is remarkably true of underground accident prevention, for there still exists, among a great many miners, that spirit of bravado so often the undoing of the fellow who knows better but "takes a chance."

The uptodate shiftboss is a man who is not only posted in his methods of mining and well read in his safety rules but also a born diplomat as well, and it is to him that the management looks for the best interpretation of those rules. Upon him devolves the task of educating his men as to the safe way of doing their work. He must be the example, and, while the use of signs, bulletin boards, etc., are all aids in accident prevention, the big factor is the personal work done by the man directly in charge.

The following is suggested as offering a means of putting this into practice. The idea is that each shift boss is considered accountable for the accidents to his men, and on this basis his rating is made. While at first glance this may seem unfair—for the reason that the boss is rarely present when accidents occur—the fact still remains that the largest proportion of accidents is due to carelessness, and this may be materially decreased through instruction given to the men by the boss. So, with the sense of responsibility placed on the boss, it is up to him to see that his men observe the rules and suggestions made for their safety.

At certain periods of time an "accident rating" can be given each boss and this may be used in conjunction with his production or other records, as a basis for promotion or bonus. The tabulation shows the figures covering an 11 months' period.

ACCIDENT RECORD FOR RATING SHIFT BOSSES

Rating of Shift Bosses, Jasper Mine, Based on Accidents January, 1916, to December, 1916

Shift Bosses	Williams	Dawson	Treloar	Wilson	Samson	Nichols	
Months as Shift Boss	11	4	11	11	11	10	(1)
Number of Months having Accidents	4	2	6	6	6	9	(2)
Percentage Frequency of Accidents	36.4	50.0	54.5	54.5	54.5	90.0	(3)
Number of Men—Average per Month	29	42	36	35	32	44	(4)
Total Accidents	5	3	7	8	10	17	(5)
Percentage All Accidents per Average Men Employed	17.5	7.2	19.4	22.8	31.3	38.7	(6)
Accidents per Month, Each Shift Boss	0.5	0.8	0.6	0.7	0.9	1.7	(7)
Accidents per Accident Month	1.2	1.5	1.2	1.3	1.7	1.9	(8)
Total Days Lost	8	53	118	125	124	526	(9)
Days Lost per Accident	1.6	17.7	16.8	15.6	12.4	30.9	(10)
Percentage Injured	1.7	1.9	1.6	2.0	2.8	3.9	(11)
Comparative Standing	2.72	33.63	25.60	31.20	34.72	120.51	(12)
Accumulated Deduction	56.6	90.8	99.5	108.5	120.5	249.2	(13)
Final Deduction	18.9	30.3	33.2	36.2	40.2	83.1	(14)
Rating	81.1	69.7	66.8	63.8	59.8	16.9	(15)
Rank	1	2	3	4	5	6	(16)

Explanation: Line (1) shows the number of months the shift bosses were employed as such during the eleven months' period. Line (2) shows the number of months in which accidents occurred. Line (4) shows the average number of men in the charge of each shift boss. Line (5) shows total accidents occurring to the men working under each shift boss; this includes all accidents regardless of whether time was lost or not. Line (9) shows total days lost by injured men; in case of fatality, 300 days lost is used.

Line (3), Percentage Frequency of Accidents, is found by dividing (2) by (1)

Line (6), Percentage All Accidents per Average of Men Employed, is found by dividing (5) by (4).

Line (7), Accidents per Month, Each Shift Boss, is found by dividing (5) by (1).

Line (8), Accidents per Accident Month, is found by dividing (5) by (2).

Line (10), Days Lost per Accident, is found by dividing (9) by (5).

Line (11), Percentage Injured, is found by dividing (7) by (4).

Line (12), Comparative Standing, is (10) multiplied by (11). This "standing" can be made each month as an indication of how the shift bosses are making out in their accident-prevention work.

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*Mining Engineer, Pilares de Nacozari, Sonora, Mexico.

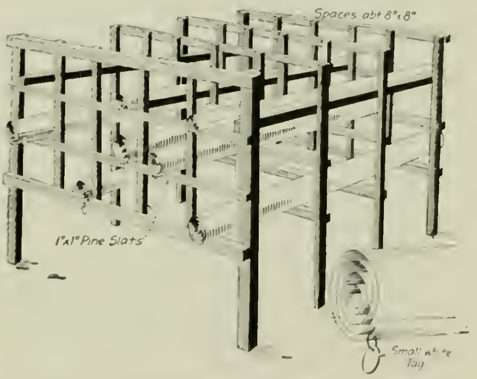
†Mining Engineer, Virginia, Minn.

Line (13), Accumulated Deduction, is determined by the sum of (3), Percentage Frequency, (6), Percentage All Accidents and (12), Comparative Standing. These three are weighted the same, and the total is divided by three to secure (14), Final Deduction. This is subtracted from 100—perfect score—and gives the rating (15). From that the rank (16) can be determined.

From this table it will be seen that all data available—magnitude and frequency of accidents and number of men employed—are taken into consideration. No doubt, if the study of accidents were to cover a longer period of time it would show up other points not now apparent. Conditions such as mode of occurrence, time, place and preventability all go to make up a complete study of the accidents and should be given proper weight. It is impracticable, however, to show all this in the above record, which is offered only as a means of reducing accidents by interesting the "man on the job."

Rack for Holding Drawings

A good rack for long tracings and drawings can be made as shown in the accompanying illustration. It consists of a number of frames, the number depending on the length of the drawings, placed one in front of the other, and securely fastened together. Legs may be provided for resting on the floor or the rack may be hung from the ceiling. The number of compartments depends of course on the number of drawings to be filed. By making the compartments small, about 8 x 8 in., the drawings on the top are not sufficiently heavy to crush those on the bottom. If made of soft pine or other soft wood, the whole rack is not heavy and may be readily moved from place to place. The compartments may be numbered in any manner to facilitate making a card index of the contents. A small white tag, such as is used in clothing stores for marking prices, attached by its string to one corner of the drawing, eliminates the waste of time caused by hunting blindly for the desired drawing. The tag should be large enough to allow an abbreviated description of the drawing and on the reverse side to note, in fairly large figures, the number of the compartment to which it is assigned.



EASILY CONSTRUCTED RACK FOR DRAWINGS

Protection for Ropes in Raises

In raw vertical raises driven on simple stulls for scaffolding and set at intervals along the raise of from 4 to 5 ft., heavy and somewhat expensive hemp ropes are tied to the uppermost stull before each round of holes is blasted. Such ropes are necessary to assist in climbing back into the raise after each blast and to haul to the top the machine drill, steel and timber. Where raises are driven to great heights ropes must be of a length to correspond. The life of such a rope can be greatly prolonged by the use of a light endless chain of a peripheral length of about 8 ft. The chain makes a loop hitch over the top stull and from the free hanging loop end the rope is suspended. The rope is thus protected from the blasted rock striking against the usual tie around the stull and it is subject to but little damage below this point.

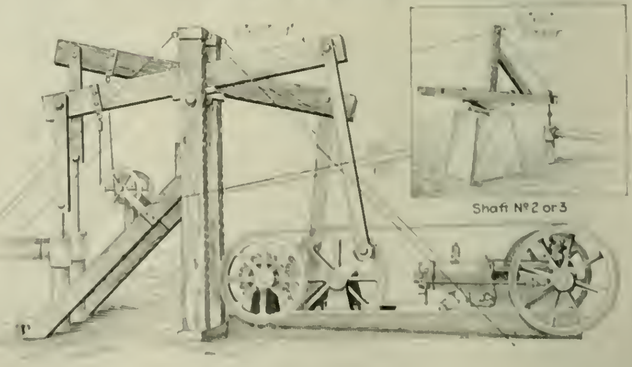
In this age, when "Safety First" is given so much consideration, the use of a chain, while undoubtedly adding to the already overburdened equipment of underground paraphernalia, is good insurance against the possibility of an accident, due to a weakened rope knot, which might occur when a miner was returning to his place at the top of a raise after a blast, and depending upon the rope for support in climbing back.

A Joplin "String Pump"

BY ABEL GREENE

Superintendent, Adams-Hicks Zinc and Lead Corporation

At the No. 1 shaft of the Adams-Hicks Zinc and Lead Corporation, Joplin, Mo., the operators installed an old-style walking-beam pump, driven by a 50-hp. Bessemer gas engine. When the shaft was pumped out, it was found that the pump would not drain the entire lease of 30 acres. Instead of installing another engine at No. 2 shaft, what is locally known as a "String Pump" was installed. At No. 2 shaft, distant about 330 ft. from No. 1, an angle beam was erected and operated by a $\frac{5}{8}$-in. cable running over a 36-in. sheave, pulled by the engine on its original foundation. Later, another angle beam was placed 650 ft. from the engine, both installations proving to be entirely satisfactory in every way. The engine, operating a 5-ft. stroke walking beam, consumes from $60 to $70 per month in gas. The illustration shows the general scheme as operated.



JOPLIN STRING PUMPS

Events and Economics of the War

The sensation of the week was the revelation by Secretary Lansing that intercepted dispatches from the German charge at Buenos Aires had been transmitted through the Swedish embassy to Berlin advising complete destruction of Argentine ships if it were decided to sink them by submarine. Offices of the I. W. W. were raided throughout the country and much documentary evidence seized. A battle between an American steamship fleet and U-boats was reported on Sept. 5. The House has passed the $11,000,000,000 bond issue and the Senate the tax bill for $2,406,670,000. Nearly $5,000,000,000 has been asked for army and navy. Movement of troops to training camps proceeds with little delay.

Civil war again threatens in Russia; Korniloff, chief of the Army, has been deposed by Kerensky for seeking the dictatorship and is advancing with troops against Petrograd. The Germans are extending their gains at Riga but Russian warships hold the Riga Gulf. Hard fighting continues on the Italian front for Monte San Gabriele against heavily reinforced Austrians. In France, Ribot has failed to form a ministry and the task has fallen on Painlevé, Minister of War; more vigorous government and less politics is demanded.

Unpreparedness for War

The testimony of General Crozier, the chief of ordnance of the War Department, before the Appropriations Committee of the House, in urging the estimates for the deficiency bill calling for nearly $5,000,000,000, is illustrative of the inefficiency of bureaucracy.

He stated, according to the New York *Sun*, that the supply of machine guns was so limited that in some instances they have not been able to furnish manufacturers of small-arms ammunition with guns with which to make the necessary tests. Explaining his estimates of $21,750,000 for armored motor cars, he said that little or nothing had been done with $5,400,000 already appropriated for that purpose, because our border experiences did not tend to a very high idea of a machine-gun motorcycle and the armored and armed auto had not proved of any great value. The tank car, however, he said, seems to have come to stay. It is necessary, therefore, to provide for this general class of vehicle, but the ordnance bureau has not made any very definite programme of procedure.

American troops will be equipped with three different kinds of rifles—Springfield, American-Enfield and the obsolete Krag—for training purposes because there are not sufficient Springfields for the Regular Army and National Guard. The Enfields will not begin to be turned out for several months, no preparation having been made for their manufacture prior to the outbreak of the war.

The supply of pistols is so short, Gen. Crozier admitted, that it is impossible to supply even the Regular Army and National Guard. Hand grenades can not be furnished, even to the Regular Army in France, except by drawing on the supplies of our Allies. Despite the fact that the demand for field artillery and machine guns is and for years has been recognized as the most pressing need of the army, the Government in the five months it has been at war has accomplished nothing toward increasing the production of these arms here.

"Some of these estimates," said Gen. Crozier, "might have been foreseen, and undoubtedly would have been foreseen if there had been time for a thorough and complete study of the probable requirements of the war before the passage of the last appropriation act."

Nation-Wide Raid on I. W. W.

The offices of the I. W. W. were raided simultaneously throughout the country on Sept. 5, at 2 p.m., central time, by agents of the Department of Justice who had carefully prepared their moves. William D. Haywood, head of the order, was taken in custody, though later released. Thousands of documents were seized, including in particular Haywood's private papers. The Government has reports that, in addition to its many acts of violence, the organization was planning the destruction of plants and other crimes to lessen the output of war supplies. At the same time the agents took possession of the national headquarters of the Socialist party in Chicago where many documents were also seized.

It was charged that the documents taken had been used in "committing certain felonies," specified as (1) insubordination, disloyalty, mutiny, and refusal of duty in the military and naval forces of the United States while the United States was at war with the imperial German government. (2) The felony of wilfully obstructing recruiting and enlistment service of the United States while it was at war. (3) The felony of using the mails and postal service for the transmission of non-mailable matter advocating treason, insurrection, and forcible resistance to the laws of the United States concerning the carrying on of the war.

Strike Agreement Proposed

To prevent strikes and lockouts during the war, a joint agreement between employers and employees was recently proposed to the Council of National Defense by members of the National Industrial Conference Board representing 50,000 manufacturers. The Board recommended that the Council's policy of discouraging changes of labor standards during the war be applied as follows:

"Concerning existing statutory regulations intended to promote safety and health, there shall be no suspension or modification of such provisions, except upon recommendation of the Council of National Defense;

demands for increase in wages shall be tested by the prevailing local standard of the establishment in effect at the beginning of the war, with such modification as necessary to meet any demonstrated advance in the cost of living; the standard number of hours shall be that established by statute or prevailing in the establishment at the beginning of the war, subject to change only when in the opinion of the Council of Defense it is necessary; as to 'open' or 'closed' shop conditions, every employer entering the period of the war with a union shop shall not by lockout or other means undertake to alter such conditions for the duration of the war, nor shall any combination of workmen undertake during the like period to close an open shop."

To settle the major labor disputes in war industries, the manufacturers recommended creation of a board of employers, employees and Government representatives with authority to render decisions binding on all parties, and "with full power to create all machinery necessary to execute its functions." It was said that the feeling was growing among manufacturers that labor bodies were not abiding by the recommendation made by Samuel Gompers, that unions should not insist on changing labor standards during the war.

Coal Miners Ask Increase

Bituminous coal operators of the central competitive field, including Indiana, Illinois, Ohio and western Pennsylvania, conferred recently with John P. White and others, representing the United Mine Workers of America, in an effort to agree on the miner's demands for a "substantial" wage increase. The extent of the demands has not been definitely stated. It is expected that Dr. H. A. Garfield, the Fuel Administrator, will attempt to settle the dispute. Operators will insist, it is said, on adding any increase granted to the prices fixed by the Government for bituminous coal.

Plans of Fuel Administration

To secure the largest possible production of fuel at just and reasonable prices, Dr. Harry A. Garfield announces that the following rulings will be observed:

The prices fixed for coal are provisional. They will stand unless changed by order of the President. The Fuel Administration will examine all applications for revision of prices accompanied by cost statements, presented in writing. These statements should be verified and cover at least the years 1915, 1916 and 1917 to date. If further explanation is needed, the Fuel Administration will ask complainants to appear in person. It is not proposed to require efficiently operated mines to produce coal at a loss, but the burden rests upon applicants to show that the prices fixed in particular cases are unfair.

It will greatly expedite the work of the Fuel Administrator if associations, whether of operators, miners or industries affected, would postpone the appointment of committees to confer with him, or for the purpose of taking action concerning prices and wages, until he has had opportunity to select his advisers and has heard from those who believe themselves likely to be adversely affected. Prompt attention will be given to all communications.

Plans will soon be announced whereby production may continue without affecting adversely either the producer or the purchaser pending the examination of applications for revision of prices. Until then it is suggested that sales and deliveries be made at the prices fixed, with a stipulation to the effect that if prices are readjusted, settlements shall be made accordingly. To determine a proper basis for sales by retail dealers, local committees will be organized throughout the country. Each will investigate and report upon the local situation and advise concerning the regulations to be established. When the price is fixed, the local committee will be asked to superintend its enforcement.

The Fuel Administration is preparing a plan of apportionment which will secure to domestic consumers their fair share of the coal supply at prices which will reflect those already announced. Contracts relating to bituminous coal made before the proclamation of the President on Aug. 21, and those relating to anthracite coal made before the President's proclamation of Aug. 23, are not affected by these proclamations, provided the contracts are bona fide in character and are enforceable at law. The Federal Trade Commission has been asked to secure at the earliest moment possible a certified copy of all contracts held to come within the foregoing rule.

Sweden Wants Coal for Iron Ore

Sweden will try to exchange her iron ore for American coal, is the report from Stockholm. The appointment of Hjalmar Lundbohm to undertake a special mission to the United States is looked upon as indicative of a change in Sweden's commercial policy. Before the war Swedish iron ore was exported to a great extent to this country and a reopening of this traffic would cause a decrease in the quantity now sent to Germany. Not only does the general situation, which is the result of the commercial policy of the Entente nations toward Sweden, cause her to seek relief, but, in addition, she can no longer get all the coal she wants from Germany and so looks to the United States for it.

Government Buys Wheat

The Government through the Food Administration's wheat corporation entered the wheat market on Sept. 5 and bought wheat at the basic price of $2.20 per bu., Chicago. It is buying on warehouse receipts only and will make no contract for future delivery. The wheat is being resold at an advance of 1% which is expected to cover the cost of handling. No profit is to be made on the transactions.

The control of the Food Administration over prices begins in the elevators and ends with the sale of flour at a 25-c.-a-bbl. profit by the millers. If bread prices are not lowered and the bakers seek to keep the increased profit that will obtain between the lowered milling prices and the present high retail prices, then the Food Administration will step in, but until that condition arises the corporation will not interfere.

Development of Water Power

The railroads are burdened to carry the coal needed to keep the nation's industries running, yet more than 35,000,000 hp. (according to Secretary Lane) are running to waste in American streams. "Once again a movement is gathering force to utilize this power, says the *Annalist*. "Four-fifths of the possible electric energy that could be developed from it must be developed on lands belonging to the Federal Government, which are under the jurisdiction of the Secretary of the Interior, or on navigable streams which are controlled by the Secretary of War. The agitation in favor of conservation of natural resources resulted in restrictions so severe that resources were not only conserved, but reserved. Present laws permitting the utilization of these sites for hydro-electric plants provide that any permit is revocable at the pleasure of the Federal department concerned, and the possibility of this summary action has tended to scare capital away."

Legislation, including the Walsh Public Domain Water Power bill and the re-introduced Shields General Dam bill, is now pending in Congress providing among other things for issuance of 50-year permits for the erection of hydro-electric plants for the "diligent, orderly and reasonable development of power." These permits are irrevocable except that they may be canceled by legal proceedings if the permitee fails to comply with the provisions of the act.

Engineer Regiments Forming

At present, there are being organized and enlistments are invited for the following: 20th Engineers, forestry, at American University, Washington, D. C.; 21st Engineers, light railway, at Rockford, Ill.; 23rd Engineers, highway, at Annapolis Junction, Md.; 25th Engineers, construction, at Ayer, Mass. (less one company camouflage); 25th Engineers, construction, one company camouflage, at American University, Washington, D. C.; 26th Engineers, supply and water supply, at Wrightstown, New Jersey.

Rising Cost of Alaskan Railway

Rapidly rising costs of labor and material have faced the Government with a possible curtailment of the work on the Alaskan Railway or an ultimate increase in the cost of the road, first estimated at $35,000,000. The work is now costing 22% above the estimate.

Secretary Lane has advised the House Appropriations Committee that a special commission now is investigating and will prepare a report for Congress. He says it may come down to a business question of whether it is advisable, with the high cost of labor, rails, and other supplies to push the railroad through the Susitna Valley immediately, or merely to connect up the Matanuska Valley with Seward, so that the Navy can get coal either at Anchorage or at Seward, and also connect up the Tanana field with the Tanana River, so that coal field could be made available for the Fairbanks mining district.

Camoufleurs Wanted

The first American *camouflage* company is now being organized for service in France, it is announced from Washington. The *camoufleur* "practices the art of military concealment." Faking is his strong point. "Therefore," says the announcement, "the Chief of Engineers of the War Department is looking for handy, ingenious men who can fight one minute and practice their trade the next." Whenever a machine gun is set up, or a trench is taken and reversed, or a battery of artillery goes into action or a new road or bridge is built, there the *camoufleur* must use his art to render things invisible. Ironworkers and sheet-metal workers, carpenters, property men, photographers and scene- and sign-painters are included among those who will make up this force.

Dummy cannon that recoiled and flashed a puff of smoke have been used to deceive hostile airplanes as to the location of real guns a short distance away. Airplane sheds have resembled wheat fields and railroad trains cottages. Even canvases painted to resemble rivers have been stretched across bridges in the daytime and rolled back at night, often saving the structures from serious damage.

To Develop the Torpedoplane

For the development of the torpedoplane into a craft able to carry and launch a 2000-lb. torpedo, $30,000 has been put at the service of the inventor, Rear Admiral Bradley A. Fiske, U. S. N., by Godfrey L. Cabot, vice-president of the Aero Club of America. Admiral Fiske's device, patented in 1912, has been used successfully but only with 200-lb. torpedoes which weight has heretofore been the limit in this country. Seaplanes now are being built, however, capable of handling a much larger missile.

The Government, as usual, has left the development of Admiral Fiske's idea to private subscription, although Great Britain, Italy and Germany have seemed to see value in it and have experimented with it to some extent. In 1915, by its use, the British sank four Turkish vessels using 14-in. torpedoes weighing 731 lb. each. The Italian Navy tried out the scheme successfully, hitting the target nine out of ten times at 3000 yards. Germany disclosed her adoption of the plan when a torpedoplane sank the British steamship Gena off Aldeburg, England.

War Causes Silver Problem

The rising price of silver has presented the Government of Honduras with a problem arising from a shortage of silver coin which is being drained from the country in accordance with economic law because it is now worth more as bullion than its face value. An attempt will be made to meet the situation, in part at least, by issuing a coinage about 50% fine. It is announced semi-officially that the national mint, long closed, will be reopened for the reminting of about 250,000 pesos, which will make 500,000 pesos of the new silver currency. The Honduras peso, which has been worth for the silver it contains about 75c. or even more in New York, and which also contained a small quantity of gold, has long been quoted around 44c. (gold) in Honduras.

Embargo on Gold

To conserve the huge store of gold in this country, lately drawn upon rather heavily by Japan, Mexico and Spain, the President has placed an embargo on the exportation of coin, bullion and currency. This applies to all nations and became effective Sept. 10. The control of gold exports is thus placed in the hands of the Secretary of the Treasury and of the Federal Reserve Board. The former is authorized to license such exports where, in the opinion of the latter, they are not harmful to the public interest. The stock of gold in the country is about $3,000,000,000, about 40% of which has been imported since January, 1915. The trend of gold has, however, been distinctly away from the United States recently. This movement is said to have started with the financing of the Allies.

Industrial News from Washington

By Our Special Correspondent

Manganese Output in 1917

Domestic mines that produced but 1% of the country's manganese needs before the war are expected to yield 15% in 1917. The metal will come from 22 states and 75 producers this year. Production was limited to five states in 1912, to four in 1913 and six in 1914. Steel companies are said to be changing their practice so as to use alloys having as low as 30% manganese, thereby lessening their dependence on imported ores. One plant making several grades of mild steel has not used a pound of ferromanganese in two years though it has maintained the quality of its product and even increased it's output.

The United States Geological Survey has carefully revised its lists of producers and purchasers of manganiferous ores. Lists of the former will be mailed to each of the latter. Likewise each producer will receive a list of the purchasers. In each case the class of ore purchased or produced is indicated.

Copper Mining in Chile

Mine operators in Chile are not disturbed by the threatened imposition of an export tax on minerals, according to E. S. Bastin, of the United States Geological Survey, who has just returned from Rancagua, Chile, where for eight months he has been studying the geology of the Braden copper properties. A Chilean commission is at present engaged in studying conditions to determine the advisability of imposing export taxes. While it is impossible to forecast the decision, Mr. Bastin says that there is no apprehension felt by the mining industry; the policy of the Chilean government in encouraging investment in the industry is too well established to allow any shortsightedness in the matter of taxation.

Despite the great difficulty in obtaining supplies the production of copper from the Braden mine is being increased materially. Work is also progressing rapidly on the new smeltery and on a large flume for the development of hydro-electric power as well as on the tunnels which are being driven to permit tailings disposal in an adjacent valley. A plentiful supply of efficient labor is said to be available. The difficulty in securing supplies from the United States is stimulating the manufacture of many articles in Chile.

A geological department was also organized by Mr. Bastin for the Braden company and has been placed in charge of Leroy Le Duc who will carry on the geological work systematically as the development proceeds. Mr. Le Duc received his geological training at the University of Chicago. A geological examination of the Chuquicamata mine in northern Chile was also made by Mr. Bastin during his stay, in association with Prof. Waldemar Lindgren of the Massachusetts Institute of Technology

To Study Quicksilver Industry

Research into the metallurgy of quicksilver is to be the sole work of the Berkeley (Calif.) station of the United States Bureau of Mines. Production of the metal is retarded, it is believed, by ignorance of its technology. The quicksilver industry, though employing relatively few men and requiring but small investments of capital, is nevertheless most important, due largely to the use of mercury as a fulminate and in amalgamation. The metal's use as an antiseptic is increasing and as a constituent of marine anti-barnacle paint is of probable future importance.

Efforts will be made to determine the sources of loss in mining. In many quicksilver mines a 60% recovery is considered good. Assaying and sampling of the ore will be investigated, the latter being peculiarly difficult. A study will be made of direct furnace treatment, and of the type of furnace best suited for low-grade ores. Wet treatment and retorting of concentrates will receive attention and improvement of the present method of condensing mercurial vapors will be sought. War prices have greatly stimulated the industry and operators so far have coöperated willingly with the Bureau.

A study of all the important quicksilver deposits in the West has been undertaken by F. G. Ransome of the United States Geological Survey, who will visit the localities to determine the most promising places for new development. Special attention is to be given to prospects.

Export Licensing Systematized

Congestion at ports is diminishing, as the work of licensing shipments becomes systematized and as shippers become more familiar with the procedure, according to word from the Exports Administrative Board. By providing a certificate for partial shipment against an export license, those shipping through several ports are spared much inconvenience. In explaining the handling of such shipments, C. A. Richards, the director of the board, says:

> If the applicant is shipping through various ports, he should make a separate application for the total amount he expects to ship through each port. Shippers then can make the shipments as desired during the ensuing 60 days. For this purpose the certificate for partial shipment is used which enables the consignor to make as many shipments under one license as he requires. These certificates may be used against shipments to all countries regardless of whether or not they are for shipments to countries associated with us in the war

The organization of the Exports Administrative Board is as follows: Vance McCormick, chairman; Thomas B. Jones, representing the Department of Commerce; J. B. White, representing the Food Administration; Dr. Alonzo Taylor, representing the Department of Agriculture; a representative of the Shipping Board who has not been named; C. A Richards, director; Harry A. Engman, assistant director; and Weldon E.

Judd, chief of the administrative division. Specialists familiar with the commodities exported are being retained. Another division within the bureau has charge of imports.

Ground Frost in Alaska

Commenting on the wide distribution of ground frost in Alaska, Alfred H. Brooks, in charge of the Alaska division of the United States Geological Survey, says:

In numerous excavations made in mining operations, it has been found that the alluvium is frozen down to hard rock. In the Klondike the alluvium is frozen to a depth of about 200 ft. At Fairbanks, permanent ground-frost has been found at many places to a depth of more than 200 ft., and the deepest shaft sunk there penetrated 318 ft. of frozen alluvium. In Seward peninsula many holes in permanently frozen alluvium are more than 75 ft. deep and one is nearly 200 ft. deep.

Some ground in the province is not frozen, for causes not determined. Underground channels of water have been encountered in some mine workings and have played havoc with the operations, but these appear to be exceptional. When the moss is stripped, the ground thaws, and with opencut mining or cultivation the upper level of permanent ground-frost seems gradually to descend. It appears that this ground-frost is a survival of a climate colder than the present and is preserved by the nonconducting mat of moss and other vegetation. It is natural to attribute it to the climatic conditions that brought about the last glacial advance in Alaska, during which but little of the central region was ice-covered, though glaciers advanced into it from the higher mountains on the north and south.

More Domestic Pyrites Needed

With a demand for sulphuric acid declared to be fully 25% greater than at this time last year, the pyrites situation is taking on increasing importance. The experience of the last few weeks makes it apparent that pyrites can not be imported in anything like pre-war quantities. It is becoming more evident that recourse must be had to the domestic sulphur supplies. The War Minerals Committee has begun an investigation to determine how far sulphur resources can be relied upon. The pressing need of more domestic pyrites has caused every Government agency concerned to redouble its efforts to encourage production.

Defense Council Resignations

Reports that wholesale resignations are taking place in the committees of the Council of National Defense are denied vigorously at the offices of the council. At the time of the passage of the Food Bill, certain tentative resignations were submitted for fear of violations of Sec. 3 of that act. Officials of the council are certain, however, that no such interpretation of this section was intended as has been placed upon it, and expect soon to have an opinion on the subject from the Attorney General. To increase efficiency by avoiding duplication of effort, specific problems are being worked out for each of the committees.

Report on Potash Bill

A favorable report will probably be made on the potash-leasing bill when the Public Lands Committee of the House meets on Friday. Several requests have been made that hearings be conducted before the committee acts on the bill. These will hardly be granted, however, as the limited time before adjournment of Congress is making the committee anxious to get the bill on the calendar at the earliest possible moment.

Alabama's Graphite Production

Alabama's output of graphite in 1917 will more than double that of 1916, it is predicted. This is the more remarkable because Alabama's 1916 production was 50% greater in quantity and 141% greater in value than that of 1915. Mining conditions in the state are good, and costs are low. Improvements in concentration will result in a large per cent. of good flake in the finished product and a higher saving of graphite of all grades.

Attacking the Potash Problem

A way of obtaining potash from silicates is being persistently sought by the Salt Lake City and Golden stations of the United States Bureau of Mines. Tailings are being collected from a number of mills throughout the West to ascertain what points are richest in potash. Tailings are preferred for this experimental work as they are already mined and ground. Tests are being made on large samples.

Visitors at the Bureau of Mines

More Japanese visit the Bureau of Mines to study its methods than do representatives of all other foreign governments combined. Most of the visitors from Japan are specialists who come each to investigate a single activity of the Bureau. Visitors from other governments usually try to become familiar with all the activities of the organization.

Heavy Demand for Tin Plate

An increase of 25% in the domestic production of tin plate during 1917 is estimated by the Department of Commerce. Exports this year will be one-tenth of the total production. Since the demand is larger than the greatest possible output, Secretary Redfield urges the substitution of fiber and paper cans wherever possible.

Three additional sections of the Geologic Atlas of the United States have been issued by the United States Geological Survey. The folios and their authors are as follows: Deming, N. M., N. H. Darton; Detroit, Mich , W. H. Sherzer; Leavenworth—Smithville, Mo.—Kan., Henry Hinds and F. C. Green.

An effort to pass the Shafroth bill for the suspension of assessment work, by unanimous consent, having failed, Representative Taylor, of Colorado, will bring it up for vote under suspension of the rules at the first opportunity.

Editorials

American Academy of Engineers

ELSEWHERE in this issue is published a rather tart communication respecting the American Academy of Engineers which has recently been voted a charter by the Senate of the United States, but not yet by the other house of Congress. We are inclined to agree with Mr. Wilson in the opinion that such an organization is un-American, for the simple reason that its membership is limited and engineers do not have an equal chance to be included among the number. The Congress of the United States is limited in number, but any citizen possessing certain simple and equitable qualifications may be elected to Congress. We are not for a moment making any comparison between the Congress of the United States and the American Academy of Engineers. The latter may be a body of higher distinction and many persons may be willing to accept membership in it who might be averse to an election to Congress. Our point pertains rather to the matter of election to a body of limited membership. As it is created, Congress is a thoroughly American and democratic body, but, if it filled vacancies by an election confined to its own members, it would certainly cease to be democratic.

Now the American Academy of Engineers, with a membership of only 200, can not hope to be thoroughly representative of the American engineering profession. Among the 50 incorporators we count nine who may be classed distinctly as mining and metallurgical engineers. If the same ratio be preserved in filling the ranks to the number of 200, there would be 36 mining and metallurgical engineers. Speaking for our own profession, it would be impossible in this era of specialists to select 36 men as preëminent. Many of the leading specialists would have to be excluded.

If, then, such an organization were not thoroughly representative, why should the United States Government "as a matter of course, turn to it for expert aid and advice?" Why should state and municipal governments feel that they would have the privilege of appealing to such an academy for information and advice? What good ground is there for the statement that foreign nations desiring to send commissions to America for expert technical aid do not know to whom to appeal? What is the matter with our existing national societies, to which the bureaus in Washington appeal freely in every case of need, and to which appeals the societies respond with generosity?

The proposed American Academy of Engineers is a very different thing from the proposal to classify members of existing societies and is a very different thing from those societies which have and maintain strict qualifications for membership. Respecting societies of the latter class, we know of none that does more than say that it limits its membership to professional men of good character and a certain degree of professional experience. There is nothing undemocratic about that, any more than there would be in the organization of a society to which only the red-headed men of the United States were eligible. The organization of an academy limited in number is a very different thing, and one that is likely to create unjust and invidious distinctions. The fact that the nucleus of 50, which is to elect the remaining 150, was created in some unknown way will not contribute to the popularity of the movement. Nor will the fact that the 50, while in main consisting of engineers of distinction, nevertheless include some who would not be recognized as leaders by their respective professions. We prophesy that the American Academy of Engineers will not be taken very seriously.

Judge Bourquin's Decision

WE HAVE refrained from any comment upon Judge Bourquin's decision in the case of Minerals Separation vs. Butte & Superior until we could read the full text of it. The text is published elsewhere in this issue.

Back in the dark ages theologians used to discuss such questions as how many angels might stand on the point of a needle, so trifling was their quibbling. The arguments of the learned counsel in the interminable flotation litigation, and Judge Bourquin's recent decision, remind us of the ancient theological controversies. We have no patience with it.

The flotation litigation was carried up to the Supreme Court of the United States, which in itself was an unusual event. The Supreme Court rendered a decision upholding the Minerals Separation patents upon the use of less than 1% of oil plus a certain kind of agitation. Whether anybody dislikes that decision does not matter in the least. It stands as the decision of the highest court and is to be obeyed and respected accordingly.

The Supreme Court was perfectly clear regarding the matter of less than 1% of oil. It was the patent claims so reading that were upheld. The claims that specified simply "a small quantity of oil" were declared invalid.

The Supreme Court was not equally specific about the matter of agitation. The Minerals Separation consequently pushed its suit against the Miami Copper Co., which involved that question, and won its case on appeal to the Philadelphia court. Unfortunately the Miami Copper Co. did not present a clear-cut case with respect to the Callow process, the status of which has not yet been legally defined. The Philadelphia court intimated, however, that in its judgment the Callow process involves a kind of agitation that is different from what the Supreme Court contemplated.

Meanwhile, Butte & Superior changed to the use of more than 1% of oil and Minerals Separation brought suit against it, claiming that to be an infringement of its patents. Last week we remarked that Judge Bourquin's decision seemed to us to be contrary to the letter of the ruling by the Supreme Court. Mr. Williams, the distinguished counsel for Minerals Separation, has objected to that characterization, alleging that the Supreme Court's decision protects Minerals Separation against the use of any quantity of oil when the results obtained are the same as with less than 1%. We are unable so to read the decision of the Supreme Court, and look upon such a claim as a species of the quibbling that we find so irritating.

Judge Bourquin, however, falls right into this. What shall we say of the mind, which, after quoting the Supreme Court as saying that the patent must be confined to the results obtained by the use of oil within the proportion amounting to a fraction of 1% on the ore, and holding invalid the claims that simply refer to "a small quantity of oil,'" says, "It seems clear neither patent nor decision undertakes to say the process depends upon less than 1% of oil or is inoperative with 1% or more of oil"? Judge Bourquin's reasoning and his decision follow this line.

With all due respect to the learned judge, we do not think that he viewed the case in the light of common sense. The keynote of the decision of the Supreme Court was its upholding of the contention of Minerals Separation that in experimenting with agitation with oil the inventors had discovered a critical point at which a result was obtained that was different from any ever obtained previously. Inasmuch as that point could not be defined precisely, the claims of the patent were drafted to cover the use of less than 1% of oil, which would embrace the critical point. The Supreme Court was convinced,'moreover, that preceding investigations were so informing that the final step of these patentees was not a long one. Common sense tells us that the Supreme Court would not have expressed itself in those ways if it had thought that the quantity of oil were immaterial, nor would it have declared invalid those claims which specified merely a small quantity of oil.

The inverted reasoning of Minerals Separation is that with a fraction of a per cent. of oil there is a critical point at which the important thing happens, and that the use of more oil than that is simply a loading of the apparatus with useless material. Judge Bourquin accepts that view. But according to it any use of oil, with a certain kind of agitation, falls within the scope of these patents. Now, reversing the reasoning, suppose that Butte & Superior working in the light of preceding investigations, so informing in character as the Supreme Court says they were to Sulman, Picard and Ballot, had developed a process using 1.1% oil and were operating with it. Suppose that unbeknown to it, Sulman, Picard and Ballot, pursuing their similar investigations, later discovered the "critical point" at 0.2% oil. Suppose that, hearing of the Butte & Superior operation, they said to it, "You've got to pay us royalty. You're simply using our critical point plus 0.9% of useless oil." This did not happen, but it is conceivable that something of the sort might have happened. It is certain that, according to Judge Bourquin, nobody who might have undertaken the development of the Everson, Froment or any of the other early processes would have had a ghost of a chance against the present claims of Minerals Separation.

The several decisions of the American courts in the flotation case have exhibited much clever analysis and clear reasoning. Judge Bourquin's recent decision is the poorest contribution to this juridical literature. We do not think that the loser will be content to let the matter stand as it does now.

Sulman, Picard and Ballot, who obtained the basic patents now owned by Minerals Separation, are entitled to the highest possible credit for carrying forward the early work of others in the field of flotation to a brilliant outcome in the laboratory. The management of Minerals Separation exhibited great skill and perception in collecting a far-reaching group of patents pertaining to the new art. With bulldog persistency they have fought their case through the courts of Australia, Great Britain and the United States. No fair-minded person ought to want to deny them the rights that the highest courts have given them. But when, in the same breath, Minerals Separation asserts that the use of more than 1% oil gives woefully inferior results as compared with the use of less than 1%, and yet claims the right to collect royalty on the use of any quantity of oil, in certain ways, there is created a feeling that hoggishness is being exhibited. While the mining public ought generously to admit the service that Minerals Separation has rendered to it, that company ought on its own part to recognize the service that mining and mill men, especially those of Broken Hill, rendered to it in making a commercial success of its process. In this, as in many other new steps in metallurgy, as, for example, in the cases of basic copper converting and in coal-dust firing, there was a big gap between the idea and the successful development of it in practice. The enormous success of the flotation process of ore concentration, which is admittedly one of the major improvements of all times in metallurgy, is the result of the work of many men. That being the case, one small group of men can not be permitted to sit astride the mining industry of the world, claiming and collecting royalties at its own sweet will. So long as any such wish is expressed there will be litigation.

Rightly or wrongly, the mining industry of the United States has obtained the idea that the management of Minerals Separation is arbitrary, dictatorial and grasping. In its own interest that management ought to dispel that idea. Instead of antagonizing the mining industry, it ought to seek to win its friendliness and coöperation. If such a wish were exhibited, the mining industry would meet the company half way. It would be a good idea for the management of the American subsidiary of Minerals Separation to hold a conference with representative men of the mining industry and talk things over, giving the mining men a chance to say what in fairness they themselves think they ought to do and not telling them what they must do.

The Butte Rustling Card

THERE has been so much talk about the Butte rustling card that we have taken the trouble to secure a copy of it, together with the accompanying papers, and are publishing them in this issue so that everyone may see what they are. They look very innocent. We must confess to using similar records for employees in our office and we fancy that in many large establishments such records are common.

Of course it is a pity that we can not go back to the customs of our native villages, wherein everybody knew all about everybody else and no vouchers or records were necessary. There are many things that used to be done in the little shops that have to be done in a less agreeable way in big work. The personal salutation of the boss in the morning is more likable than hanging a brass check on a tally board, and at the end of the week, one feels better to have the "old man" come around with the pay than he does to stand for half an hour in a queue moving up to window A to G.

However, if we want to enjoy the advantages of big work we have got to put up with things that we do not like, such as time-clocks, tally boards, credentials and rustling cards, for 10,000 men can not be handled so intimately as 10. And if it were not for big things we could not enjoy all that we have now. If it were not for the Standard Oil Co. we should not have such cheap gasoline, and if it were not for the Anaconda Copper Mining Co., and its great improvements in mining and metallurgy, Butte miners would not have the high wages that they get (or can get when they want to go to work).

Mining on the Leasing System

THE interesting article by Mr. Adkinson, published elsewhere in this issue, discusses an old but important subject from a new angle. Mr. Adkinson is excellently qualified to treat of this subject, for he is one who has actually practiced what he preaches. Among other things, he has been recently engaged in the development of a leasing project on a large scale in a mine that has been worked by 250 miners, distributed among about 60 leases. In this work he has had occasion to examine the figures of other mines operated under the leasing system, and has found that those with the most accurate and most detailed accounting systems are the ones in which the best results are obtained, this being another tribute to the importance of the accountant in mining work.

We understand from Mr. Adkinson that he has found that many mines operated under the leasing system are making a higher profit on every basis of comparison than when operated on day's pay account. This is another example of the rule of increased efficiency of workmen when they have a direct incentive, when they are made partners in the business, so to speak, and can see from week to week or from month to month how they are coming out. We wish that Mr. Adkinson had been free to transcribe and publish some of the illuminating figures on this subject that he has accumulated.

The sum and substance is that we all turn automatically to the leasing system of operation in mining at the time when it is proper to administer extreme unction, but it does not often occur to us that this system is equally as applicable as a direct method of mine management for flourishing and prosperous property. It goes without saying that the more carefully and exactingly the management does its work, the better will be the results. Detailed accounting is the essential factor which throws the spotlight on the whole subject. Especial emphasis should be paid to that point.

Suppression of the I. W. W.

THE raiding of the offices of the I. W. W. all over the country was one of the best steps that the Government has taken. There is strong ground for the suspicion that Germany seeing herself sure to be beaten, has been attempting as a last resort to sow internal dissensions among her enemies. Therein is her only chance. What she has done in Russia is well known. Probably she has attempted to do similar things in the United States, and it is likely that her hand has played a part in Socialist agitations everywhere.

The elements that she has incited are everywhere the same. First there are the anarchists—the Bolsheviki in Russia and the I. W. W. in the United States—who want to destroy everything, hoping to get some brokerage out of the wreckage. Next there are the theoretical socialists—the believers in the internationalism of Karl Marx—who dream of a Utopia in which all people will be happy and consider that they are going to reach it by eliminating nationalism and capitalism. Beyond them stand the simple pacifists, another set of theoretical dreamers. Finally there are the deliberate traitors, who conceal their pro-German sympathy in order to deal a blow to the land of their adoption. No, we should add another class, namely, the politicians, like some of our senators, who for their own selfish purposes, cater to the foolish and the traitorous.

Washington has now put an end to the machinations of one of the dangerous classes. Let us hope that it will next proceed against the German elements that are sowing sedition in our midst. Let us hope, furthermore, that it will take steps to deal with the traitorous members of Congress.

Why This Governmental Secrecy?

SOME time ago there was issued from Washington a ukase that no information respecting governmental transactions in the metal market should be published except through a certain official in Washington. This ties the tongues of the producers' committees, and acts as a serious and unnecessary handicap upon the trade in general. Since the ban was imposed, important transactions have been effected, but Washington has not reported them at all.

There might be some good reason for imposing secrecy while negotiations are pending. There might even be some good reason for prohibiting news of such transactions if the Government were trying to manipulate the market and were dealing with only one or two producers. But the Government has not aimed to do business in that way. Even in transactions where contracts have been awarded to the lowest bidder, the unsuccessful bidders have a right to know what was done. In cases where business is done with the producers' committees, and then is allotted among the several producers, they naturally have to know about conditions, wherefore there is no general secrecy and no such thing is possible.

The main effect of this bureaucratic policy is to keep the consuming public in the dark, and also the general public, whose business and industrial affairs are based more or less directly upon market conditions. Publication of the terms on which the Government is buying zinc and lead cannot lend any aid or comfort to the enemy. Secrecy in such affairs is to be construed rather as an example of bureaucratic stupidity, inspired probably by the desire to aggrandize the importance of officers in Washington and contribute to the vanity of new officials who have been clothed with powers.

High prices and demand have served to increase largely the production of tungsten ore and concentrates in Siam and in the Federated Malay States. In the Malay States the increase has been largely from working tailings dumps in which much of the ore mined was formerly deposited on account of its comparatively low value. In Siam the gain has been from newly opened deposits found by active prospecting. As in many other cases, active demand is bringing out new supplies of tungsten and its ores.

Since the United States has been in the war, American metal refineries have been closely guarded and the managers have been averse to receiving visitors. Metallurgists from other countries who intend to visit the United States with a view to inspecting our works should take steps to learn whether entry may be obtained before embarking on long journeys that may result only in disappointment.

What a pity it is that in this great national emergency so many of our best men of business should be relegated to Red Cross work, while the great business affairs of the nation are entrusted to second-raters, to inexperienced men and to doctrinaires.

What use is it to reduce the price for bituminous coal so that the public may have cheaper coal, if it cannot get any coal at all? Something of that sort seems likely to happen in some districts of the United States.

BY THE WAY

Today—Sept. 15, 1917—is the 100th anniversary of the starting of the first iron rolling mill in the United States. Previous to that bars and sheets had been forged under the hammer. The mill was at Middletown, in Fayette County, Penn.; it was owned by Col. Isaac Meason of Connellsville, was designed by Thomas Cotton Lewis, a Welshman by birth, and was run by him with the assistance of his six brothers.

After getting a decision from the United States Supreme Court for a process of concentration with a critical reaction when less than 1% of oil is used, the attorneys of Minerals Separation, Ltd., argued at the recent trial in Butte that the use of more than 1% is likewise an infringement. The Shade of Carrie Everson, after listening to some of these arguments, is reported to have prepared for a hasty and noiseless departure, saying: "I had better leave here *spurlos versenkt*, or those M. S. attorneys will be coming after me for back royalty."

Notwithstanding the strict censorship rules, it may interest readers to learn that war-time developments in England include a new ——— - ——— 3-phase furnace installation at ——— on the ———, for the production of ——— acid from the air. It is stated that the ———are so arranged and disposed relatively that they inclose a central space communicating with a free space surrounding said ———, by means of free spaces between the ———, in which the arcs are maintained and which the ——— is made to traverse. In truth, a regular *luft-verwerthungs-geschäft*.

The strikers at Metcalf, Ariz., are suspicious; they do not believe that the Coronado mine is on fire. The oxygen-helmets and other paraphernalia of fire fighting are to them merely camouflage, obscuring the diabolical machinations of the company in attempting to break the strike. "*Por Dios, hermanos*," cries one, let us send a *junta*, one comeetay, to examine the mine and see if there be some damliars by here." Committee sees superintendent. Explanations. Courteous refusal. Committee pleads, "Just to satisfy the '*gente*.'" Superintendent softens and explains, "Permit this once. Thorough examination. Examine whole mine." Gratified committee smile and acquiesce. Superintendent remarks, "Seventh level two miles long, gas all the way. Committee please leave names and addresses, to notify sorrowing relatives." Committee serious, silent, timid and suspicious. Brave Santiago volunteers. "I go alone. Not afraid of man nor God." An inspiration of law, protection, etc., bids him add, "Deputy sheriff, come with me?" Deputy answers, "Sure."

Heroic Santiago trims lamp. Yawning tunnel, waiting motor. Hands tremble. "Hurry," says deputy. Brave Santiago's knees shake. "*Pronto!*" says motorman. Brave Santiago's face grey. "Me no go." Scurries off, tail between legs. Rejoins committee. Pow-wow. More pow-wow. In the meantime courageous Americans are fighting in smoke and gas to save the mine.

Personal

F. G. Clapp has gone on a trip to Texas and other parts of the West.

W. H. Wright is making an examination of gold-placer properties in Idaho.

J. B. Tyrrell, of Toronto, is examining some mining properties in Newfoundland.

F. R. Weekes has been examining mines in the Trout Lake district, British Columbia

Benjamin Magnus has joined the metallurgical staff of the American Metal Company

John W. Mercer has been visiting Montana and the Northwest. He is now in California.

H. W. Baker, of Boston, is examining several properties in the Kirkland Lake district of Ontario.

B. W. Knowles has been appointed superintendent of the Nickel Plate mine at Hedley, B. C., in place of W. Sampson.

Horace V. Winchell, who has been in the Far East for several months on professional business, is due to arrive in San Francisco on Sept. 13.

J. C. Shepherd, president of the Shepherd Mining Co. in Marion County, Ark., left for the training camp at Leon Springs, Texas, last week.

Prof. Arthur L. Walker, of Columbia University, has been appointed consulting metallurgist at large for ordnance in the War Department.

Heath Steele, formerly associated with J. R. Finlay, has been appointed assistant to Dr. Otto Sussman, vice-president of the American Metal Company

Henry A. Oesterle, ore buyer of Joplin, has been appointed resident agent for the Illinois Zinc Co., for the Joplin district, succeeding the late John Immel.

John C. Wilkes, of Trenton, N. J., is examining the feldspar deposits of the Ottawa Valley district in Canada on behalf of American manufacturing interests.

J. H. Means, of New York, who has taken options on several claims in the Tashota gold camp, is making an examination of the Manigotagon district, Manitoba.

S. R. Brown is now with the Porphyry Dike Gold Mining Co. at Rimini, Mont. He was recently mill superintendent at the Plymouth Consolidated mine in California

Erle P. Dudley, construction engineer at the Bunker Hill & Sullivan concentrator at Kellogg, Idaho, has been commissioned captain in the Engineer Officers' Reserve Corps

William Yeandle, Jr., of Boston, representing the United States Smelting, Refining and Mining Co., is making an examination of the Newray mines, Porcupine, Ontario

R. M. Stene, president of the R. M. Stene Mines Co., Ltd., has returned to Phœnix, Ariz., after having arranged for the financing of copper and lead properties in Mohave County.

Edward L. Dufourcq is now manager of the Teziutlan Copper Co., and is engaged in organizing the force to operate. He expects to return to New York about the end of September.

George J. Carr, for several years division manager of the Yuba Consolidated Gold Fields dredges at Hammonton, Calif., has resigned and will probably devote his time to his ranch interests

L. H. Duschak, superintendent of the Berkeley, Calif., station of the United States Bureau of Mines, was in Washington recently to confer with officials in regard to research work in the metallurgy of quicksilver

Harry J. Wolf was recently in the East on professional business. Upon his return to Colorado he examined properties near Bonanza in Saguache County, and is now engaged in the examination of a copper property in Fremont County

Dr. Colin G. Fink, for the last 10 years in the research laboratories of the General Electric Co., has been appointed head of the new laboratories of the Chile Exploration Co. at 202nd St. and 10th Ave., New York. His new work will be largely research along metallurgical and electrochemical lines

H. F. Hollister, chemical engineer, has resigned his position as chief engineer with both the Kalbperry Corporation and the Kalbfleisch Corporation to attend to his private engineering practice and to push the sale and use of his new process for converting niter cake into salt cake and sulphuric acid

Dr. C. L. Parsons, chief chemist of the United States Bureau of Mines, and **Dr. H. P. Talbot**, professor of chemistry at the Massachusetts Institute of Technology, have been appointed by Secretary Baker as members of the committee to investigate the defective ammunition sent to the American Expeditionary Force in France

J. F. Berteling has been appointed superintendent of the iron properties recently acquired on the Mesabi Range by the Schlesinger interests, of Milwaukee, Wis., which are to be operated by the Newport Mining Co. His headquarters will be at Grand Rapids, Minn. He was formerly with the Sullivan Machinery Company.

A. H. Ramage, manager and part owner of the various Ramage properties in the Joplin district, has gone to the officers' training camp at Niagara, N. Y. **J. H. Capelli**, of Webb City, Mo., and superintendent of the Carterville No. 4 property, has been appointed general manager for the Missouri and Oklahoma mines. **S. L. Kenny**, superintendent of the No. 6 mine at Joplin, has succeeded Mr. Capelli at No. 1 mine.

Obituary

John Immel, ore buyer for the Illinois Zinc Co. in the Joplin district for 45 years, died on Aug. 25, at the age of 85

George E. Scarfe, a metallurgical and construction engineer, died at Nevada City, Calif., Aug. 24. He was 51 years old and born in London. After traveling in various parts of the world he went to California where he later designed and directed the building of the North Star electrical hoist and the late improvements at the Empire mine in the Grass Valley district. For the last two or three years he was consulting engineer for the chief mines in Nevada City and Grass Valley. He also designed the plant for the Allison Ranch mine. Overwork was evidently the cause of the recent illness from which he never recovered. He was a member of the Institute of Mechanical and Electrical Engineers.

Societies

American Institute of Mining Engineers—Certain members of the New York Section tendered a dinner at the Engineers Club on Tuesday evening, Sept. 11, to the three mining engineers composing the Russian Mining Commission now in this country.

War Committee of Technical Societies, appointed by the United Engineering Societies' Engineering Council to act as an intermediary between members and the Government in presenting to engineers technical problems requiring solution, has mailed recently to members of the societies, a bulletin of information on the submarine problem which has been prepared by the Naval Consulting Board. Each recipient is asked to study this problem and to transmit any ideas, thought to be of use, to the secretary of the Naval Board. Members of the committee are: J. M. Boyle, J. V. Davies, American Society of Civil Engineers; A. M. Greene, Jr., R. N. Inglis, American Society of Mechanical Engineers; D. W. Brunton, Edmund B. Kirby, American Institute of Mining Engineers; C. R. Corning, G. C. Stone, Mining and Metallurgical Society of America; Joseph Bijur, American Electro-Chemical Society; A. S. McAllister, H. W. Buck, American Institute of Electrical Engineers

Industrial News

Asbestos Protected Metal Co., of Pittsburgh, Penn., announces the appointment of C. A. Crowe, formerly manager of the Grand Rapids office, to take charge of the Detroit office. M. W. Taber, formerly Detroit manager, has been appointed factory manager

Morse Bros. Machinery and Supply Co. has purchased the Colorado Smelting Co.'s smeltery and equipment at Alma, Colo., and will dismantle it and ship the equipment to Denver. This plant, which ran only about three months, had a capacity of 200 tons of copper matte daily

Locomotive Pulverized Fuel Co. announces that it has contracted with the Milwaukee Electric Railway and Light Co. to equip 25,000 hp. of boilers at the Oneida St. plant with its apparatus for burning pulverized fuel. It claims that this is the first central station to be so equipped and the largest equipment of the kind ever furnished

Trade Catalogs

"Crown" Coal Pick and Core Breaker. Ingersoll-Rand Co., 11 Broadway, New York. Form No. 8212. Pp. 4; 6 x 9 in.; illustrated.

"Imperial" Motor Hoists and Stationary Motors. Ingersoll-Rand Co., 11 Broadway, New York. Form No. 8006. Pp. 20; 6 x 9 in.; illustrated.

Air Receivers, Pressure Tanks and Moisture Traps. Ingersoll-Rand Co., 11 Broadway, New York. Form No. 9102. Pp. 8; 6 x 9 in.; illustrated.

"Little David" Pneumatic Chipping, Calking and Scaling Hammers. Ingersoll-Rand Co., 11 Broadway, New York. Form No. 8213. Pp. 16; 6 x 9 in.; illustrated.

"Michigan" Combination Steel and Wood Water Pipe. The Michigan Pipe Co., Bay City, Mich. Catalog. Pp. 88; 6 x 9 in.; illustrated. Interesting historical data on wood pipe are given; also various tables for hydraulic calculations

Buchanan All-Steel Rock and Ore Crusher Type C. C. G. Buchanan Co., Inc., 90 West St., New York. Bulletin No. 10. Pp. 16; 8 x 10½ in.; illustrated. This contains a table of standard sizes, etc., and other data including outline cuts showing general construction of crushers.

New Patents

United States patent specifications listed below may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

Alloys—Process of Alloying Metals. Chauncey C. Baldwin, Perth Amboy, N. J., assignor to Standard Underground Cable Co., Pittsburgh, Penn. (U. S. No. 1,235,872; Aug. 7, 1917.)

Aluminum Fluoride—Process for Obtaining Aluminum Fluoride. Charles A. Doremus, New York, N. Y., assignor of one-half to John Sherman Hoyt, Darien, Conn. (U. S. No. 1,237,188; Aug. 21, 1917.)

Crushing Machinery. Robert William Pringle, Gatooma, Southern Rhodesia, South Africa. (U. S. No. 1,237,383; Aug. 21, 1917.)

Drill-Steel Retainer. Charles A. Hultquist, Los Angeles, Calif. (U. S. No. 1,238,018; Aug. 21, 1917.)

Electrolytic Cell. Frank G. Wheeler, Appleton, Wis., assignor to Bleach Process Co., Appleton, Wis. (U. S. No. 1,236,025; Aug. 7, 1917.)

Fume Condenser—Thomas B. Stewart, Portola, Calif. (U. S. No. 1,237,571; Aug. 21, 1917.)

Fume Disseminator. Vern Slater and Leonidas D. West, Denver, Colo., assignors to The Electro-Fume Co., Denver, Colo., a corporation of Colorado. (U. S. No. 1,238,068; Aug. 21, 1917.)

Gold-Separator. Benjamin P. Tuggle, Portland, Ore., assignor, by direct and mesne assignments, to Redemption Gold Co., Seattle, Wash. (U. S. No. 1,235,945; Aug. 7, 1917.)

Iron Ore—Method of Treating Iron Ore. Frederic A. Eustis, Milton, Mass. (U. S. No. 1,237,765; Aug. 21, 1917.)

Lamp—Acetylene Miner's Lamp. Nelson Llewellyn, Cainesville, Mo., assignor of one-half to John W. Sole, Cainesville, Mo. (U. S. No. 1,238,032; Aug. 21, 1917.)

Openhearth Furnace. Thomas S. Blair, Jr., Chicago, Ill., assignor to Blair Engineering Co., New York, N. Y. (U. S. No. 1,236,140; Aug. 7, 1917.)

Ore-Concentrating Method—Alfred Schwarz, Joplin, Mo., assignor to Metals Recovery Co., New York, N. Y. (U. S. No. 1,237,961; Aug. 21, 1917.)

Sampler—George S. Backus, Leadville, Colo., assignor to Frederick W. Braun, Los Angeles, Calif. (U. S. No. 1,238,058; Aug. 21, 1917.)

Settler—Apparatus for Separating Liquids from Solids in Fluid Suspension. Alfred L. Blomfield, Colorado Springs, Colo., assignor, by mesne assignments, to the Dorr Co. (U. S. No. 1,237,745; Aug. 21, 1917.)

Tin Oxide—Process for the Direct Production of Pure Oxide of Tin. Johann Terwelp, Neuss, Germany. (U. S. No. 1,237,840; Aug. 21, 1917.)

Tunneling Machine. Ferdinand Stolzenburg, New York, N. Y. (U. S. No. 1,238,692; Aug. 28, 1917.)

Editorial Correspondence

SAN FRANCISCO—Sept. 5

Minarets Iron Deposits, in Madera County, reported to be under examination by Noble Electric Steel Co., operating electric smeltery at Heroult, Shasta County. Prospecting will be done by diamond drilling, if undertaken extensively. Reported that high-grade silver-lead ores, tungsten and medium-grade copper have been disclosed in region. Iron is present, as reported by State Mining Bureau, but situation of deposits and inaccessibility, together with lack of economic smelting facilities, have combined to retard development. Several years ago an effort was made to open these mines and within two or three years it was reported that the Southern Pacific Co. was making a move toward acquiring the holdings.

New Ore in Hardenberg Mine, in Amador County, recently disclosed below the poor zone, has confirmed the opinion of W. J. Loring, manager, that the Hardenberg ground is similar to other Mother Lode properties. The new ore was found at the 1500-ft. level. The total development since the Hardenberg syndicate took hold of the property has amounted to 1621 ft. from the 1068-ft. point to the 1500-ft. point. The results obtained at the 1200- and 1330-ft. levels were discouraging in the extreme, no pay ore having been found; and the only reason for further deepening the vertical shaft to the 1500-ft. point was the hope of repeating the history of the Mother Lode in the recurrence of good gold content below the point where the payable oreshoots are worked from the surface down to about 1000-ft. depth. At the 1500-ft. level the vein where intersected gave a low assay. Extension of the drives north and south on the vein have disclosed a northward section 20 ft. in length, 12 in. wide, containing visible gold. The vein continued in the face of the drive but showed less than $1 per ton. The south drive at a point 125 ft. distant from the 20-ft. chute has developed a section 35 ft. in length, 50 in. wide, showing about $4 per ton. Compared to the results obtained at the 1200- and 1300-ft. levels, these results at the 1500 are highly satisfactory, and the management hopes that this means a recurrence of permanent improvement of the mine at this point Two winzes will be sunk from the 1500-ft. level and it is believed that payable ore may be encountered at further depth.

Labor Problem in California Mines is becoming acute. Gold mines are in worse condition than copper and lead-silver properties because they cannot profitably support higher rate of wage than they are already paying. The copper mines, the lead-silver and tungsten mines have recently made an advance in wages but the growing demand for these metals and increasing prices urged the miners to demand still further advancement in wages. The miners at Atolia, the chief tungsten camp in California, are asking for an increase upon the scale of $3.50 and $4 per day. The copper miners along the Shasta copper belt, particularly on the west side of the Sacramento River, are demanding an all-round increase of $1 per day and certain betterments in working conditions. The copper mine operators have from the beginning of the rise in price of copper increased wages in accordance with advanced prices. But just now the scarcity of labor due somewhat to the army needs seems to have induced miners to make still further demands. There has been no disorder either in the copper or the tungsten region. The men are simply standing out for their demands and the latest news from Shasta County was that the matter would most likely be submitted to arbitration. Most of the gold mines along the Mother Lode region are running shorthanded and it would not be surprising if some of the important producers as well as properties being developed may have to curtail active operation still further. The demand for metals other than gold has given a strong impetus toward development and production while the decreasing purchasing value of gold and the increased cost of supplies has had the effect of discouraging development of new ground and the reopening of old known producers. The large producers not only in the Mother Lode region but in Nevada City and Grass Valley districts are feeling these effects of the extra cost of mining and some of them are better able to discontinue progressive development and new exploration, holding their operation down to the actual necessity of keeping the mines clear, so it would not be surprising if some of the larger mines would reduce production to a point greatly below normal. The smaller mines and properties under development cannot afford to curtail their operation, because in most cases this would mean a closing down of the property indefinitely. Of course the ultimate result is going to be an advance in gold mining when the demand comes for an increased amount of gold. However, the future is not of so much interest as present conditions. One thing is certain. The gold miner, whether he is a producer or a developer, cannot afford to make material inorease in wages. If the workmen persist in further increase in the wage schedule it will simply mean a closing down of a number of gold mines. While there is a good deal of chrome and some manganese being mined in several districts of the state, these operations do not call for a large amount of labor and much of the labor employed is unskilled, so that these operations do not have any direct effect upon the labor situation in the mining districts. [Later—Dispatches report that in Shasta County, 1000 miners and smeltery men are on strike and saloons at Kennett and elsewhere closed. Important companies affected are Mammoth Copper Mining Co. and First National Copper. The production affected approximates 26 to 27 million pounds per annum.]

BUTTE—Sept. 11

(By Telegraph)

Anaconda Mines and Smelteries will probably resume operations in a few days. Representatives of smeltery employees at Great Falls and other labor unions in Butte, including representatives of miners, met with smeltermen and other unions in Anaconda tonight in a big mass meeting and voted unanimously to return to work declaring the company to be fair. The action means that the radical element among striking miners in Butte is repudiated and defeated. There has been pretty strong evidence that the leaders among the strikers, including some I. W. W.'s, have been financed in the interest of Germany, and this phase of the situation is under investigation by the Federal authorities. A large majority of the miners have long been anxious to return to work under the advance in wages, but have been prevented by the radicals and fear of violence and of being called "scab." It is probable that mines can reopen with 60% of normal working force, but thousands of best miners have left district, many of whom have entered other occupations and will not return.

BUTTE—Sept. 8

Anaconda Mines Remain Closed on account of labor troubles, and also those of independent concerns which ship to the Anaconda smelteries. The Butte & Superior, East Butte and Elm Orlu mines are working at capacity for the first time since the strike was inaugurated in June. Among the independent producing companies that have been compelled to suspend production are the Tuolumne, Davis Daly and the copper producing portion of the Elm Orlu mines. The Tuolumne, Davis Daly and Butte Detroit are taking advantage of conditions to push development work. The changes at the Butte Detroit mill, made to treat a large tonnage of manganese ore, have been completed and development of the mine is being prosecuted.

I. W. W. Headquarters in Silver Bow County, together with a number of other places suspected of harboring traitors known to be active in spreading seditious propaganda in this community, were raided on Sept. 5, under orders from Washington, by the Federal authorities assisted by the police. While no arrests have been reported as yet, a large number of I. W W. members are being detained at Finlander's Hall while officers are examining records, literature and correspondence seized when they took possession of the place. The raid was so well planned that it was effected without serious resistance on the part of the I. W W. members and in spite of the fact that a large crowd of sympathizers had gathered quickly around the hall when it became known that the raid was taking place. The story is current that the authorities had reason to believe they might be able to connect the I. W. W. activities in Butte with certain German propaganda. It is said that Joe Shannon and Tom Campbell are among those detained by the officials for further investigation and hopes are expressed that this action of the Government will clear the way for an early resumption of mining and smelting operations on which Butte and over 20,000 of its population depend for a livelihood.

Labor Situation in Butte and other districts of the Anaconda company, is gradually resolving itself into another fight between labor unions themselves, and each faction is accusing the other of being influenced by the company. The strike of the miners made it possible for all the other unions to get in and make demands for increased wages. The miners were not organized, but a score of other unions are and these, using the strike of 10 000 miners, forced material concessions from the companies and then joined with the companies in refusing to deal with the striking miners because they were not "regularly" organized and had no international affiliation. The miners, having a sad recollection of their many years of experience under a grafting regime declined to affiliate again with the Moyer organization, and so they have remained dubbed "outlaw," "I. W. W.," "traitors," etc., and everyone who has sympathized with the striking miners, or attempted to advise them or suggest a basis for a peaceful settlement, has likewise been listed and published as an I. W. W and traitor to the country. It is evident that the strike is slowly dying of starvation, and the first fall of snow will see the men breaking away from all restraint and fear, and return to work Even then it will be many months before anything like a normal working force will report, as thousands of the best miners have left the district, have gone to other districts where wages are better and working conditions preferable. Many have abandoned the mines for good, and hundreds have joined the army. [Later—Dispatches report that some of the trade unions which endorsed and helped finance strike of miners before general shutdown of Anaconda mines and smelteries are backing down and some of the trades are expected to offer to return to work in the next few days, and committees will negotiate with striking smeltermen at Anaconda. Company officials, however, say that they have no interest in different moves of the union.]

DENVER—Sept. 7

High Price of Silver is stimulating development work in old silver-lead properties, which have been idle for years and are now being reopened. Some properties contain ore which could not be mined at a profit when silver ranged near 50c. per ounce, and pockety mines are attracting small leasers

Tariff on Tungsten Ore has been advocated by producers of tungsten in Colorado, who claim that tungsten produced in South America can be laid down in New York for about $8 per unit, while average cost of production in Colorado is about $16.50 per unit. The high cost in Colorado is because the ore occurs in lenses and pockets, and requires a large amount of development work to keep up production, while the relatively low cost in Bolivia is possible because, it is claimed, the ore occurs in continuous shoots, requiring less development work. It is proposed that a tariff of $10 per unit be placed on ores coming from South America.

Coal Operators of Colorado, represented by a committee consisting of H. F. Nash, Frank Bulkeley, Geo. W. Harris, D W Brown and W W. Curtis, have protested against the prices published in a coal schedule for the State of Colorado bearing President Wilson's signature. The local operators claim that these prices are lower than have obtained in Colorado for the last 10 years, and labor and supply costs have steadily advanced, especially during the last year The operators offer to submit production costs to substantiate their claims that under the abnormal costs now existing many mines will be unable to operate at the proposed prices except at a substantial loss. The committee is endeavoring to bring about a suspension of the proposed schedule of prices, pending an investigation of operating conditions. It is reported that the Reliance mine, at La Veta, and the Wolf Park property, at Canyon City, will be compelled to shut down if the proposed schedule goes into effect

WALLACE, IDAHO—Sept. 8

Cœur d'Alene District Miners' Union, affiliated with the International Union of Mine, Mill and Smelter Workers, has sent a communication signed by the president and secretary to every mine manager in the Cœur d'Alene district, in which an early conference is asked for the discussion of certain propositions, but upon which it is apparent there can be no agreement unless the mining companies accept them. Before stating the propositions, the communication calls attention to the "universal unrest that is permeating the entire country, and especially the mining industry," which renders immediate consideration of the proposals necessary. As a further preparation of the manager's mind for a favorable reception of the propositions, it is stated that they are not submitted "in the shape of demands, but to call your attention to conditions that should have been changed long ago, but that still exist almost universally in the district, and to impress upon you the necessity of improving conditions before sentiment crystalizes to any greater extent than it has at present." It is further pointed out that "developments of the last six months have shown that the workers are not satisfied with conditions in the mining industry, and that they are going to organize to improve them," and that "it is only a matter of time until some incident may occur that may bring on turmoil and strife in the Cœur d'Alenes. Such a condition can be avoided by intelligent action and foresight on the part of the managers." Further kindly advice is volunteered to the managers in the suggestion that "we should profit by the mistakes of others, and while the opportunity presents itself you should open negotiations now with the bona-fide labor movement to the end that through conference and discussion of grievances, either real or fancied, friendly relations may be preserved between the workers and the operators while the war is in progress." Then follows the propositions which the "bona-fide labor movement" desires to discuss with the managers, namely: "An eight-hour day from 'portal to portal' for all miners, and an eight-hour day for all outside men employed in or around the mines, mills or smelteries; change and dry rooms with bathing facilities at all mines; a payday at least twice a month; two men to be placed on all Leyner machines; enforcement of the state law relative to a spray to be used on all machines not equipped as water machines; readjustment of the wage scale, and a continuation of the sliding scale upward based on the price of metal; recognition of the grievance committee; recognition of the International Union of Mine, Mill and Smelter Workers, and a union shop." In order to reassure the managers of their peaceful intent, the officers close the communication with "Yours for industrial peace." Up to this time the managers of all the mining companies have ignored this request for a conference, and there is nothing to indicate that this attitude will be changed. Even the large interests represented by men who were formerly closely identified with the Western Federation are understood to be in line with the other companies in their opposition to giving any recognition to the old gang under a new name

SALT LAKE CITY—Sept. 10

Deep Creek District Shipments for August of 126 cars, or about 5000 tons of ore, show that this new camp is fulfilling its promise of profitable operation for the recently completed railroad into the district. The major part of this output—119 cars—came from the Western Utah Copper, which property has been under development for several years, with a view to production as soon as adequate transportation could be afforded. The remainder came from the Pole Star Copper, Woodman Mining, Spotted Fawn and Silver King, the two latter properties being operated by lessees, and each producing one car of ore. The Woodman Mining Co., owning two properties, is operating the Frankie mine and producing copper ore. There is stated to be a considerable amount of low-grade ore of this character proven, as well as higher-grade copper also being found on the property. The Pole Star, which is next to the Western Utah in point of development, etc., resumed shipments last week in August, and management announces that from now on it expects to maintain a regular output, hauling its ore by truck to the loading bin at the railroad at Gold Hill. The first car for the present month was shipped Sept. 1, and it is expected to make shipments every two or three days. The ores from this property carry bismuth, tungsten, copper, silver and gold. In the case of the Western Utah Copper, reserves are stated to have been increasing during the period of shipments, so that the present rate of output can be increased at any time. The production coming from the district—with this mine as the chief producer—is estimated to have been about $500,000 since last spring, when the railroad began operation—exceeding in value the cost of the installation of the road

JOPLIN, Mo.—Sept. 8

Site for New Lead Smeltery of the Ontario Smelting Co., of Joplin, after an unexpected delay, has been obtained two miles north and one mile east of Quapaw, Okla., and construction work will be started Sept. 10. The company found it necessary to purchase the fee and mineral rights to a 40-acre tract. The situation is only a short distance from the Frisco R.R., to which it will be connected by a switch, and the Mineral Belt R.R. also will connect with it from the northwest. One result of the delay in securing the site will be the construction of a larger plant than originally intended, it having been decided to build five furnaces instead of four, which will give the plant a capacity of about 100 tons of lead ore per day. The plant will thus be larger than the Eagle-Picher company's lead plant at Galena, Kan. C. V. Jones, of Joplin, who is president and treasurer of the Ontario Smelting Co., said today that construction work will be rushed, and that all the machinery has been purchased and is ready to ship. He hopes to have the new plant in operation at the end of the 12 weeks, though it is likely it will take longer than this. It will be built entirely of brick and steel and will be thoroughly modern.

HOUGHTON, MICH.—Sept. 8

August Output of Copper of Lake Superior mines will show close to 10% increase over July, although smeltery figures are not yet at hand. Further increase can be reasonably expected for September, as many workmen are coming in from farms and taking underground positions; the influx from Butte continues to some extent. Estimated rock outputs for August follow: Calumet & Hecla, 241,400 tons; Centennial, 11,600; South Lake, 5185; Isle Royale, 70,000; Osceola, 100,000; La Salle 15,615; Hancock, 32,800; Mass, 16,000; Superior, 10,000; Ahmeek, 103,400; Wolverine, 28,980; Mohawk, 48,090; Franklin, 27,045; Allouez, 48,165

The Mining News

ARKANSAS

Marion County

WILLETT (Yellville)—Operated by Liberty Lead and Zinc Co. New 150-ton mill purchased and construction work will start immediately.

OLENA (Flippin) — Owned by Glynn Bros. of Tulsa, Okla., and local people. Opening up shallow deposit of zinc and carbonate ore, in massive and disseminated form.

ARIZONA

Cochise County

SHATTUCK ARIZONA (Bisbee)—Production for August was 641,677 lb. copper comparing with 205,081 in July; 12,997 lb. lead, comparing with 101,011 in July; 8277 oz silver, compared with 3213 in July; 77.9 oz gold, compared with 30 oz in July

Gila County

MIAMI (Miami)—Production for August was 260,000 lb comparing with 5,319,000 in June. No production for July as properties were shut down entirely because of strike. Announced that 50% of men are now at work. September production expected to be over 50% and still further increase in October

Mohave County

NEW MOHAWK MINING CO. (Chloride)—Just shipped carload gold and silver ore to Selby. No. 2 shaft opening shoot of silver ore, showing ruby silver. No. 3 shaft down nearly 60 ft. J. J. Robertson, superintendent.

UNION METALS CO. (Chloride)—Just made arrangements with Union Basin Mining Co., operating Golconda mine, to run 600-ft crosscut from latter's 1100-ft level to cut Fredonia and other veins of same group of former company. Will open these veins on Fredonia at depth of 800 ft. Shaft on Fredonia down 60 ft., with 14 in. good ore on hanging wall and same amount on foot wall. Surface cut on Golconda Annex claim opened silver-lead ore. J. P. Ryan, superintendent

Pima County

TOTAL WRECK (Tucson)—Situated near Pantano and being operated by E. L. Vail & Co.

NEW CORNELIA (Ajo)—Will continue diamond-drill explorations on the Ajo Consolidated property recently acquired. Underground exploration also in progress

ARIZONA CONSOLIDATED (Greaterville)—Subsidiary of General Mining Co. of Nevada, has undertaken development of J. B. Anderson property, under direction of C. H. James

HECLA-ARIZONA (Tucson)—Adjoining the San Xavier Extension is sinking a two-compartment shaft to 200-ft depth before crosscutting. Considering building custom plant to handle ores of Twin Buttes district

Pinal County

MAMMOTH DEVELOPMENT CO. (Shultz)—Have bonded the Mammoth and Collins group. Shaft down 833 ft., under water at 712 ft.; operating on 700-ft level, where 1800-ft drift connects both groups. Hoisting 160 tons wulfenite ore daily and shipping 4 tons of concentrates carrying 20% MoO_3 and about $35 gold. Installing flotation process, giving 90% extraction to displace present means of concentration by eight Wilfley tables. Epes Randolph, of Tucson, secretary

Yavapai County

CALUMET & JEROME (Jerome)—No. 2 crosscut from 600-ft level penetrated 75 ft south of station same black slate that No. 1 west crosscut entered about a week ago. East crosscut driven 51 ft without reaching sheared zone

DUNDEE-ARIZONA (Jerome) — New electric pump insufficient to handle water in shaft, and air lift being rigged. The 8 x 12 compressor was too small and larger compressor has been installed to furnish air for new lift

CALIFORNIA

Amador County

PLYMOUTH CONSOLIDATED (Plymouth)—Report for July shows 11,000 tons of ore treated with estimated total yield, including concentrates, of $51,188

Del Norte County

OLD CROW (Crescent City)—This copper property is in the monumental district ½ mile from line of the proposed Grants Pass and Crescent City railroad. Copper vein 3½ ft wide opened 100 ft. Owned by F. E. Bauman of San Francisco and managed by E. A. McPherson

Mariposa County

YELLOW STONE MINING CO. (San Francisco)—Permitted to issue 100,000 shares capital stock to C. R. Burt as partial payment of 160 acres of patented land in Hunters Valley and to sell 100,000 shares at 25c. cash for development

Sacramento County

SACRAMENTO CLAY PRODUCTS CO. (Sacramento)—Permit to issue stock. Stipulating that 997 shares to be issued in exchange, for property formerly known as Sacramento Clay Products Plant controlled by D. A. Cannon, and associates.

NATOMAS CO. OF CALIF. (San Francisco)—Report for year ended Dec. 31, shows gross gold recovery amounted to $2,137,120 from 25,868,000 cu.yd., against $2,416,960 the previous year. Net operating profit was $988,885, against $1,313,800. In 1916, $108,248 expended in salvaging and rebuilding Natoma dredge No. 7 charged to operating expense. Fair Oaks plant operated 195 days, producing 19,500 tons crushed rock and 42,500 tons screened gravel. Oroville operated 107 days, output was 85,000 tons crushed rock and 69,000 tons screened gravel. Reclamation and drainage of lands practically completed and crops planted. Reclamation cost to date has been $4,270,000.

San Bernardino County

MOJAVE ANNEX TUNGSTEN MINING (Ivanpah)—Completed 20-ton concentrating plant and operating on wolframite ore. Development work shows presence of good tungsten ore. J. B. Evans, consulting engineer.

Shasta County

ARPS COPPER CO. (Copper City)—Reported machinery for installation of hoist, compressor, machine drills and engine received. Sixth carload ore sent to Mammoth smeltery at Kennett.

SHASTA KING (Kennett)—Mammoth Copper Mining Co. leased this copper property and started 30 men exploring and developing. Ore extracted being shipped to Mammoth smeltery. Is included in Trinity Copper Co. holdings, owned chiefly by Thomas Lawson of Boston. Prospected and sufficiently developed by John Fillius and Fred Grotefend 17 years ago to prove its approximate value and was kept alive for a few years, but finally shut down by Lawson. Believed to be one of the best copper mines or prospects on west side of Sacramento River. Stated there is no option of purchase attached to lease as Lawson is not inclined to sell, but willing that other operators shall develop, even if something is made out of development and extraction.

Siskiyou County

POLAR BEAR COPPER CO. (Calahan)—Permit granted to L. K. Stam, Albert Stone and Charles F. McAlmond to issue 150,000 shares of stock.

RANCHERIA MINING CO. (Hornbrook)—Notice served by débris commission that mining work must stop on account of pollution of Rancheria Creek by tailings.

GRAY EAGLE (Happy Camp)—James F. Mahoney, of Sullivan Machinery Co., has removed diamond drills after completing contract to drill aggregate of 8000 ft. Machinery is being moved to Mendocino County.

Tuolumne County

SAN YSABEL (Stent)—Fay Chadbourne, superintendent, met with fatal accident in mine, July 24. Workman slightly injured. Cause not reported. Operated by Nyman Consolidated Mines Co. of San Francisco.

WESTERN EXPLORATION AND MINES CO. (Sonora)—Permitted to issue 14,995 shares of capital stock to Alexander Hamilton, William F. Rose and F. B. Kinsman in exchange for assignment of option of Fortuna and Sirius No. 2 mining property, situated near Italian Camp. Also permission to sell 10,000 shares at $5 for development and equipment.

COLORADO

Boulder County

MINING REVIVAL at Jamestown is under way.

WHITE RAVEN (Boulder)—Regular shipments of heavy lead-silver ore made; production two to three cars weekly. Development work carried on for two years; mine now in shape to take advantage of high price of silver.

Clear Creek County

PRIMOS CHEMICAL CO. (Camp Boericke)—Erecting flotation plant to treat molybdenum ore from its property about 10 mi. above Empire. Survey made for new power line to connect plant with Colorado Power Co.'s line, 12 mi. distant; cost estimated at $24,000. Charles A. Chase, consulting engineer; E. A. Strong, mill superintendent; Benjamin Essig, construction engineer.

Gilpin County

SILVER PLUME activity still increasing. Many old silver mines being reopened. High price stimulating production.

C. H. W. MINING CO. (Central City)—Operating Hampton mine. Concrete piers for additions to shaft house and ore bins completed; work on ore bins under way, and will be completed before new headframe is installed in order to interrupt underground work for as short a time as possible. New 100-hp. G. E. motor to run compressor installed. Shaft sinking will be resumed when improvements completed. Development work continues to open good-grade ore, and regular shipments of crude ore and concentrates made.

Park County

WESTERN MINING CO. (Alma)—Fifty-ton mill completed and regular shipments of concentrates being made.

COLORADO POWER CO. is surveying for power lines throughout Alma district; will build lines to Paris, Dolly Varden, London and other mines.

JIM BLAINE (Alma)—Tungsten property, being worked under lease and bond. Vein in upper workings 6 ft. wide shows shoots of tungsten ore. Crosscut tunnel being driven to cut vein at greater depth. J. T. Dollison, manager.

San Juan County

DIVES LEASING CO. (Silverton)—Operating Shenandoah mine.

PRECIOUS METALS CO. (Chattanooga)—Lessees shipping good-grade ore.

TELESCOPE (Chattanooga)—High-grade lead ore opened by lessees.

COMING WONDER (Silverton)—Ore being shipped to North Star mill for treatment.

WYGALL-VANSLYCK (Silverton)—This group in Stony Pass being developed. High grade gold-silver ore discovered.

San Miguel County

LIBERTY BELL (Telluride)—New electric locomotive installed on lower tunnel level.

CARRIBEAU (Ophir)—Flotation installation completed and mill has resumed operations. Old tailings being retreated first.

GERTRUDE & MODENA (Telluride)—Being operated by lessees. Car of copper ore from development work shipped recently. Property in Bear Creek Cañon.

CARRUTHERS (Telluride)—Leasing company operating lease on block of Smuggler-Union Co.'s ground and Carruthers mill making regular shipments.

Saguache County

EAGLE (Bonanza)—Developing 7-ft. vein of payable ore.

KAPI MINING AND MILLING CO. (Bonanza)—May Bell tunnel advanced 100 ft. during August to total length of 542 ft.; new vein cut containing 12-in. streak of copper and iron pyrite ore. Tunnel being advanced to cut Shawmut vein, in which raise will be made to bottom of shaft. Upper workings now full of water, contain lead and copper pyrite ore.

Summit County

MOLLY B (Breckenridge)—Further shipments bismuth ore being made.

BLUE FLAG (Breckenridge)—Property in Illinois Gulch being reopened.

IRON MASK (Breckenridge)—Reopening old workings nearly completed. Shoot of iron-manganese ore opened.

ORO EXTENSION (Breckenridge)—Large flow of water encountered in development work this spring just now under control.

MONTE CRISTO (Breckenridge)—Mill being remodeled and flotation plant installed. Property in upper Blue River district. F. A. Peabody, in charge.

OURAY (Breckenridge)—Tunnel levels repaired; machinery will be installed and shaft unwatered. Worked for several years by lessees.

Teller County

BLUE FLAG (Cripple Creek)—Work resumed on this Raven Hill mine. Main shaft will be sunk from 1100 to 1400-ft. level; work to begin at once. Property adjoins Cresson.

QUEEN BESS (Cripple Creek)—Good-grade ore discovered in development work on this Tenderfoot Hill property. Reopened by drifting on 500- and 900-ft. levels of El Paso Gold King mine adjoining. Was once a producer of gold ore from Mollie Kathleen shaft.

IDAHO

Bonner County

ARMSTEAD MINES (Sagle)—Completed reconstruction of No. 3 tunnel at Rainbow and driving 2200 ft. to cut vein exposed in upper workings; now in 1400 ft. Size of tunnel increased from 6 x 7 ft. to 7 x 8 ft. and using 20-lb. rails. Two-in. air pipe and 20-in. ventilating pipe run in length of bore. Has 70,000 tons milling ore blocked out above tunnel No. 2 according to report of H. H. Armstead, president. Survey being made for road from mine to Sagle.

Shoshone County

BIG CREEK (Wallace)—Returns received this week from 39-ton carload of gray-copper ore shipped believed to have broken the record for the district. Driving crosscut to cut this rich oreshoot at further depth of 560 feet.

DOUGLAS (Beeler)—Shipments from this zinc property worked under lease to Anaconda company, discontinued on account of the closing of Anaconda smelteries. Other zinc properties on Pine Creek are seriously affected also, but expect to ship to other smelteries.

LIBERTY KING (Beeler)—Consists of five claims being developed since November. One drift, 550 ft. long, shows ledge carrying ore 11 to 14 ft. wide of hard quartz. Two oreshoots found from six to 10 in. wide of high-grade lead-zinc ore. Iron and copper sulphide in crosscut at end of drift. Leslie Lamb, principal owner.

NATIONAL (Mullan)—Meeting of directors in Wallace on Aug. 31 levied assessment of 1c., to provide necessary funds to place mine in shape to produce and make repairs to the mill, which is expected to be running by Sept. 15. Body of copper ore in lower level of better grade than in upper workings.

MICHIGAN

Copper

COPPER RANGE (Painesdale)—Exploration work on options south of Globe tract continue with three diamond drills. Production close to normal.

SOUTH LAKE (Houghton)—Butler lode continues to furnish the best rock coming from this lode and 200 tons daily taken out. Better ventilation will be had when sixth level cuts into the Lake extension.

MICHIGAN (Rockland)—Plat cut on seventh level. Laterals will be pushed to explore the three lodes. Ogimah lode shows fairly good rock at both sixth level openings. Considerable amount of mass and barrel rock coming from the Butler lode. Fourth-level crosscut getting into copper rock.

WOLVERINE (Kearsage)—Rock coming from No. 3 shaft on 11th level is picked carefully as it is lean, but profitable at present price of copper, with short tram and hoist to surface. The 31st and 34th levels are out to the boundary. Three other north levels are stoping and five on the south, the 25th, 31st, 34th, 37th and 38th.

OSCEOLA CONSOLIDATED (Osceola)—No. 4 shaft, North Kearsarge resumed operations after a short shut-down, during which steam engine in rock house was replaced by electric motor and another Farrell crusher in operation. Shaft continues in low-grade copper rock not much better than the old Osceola lode. Expect improvement when shaft gets to point on same shoot Wolverine and Allouez operates.

QUINCY (Hancock)—Management denies operating at 8000-ft. depth and have not done any diamond drilling below bottom of shafts. New hoist, capable of hoisting loads from inclined depth of 10,000 ft., purchased. Silver is becoming important source of income, mainly because of increasing amounts in lower openings. In early days "picking" silver was an important branch of mill work. Calumet & Hecla's lower conglomerate workings likewise are showing more silver right along.

MINNESOTA

Cuyuna Range

PENNINGTON (Ironton)—Finished shipping for this season; the tonnage amounted to about 125,000

KENNEDY (Cuyuna)—Fire in the Rogers Brown Ore Co. property still smouldering. Started on 210-ft. level and burned up raise. This section bulkheaded and mining under way in other sections. Half of stockpile has been shipped.

CUYUNA SOUTHERN RAILWAY was incorporated by Cuyler Adams, discoverer of Cuyuna iron range, and reported will tap mining properties of Southern range, pass through Clearwater range and western Mille Lacs lake and thence to St. Paul.

FEIGH (Ironton)—Temporarily abandoned at 71 ft. on account of water and quicksand trouble. New timber shaft being sunk within 300 ft. Plan is to drift under main shaft to drain water. R. H. McDonnell, superintendent.

WILCOX (Riverton)—Acquired by Omaha Iron Co. Name of mine changed to Omaha. Idle at present. Shipped 84,834 tons during 1914-16. Has 65,000-ton stockpile at mine. Estimated ore deposit of 5,000,000 tons with 1,050,000 tons accessible for extraction. New owners plan construction of ore-drying plant. Capacity of mine equipment, 200 tons. A. A. MacKay, of Ironton, superintendent of the Hoch and Ferro mines, will be in charge.

Mesabi Range

BESSEMER IRON-ORE property near Eveleth known as Burns Mine, has been opened by the owners, H. C. Dudley and associates.

MISSOURI

Joplin District

MELROSE (Quapaw, Okla.)—New 300-ton mill virtually completed on lease north of Quapaw and will be in operation by Sept. 15. H. B. Lappe, president.

LARSH (Commerce, Okla.)—Will erect mill on lease near Commerce where rich strike recently was made. Face of lead-bearing ore 45 ft. thick indicated by drill cuttings, coming in at 244 feet.

CHAPMAN BROS. (Joplin)—Have completed rebuilding of 1000-ton mill formerly located at Webb City on Goodeagle lease near Tar River, Okla., and plant now in operation. Three shafts in ore. Lease drilled out by L. C. Church, 40 drill holes showing ore.

HACKETT L. & Z. (Webb City)—Has taken lease on 1580 acres land just west of Picher and Tar River, Okla., and will thoroughly develop with drills. Is virgin territory but near good mines.

WOLFTON (Picher, Okla.)—Plans construction of two modern mills on lease west of Picher. One shaft down to ore and another started. Company recently organized with $200,000 capital. A. P. Mackel, president, is also president of Central Lead and Zinc Company.

BIG START MINERAL (Picher, Okla.)—Will start drilling operations on 120-acre lease recently acquired southwest of Tar River. Stock in company held almost exclusively by women, Mrs. M. C. Robinson and Miss Gertrude Chaffee, of Oklahoma City, among principal owners.

MONTANA

Beaverhead County

BOSTON & MONTANA DEVELOPMENT CO. (Wise River)—Reported to have cut the Park vein, uncovering about five to six ft. of ore.

Lewis and Clark County

HELENA MINE (Helena)—Two car loads a week to smeltery.

JULIA (Helena)—New shoot of $25 ore in east 300-ft. drift.

QUARTZITE DIKE (Helena)—Twenty tons of ore through Umatilla mill. Concentrates carry $10 gold, 34 oz. silver and 35% lead.

Silver Bow County

ANACONDA (Butte) — Production for August was 11,175,000 lb., comparing with 12,400,000 lb. in July, and 20,400,000 lb. in June, and 28,800,000 lb. in August, 1916. August is smallest output since December, 1914, when 11,800,000 lb. was produced.

NEBRASKA

Box Butte County

ALLIANCE POTASH CO. (Alliance)—Purchased 40-acre tract at Antioch to erect plant to take potash from water in lake east of here. Pipe line to be constructed. Recently incorporated. F. C. Krause, president.

NEVADA

Clark County

BIG CASINO (Searchlight) — Have proved up orebody on 550-ft. level, drifting east and west. Expect to sink to 1000-ft. level when financing is completed. W. W. Wishon, consulting engineer.

HOOSIER (Goodsprings) — Development work being done since July 15 and lead orebodies opened. One 50-ton carload shipped, but returns not yet available. Has ore on dump and management reports 6000-7000 tons in sight. Neis Nelson, owner.

Esmeralda County

GOLDFIELD CONSOLIDATED MINES CO. (Goldfield)—Report for July shows 18,100 tons produced, realizing net profit of $9809. Development work amounted to 1610 ft. at cost of $7.10 per ft. Mining cost was $3.018 and net operating cost was $7.808 per ton of total ore. Leasers during month produced 1386 dry tons, yielding $22,436, netting company $8505.

Nye County

TONOPAH ORE PRODUCTION for week ended Sept. 1 was 9371 tons, valued at $164,015, comparing with 9107 tons the previous week. Producers were: Tonopah Belmont, 2431 tons; Tonopah Mining, 2350 tons; Tonopah Extension, 2380 tons; Jim Butler, 800 tons; West End, 1109 tons; Rescue, 109 tons; Montana, 48 tons; Cash Boy, 53 tons.

TONOPAH EXTENSION MINING CO. (Tonopah)—Receipts from operations for July were $115,732, showing profit of $32,952.

MUSTANG (Manhattan)—New oreshoot discovered close to surface on apex of Mustang Hill. Lens has same general characteristics as that worked by Train & Chase and hope similar conditions will be encountered. Dimensions are increasing with depth. Excess of water from recent heavy rains prevented exploration of lower workings of shaft from which it was expected to extract ore for a trial mill test.

NEW MEXICO

Socorro County

TRIBULLION (Kelly)—Property under lease to Ozark Smelting & Mining Co., subsidiary of the Sherwin Williams Co. Receiving $4000 to $5000 royalties per month from lessees who are treating 40-50 tons per day in mill at Kelly, N. M., and shipping 25 tons copper ore daily. Shareholders' meeting of Tribullion company called on Oct. 2 to reduce capitalization and provide for reorganization.

OREGON

Josephine County

COW BOY AND LYTTLE (Takilma)—These copper mines, leased by C. E. Tucker and George Fife, are shipping two carloads per week.

LOGAN SIMMONS (Waldo)—The season's output of this placer mine was $40,000 gold. Also platinum and a little osmium and iridium. Gold is very fine. Deposit is from 10 to 25 ft. deep. J. T. Logan, manager.

PITTSBURG-OREGON MINING AND MILLING CO. (Grants Pass)—Incorporated Aug. 21 for $2,000,000. A general mining and ore-marketing business is planned. Victor W. Brown, C. C. Bippus, W. H. Stroup, Howard Q. Turner, of Pittsburgh, and Lester A. Brown, of Grants Pass, are interested.

UTAH

Beaver County

GOLDEN REEF CONSOLIDATED (Frisco)—Property north of Horn Silver mine being developed. Double-compartment shaft down 450 ft. Mineralization, horn silver.

Juab County

DESERET MOUNTAIN (Tintic Junction) Provided with equipment, and production of copper ore expected to begin. Shaft being sunk, and will begin drifting when 400-ft. level is reached. W. Mont Ferry, J. H. Turner and W. D. Livingston, interested.

TINTIC STANDARD (Eureka))—Stated to be in condition to ship car daily. Shipped four cars week ended Aug. 24. Drift being run from 1300-ft. level, the bottom of new shaft, now in 25 ft. in shipping ore; objective point is productive orebody on higher level, and showing ore going down.

TROUT CREEK MINING CO. (Gold Hill)—Situated at Trout Creek, 15 miles from Gold Hill, nearest railroad point. Inclined shaft down 180 ft. on a lead-silver vein. Will also develop zinc ore found on property. Recently scheelite discovered in mica schist showing good percentage of tungsten. Several tungsten discoveries on property immediately east of this will be developed by H. Pryor of Colorado. Hoist installed. H. J. Meyer, president.

Salt Lake County

VICTOR (Alta)—Two fissures showing mineralization cut by tunnel being driven through limestone, also showing some mineral. Objective point "Cardiff" contact, expected in 100 to 150 ft. of work.

SOUTH HECLA (Alta)—Shipments hindered by lack of teams, smelter embargo, etc., are being increased. Shipped about 150 tons week ended Aug. 18, and expects to double this amount week ended Aug. 24.

Tooele County

GARRISON MONSTER (Gold Hill)—Better haulage conditions being arranged for, by this Deep Creek property, and necessary buildings, etc., to be built.

SEMINOLE COPPER (Gold Hill)—High-grade tungsten ore continues to be shipped. Shipments of molybdenum to be made soon. Four veins on property carrying tungsten, but so far only one has shipped. Fifty-ton mill being built. Company owns 300 acres with tungsten-molybdenum ground and indication of possible commercial gold-silver and copper-lead ore. Portion of property from which tungsten ores being shipped opened to 135-ft. level.

CANADA

British Columbia

D. C. JACKLING states that he and associates have no interest in iron-ore properties, or iron and steel business on Pacific Coast as reported in the "Journal" of Sept. 1 and elsewhere.

Manitoba

MOOSEHORN (Herb Lake)—Operated by Northern Manitoba Mining and Development Co. Shaft down 80 ft. and vein widened from 15 in. on surface to 30 in. with increased gold content.

Ontario

CONIAGAS (Cobalt)—Has purchased Maidens MacDonald property in Porcupine for $20,000. It adjoins the Ankerite optioned to the Coniagas and formerly to the La Rose.

TEMISKAMING (Cobalt) — B. Neely, manager of the Penn-Canadian, making examination at instance of Max Morgenstern, to determine accuracy of report on ore reserves.

WETTLAUFER (South Lorrain)—Pittsburg Lorrain Co. will take over this mine. Mill being overhauled for treatment of large accumulation of low-grade ore.

LUCKY CROSS (Swastika)—Shareholders on Sept. 3 adopted resolution to wind up the company and sell property at auction. Bondholders to the amount of $56,400 stated they were prepared to bid for the property.

NIPISSING (Cobalt) — Flotation equipment of five callow rougher and one cleaner cell will be increased to eight roughers and two cleaners to give a 250 to 300-ton capacity per day. Heads in flotation will average about eight oz. per ton and expected to extract six oz.

McINTYRE (Schumacher)—Annual report covering 15 months ended June 30, shows current assets at $307,137 and fixed assets, $4,432,249. Surplus is $741,903, comparing with profit and loss account balance for March, 1916, of $383,149. Depreciation reserve fund is $252,000 and $148,987 charged to general reserves.

TEMISKAMING (Cobalt)—The report of Balmer Neilly, appointed to examine the property places total broken ore reserves at about 11,572 tons. Silver content estimated at 400,000 to 450,000 oz. Only positive ore was taken into account. Shareholders at meeting held Sept. 6 were not satisfied and ordered another examination by Douglas Mutch of the Hudson Bay mine, to get estimate of probable ore contents, which Mr. Neilly's report did not give.

MEXICO

ESPERANZA (El Oro, Mex.)—Ore milled in June was 10,896 tons. Estimated profit was $20,052, comparing with $10,911 in May.

SANTA GERTRUDIS (Pachuca, Hidalgo)—Ore milled in June was 27,550 tons at estimated profit of $41,063. Manager reports for quarter ended June 30 85,705 dry tons crushed, producing bullion valued at $702,109; estimated profit at mines, $115,157. Mine development amounted to 2186 ft., of which 783 ft. were in payable ore, 626 ft. in vein below pay and 777 ft. in country rock. On South crosscut, 16th level, parallel 2195 ft., being driven to explore outlying hanging-wall territory after passing through quartz-porphyry dike 30 ft. wide, entered wide zone of altered andesite, and 1651 ft. south of north vein cut small new vein striking N 50° E and dipping nearly vertical. Drifting thereon exposed ore shoot 128 ft. long, 4.7 ft. wide, averaging 15 oz. silver and $1.50 gold per ton. Unable yet to say if new vein will prove of much importance. Scarcity of cyanide caused mill to run at 86.8% of capacity except during May when full rate of crushing maintained. Improved cyanide deliveries in July expected to allow mill operation at 100% of capacity. Flotation experiments on tonnage scale to replace cyanidation will be resumed shortly. Earnings decreased by high price of labor, increased cost of supplies and taxes.

PERU

CERRO DE PASCO (La Fundicion)—Production of copper for August totalled 6,036,000 lb., comparing with 6,262,000 lb. in July.

SOUTH AFRICA

GOLD PRODUCTION in the Transvaal in July was 757,839 oz., being 1885 oz. less than in June and 3248 oz. less than in July, 1916. For the seven months ended July 31 the total was 5,412,954 oz. in 1916 and 5,330,775 oz.—or $110,187,119—in 1917; a decrease of 82,179 oz., or 1.5%, this year. The number of negro laborers employed in July was: Gold mines, 171,653; coal mines, 11,381; diamond mines, 5223; total, 188,257, showing a decrease of 4097 from June, and of 20,671 as compared with last January.

The Market Report

SILVER AND STERLING EXCHANGE

Sept.	Sterling Exchange	Silver		Sept.	Sterling Exchange	Silver	
		New York, Cents	London, Pence			New York, Cents	London, Pence
6	4.7550	95⅝	48½	10	4.7550	97⅝	49½
7	4 7550	96⅝	49	11	4 7550	98⅝	50
8	4 7550	96⅝	49	12	4.7550	98⅝	50

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

DAILY PRICES OF METALS IN NEW YORK

Sept.	Copper	Tin	Lead		Zinc
	Electrolytic	Spot.	N. Y.	St. L.	St. L.
6	25 @26	61	9½ @9¾	9½ @9¾	7½ @7¾
7	25 @26	60¾	9¾ @9⅝	9⅜ @9⅝	7½ @7¾
8	25 @26	60¾	9¾ @9⅝	9⅜ @9⅝	7⅝ @7⅞
10	25½ @26½	61¼	9¼ @9½	9¼ @9½	7 70 @7 90
11	25¾ @26¾	61½	9¼ @9½	9¼ @9½	7.80 @7 90
12	25¾ @26¾	61⅞	9¼ @9½	9¼ @9½	7⅞ 8⅛

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

The quotations for electrolytic copper are for cakes; ngots and wirebars. Electrolytic copper is commonly sold on "regular terms" (r.t.), including freight to the buyer's works and is subject to a discount for cash. The difference between the price delivered and the New York cash equivalent is at present about 0.25c. on domestic business. The price of electrolytic cathodes is 0.05 to 0.10c. below that of electrolytic. Quotations for spelter are for ordinary Prime Western brands. We quote New York price at 17c. per 100 lb. above St. Louis.

Some current freight rates on metals per 100 lb. are: St. Louis-New York 17c.; St. Louis-Chicago, 5.3c.; St. Louis-Pittsburgh, 13.1 cents.

LONDON

Sept.	Copper			Tin		Lead	Zinc
	Standard		Electrolytic				
	Spot	3 Mos.		Spot	3 Mos.	Spot	Spot
6	120	119½	137	241	240	30½	54
7	120	119½	137	241	240½	30½	54
8							
10	120	119½	137	241	240½	30½	54
11	120	119½	137	242	241¾	30½	54
12	120	119½	137	243½	243	30½	54

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2,240 lb. For convenience in comparison of London prices, in pounds sterling per 2,240 lb., with American prices in cents per pound the following approximate ratios are given, reckoning exchange at 4.80. £15 = 3.21c. £20 = 4.29c.; £30 = 6.43c.; £40 = 8.57c.; £60 = 12.85c. Variations, £1 = 0.21⅜c.

NEW YORK—Sept. 12

The leaking of the news that a large quantity of copper had been bought for the Allies, which became generally known on Sept 6, had a favorable effect on the copper market, which became much stronger. Spelter, which was previously considered to be bottomed on bedrock, was sentimentally affected. Similarly with respect to tin. Lead was the only metal to exhibit weakness. Readjustment of the prices of lead is necessary to bring it in line with the other metals.

Copper—It became generally known on Sept. 6, not through any official communication, but rather through the leaking of a party to the transaction, that about 77 million pounds of copper had been purchased at 25c. by the War Industries Board in behalf of the Allies. Although the principal producers were, of course, acquainted with this transaction for some time previous, it was not generally known in the trade until Thursday last. Upon the news becoming public buying by domestic consumers was immediately stimulated and there was considerable activity, in comparison with the dullness of many weeks previous, at advancing prices. We estimate the sales of electrolytic as upward of 25 million pounds. The bulk of the business was for October-December delivery, but it is noteworthy that some considerable transactions were made that extend forward to next April and also others covering the first quarter of 1917. At the close, the market was firmly established on an average basis of about 26¾c. net cash, New York.

Our Washington correspondent reported by telephone at 4:30 p.m. that Mr. Baruch and Mr. Meyer had informed him that no decision on the matter of the price of copper had been reached, and might not be for several days yet. They said moreover that there was no basis for any intimations as to what the price might be and especially requested that there be no speculation on that subject. No special significance is to be attached to the meetings with the producers this week, which are simply a continuation of conferences that have been going on for the last six weeks. We inferred from our correspondent that a decision in the matter might not be reached until after the return of the President to Washington.

News from Butte this morning is to the effect that the strikers will shortly return to work, but it is not expected that the Anaconda company will be able to resume right away at anything more than 60% capacity. Production at Bisbee, Ariz., has now attained nearly normal capacity. A small production is being made at Globe and Miami, but Clifton-Morenci continue idle.

Among the refiners, one is closed and two others are operating at greatly reduced capacity. Another refinery is reported being near the end of its stock of blister copper, with every prospect that its production will shortly be curtailed. If there be any demand at all for copper during the next three months there is bound to be an acute situation.

The copper producers and the purchasing section of the War Industries Board have been holding sessions this week. Early in the week it was reported that a decision as to the price the Government would pay for its requirements of copper would be announced today, but early in the afternoon news of another postponement came from Washington. It is disgraceful that there should be these delays, while producers are called upon to supply copper to the Government and are not getting any money for it. At present the Government must be owing them in the neighborhood of $10,000,000.

Copper Sheets are quoted at 35c. per lb. for hot rolled, and 1c. higher for cold rolled. Wire is quoted nominally at 31c. per lb., f.o.b. mill.

Tin—Market was small, but there were signs of increasing activity which was reflected by a slight stiffening of price. Banka tin regained its normal differential of about 1c. below the price for Straits and at the close was quoted at 60¾.

Lead—This market was very dull; transactions were so small that quotations are based on offers to sell, rather than on sales. Right through the week September lead was offered at 9½c., New York, and at the same price, St Louis. The A S & R. Co. maintains its price at 10c., but the market looks for a further reduction

Zinc—Transactions were small, but there was an advance in price and a firmer tone generally. This resulted in part from the better situation in copper, and in part from the prevailing idea that the price for zinc had bottomed on bedrock. Important interests were inclined, moreover, to help along an advance in zinc by themselves staying out of the market. There was some speculative bidding for the metal, but producers were at all times willing to sell to consumers at ⅛c. less than to speculators, while some producers refused to sell to speculators at all.

Zinc Sheets—Price of zinc sheets has not been changed. Market is still at $19 per 100 lb. f.o.b. Peru, Ill., less 8% discount.

Other Metals

Aluminum—This market continues inactive with quotations nominal at 45c. for No. 1 ingots at New York.

Antimony—This market continued dead, and we simply repeat our nominal quotation of 14½c. for spot. An important seller reported firm bid at that price but order not filled. Important consumers report having as much as six months' supply on hand. We quote futures nominally at 14c., c.i.f., in bond, but large foreign producers say that they cannot afford to sell at less than 15c., c.i.f., in bond, here, or £80@85, c.i.f., Great Britain. Another foreign producer reports itself out of the market until 15½c. is reached

Bismuth—Unchanged at $3.50 per pound.

Cadmium—This metal is quoted at $1.40 @1.50 per pound.

Nickel—Steady at 50c. per lb., premium of 5c. per lb. for electrolytic.

Quicksilver—Unchanged at $115. San Francisco reports, by telegraph, $114, steady.

Gold, Silver and Platinum

Silver—This metal has shown unusual strength, owing to the advance in the London price. The market there being rather bare of supplies, the advance is made on small buying. The inquiry from San Francisco on China account is still being maintained.

Mexican dollars at New York: Sept. 5, 75c.; 6 75c.; 7, 76c.; 8, 76c.; 10, 77c.; 11, 78c.

Platinum—In fair demand at $103@105.

Palladium—Firm at $120@125. Certain producers report inquiries on which they were unable to quote.

Zinc and Lead Ore Markets

Joplin, Mo., Sept. 8—Blende, per ton, high, $79.50; basis 60% Zn, premium $75; medium to low, $70@65; calamine, per ton, basis 40% Zn, $40@38; average selling price, all grades of zinc, $69.60 per ton.

Lead, high, $97.35; basis 80% Pb. $95@90; average selling price, all grades of lead, $89.57 per ton.

Shipments the week: Blende, 12,014 tons, calamine, 908 tons, lead, 1416 tons. Value, all ores the week, $1,027,080.

With intermediate grades selling on a lower base, a higher average price denotes larger sales of premium ore. A larger influx of cars is permitting the shipment of ores purchased two and three weeks ago, swelling the shipment far above the week's purchases.

Platteville, Wis., Sept. 8—Blende, basis 60% Zn, $70 base for premium ore down to $65 base for second grade. Lead ore, base 80% Pb, $85 to $90 per ton. Shipments reported for the week are 2965 tons of zinc ore, 154 tons of lead ore, and 512 tons of sulphur ore. For the year to date the figures are: 98,525 tons of zinc ore; 4869 tons of lead ore; and 19,642 tons of sulphur ore. Shipped during the week to separating plants, 3894 tons of zinc ore.

Other Ores

Antimony Ore—Considerably lower, high-grade ore being quoted at $1.70@2 per unit.

Manganese Ore—Metallurgical ore continues strong at $1 per unit, but some of the buyers are more particular respecting silica content

Molybdenum Ore—Molybdenite containing 90% molybdenum sulphide was sold at $2 15 per lb. of molybdenum sulphide contained.

Tungsten Ore—A fair amount of business was done at $23@25 per unit for high-grade wolframite, the top price being for ore assaying 70% tungsten trioxide, free from impurities. Low-grade ore was quoted at $18.50, that price being named on some lots of 60% material. Scheelite fetched $26 per unit.

Pyrites—Spanish lump quoted at 15½c. per unit on basis of 10s. ocean freight, buyer to pay war risk, excess freight and any duty. Ocean freights are 32s. 6d. for northern ports, and 40s. for southern ports.

Iron Ore—Shipments of iron ore down the Lakes were 10,116,786 tons in August, against 10,241,633 tons in July and 9,850,110 tons in August, 1916. The season total to Sept 1 is 36,523,554 tons, against 39,215,864 tons to the same date last year. Prices remain on the season basis, at $5.05 for Mesabi nonbessemer on Lake Erie docks, with a premium equal to the extra Lake freight that would be paid above the season basis of $1. The rate is now fully $1 50.

Iron Trade Review

PITTSBURGH—Sept. 11

The gossip in the iron and steel trade continues to be that everybody is waiting upon the much advertised price fixing by the Government, and the prediction made a week ago, that the Government's announcement as to steel prices would be made within a week, is repeated again this week, naturally receiving correspondingly less attention.

There is beginning to be serious doubt whether this is really what the trade is waiting for. When the market is stagnant, as it has been for weeks, it is necessary to assign a reason, and this is a convenient one The Government can fix prices for the general trade only in the case of coal and coke. As to pig iron and finished steel it can fix prices only on what it buys itself, being in position only to recommend in the case of the general trade, and if the Government makes an announcement covering everything it is authorized to do the market would probably continue stagnant, awaiting a time when the mills would have to seek business. The decrease of 437,115 tons in the Steel Corporation's unfilled obligations during August, reported yesterday, suggests that it will be only a few months until the steel mills will stand in need of booking additional business in some departments.

The softening tendency continues in scrap, pig iron, unfinished steel and finished steel but the actual declines recorded in the market are relatively small and serve merely to show the trend In finished steel the only clear-cut decline is in plates, which are now quotable at 8c as maximum, whereas a few weeks ago the market was quoted firm at 9@10c. as minimum

Steel production continues to be interfered with in various ways. The weather is better but coke is as scarce as ever. The Carnegie Steel Co has every one of its 59 blast furnaces in physical condition for operation, but two are out of blast and five banked, on account of insufficient coke. Its ingot production is about 12% under rated capacity

Pig Iron—Bessemer iron can be had at $50, valley without difficulty, or $2 below last week's quotation, but there is no demand Foundry iron has been resold at $50 or less, and while furnaces state that their price remains $53 this is purely nominal. There is not enough buying to establish prices definitely We quote bessemer at $50, basic at $48 and foundry and malleable at about $50, at valley furnaces, 95c higher delivered Pittsburgh

Steel—Billets are offered by middle interests at $75, as reported a week ago, but it is now thought they could be bought at $70 Mills as a rule are making no quotations.

Ferroalloys

Ferromanganese—The market is very quiet, demand being limited, and there are some irregularities in price in consequence, but in general the market remains quotable at $375@400 for prompt and remainder of year, and at $250 for first quarter of next year delivered

Coke

Connellsville—There is no news from Washington as to the fixing of prices on coke for the general trade The recent allotment of 16,000 tons for the Navy Department to July 1 1918, was at $3 for heating, a small tonnage and $3.60 for foundry, comprising the bulk of the 16,000 tons The spot market has fluctuated during the week but is down again approximately to the basis of a week ago, being quotable at $12@12.50 for spot furnace and at $13.60@14 for spot foundry, per net ton at ovens

STOCK QUOTATIONS

N. Y. EXCH †	Sept 11
Alaska Gold M	3¼
Alaska Juneau	2
Am.Sm & Ref ,com	96
Am Sm. & Ref , pf	108¾
Am. Sm. Sec., pf , A	96¾
Am. Sm Sec., pf B	19½
Am Zinc.	18
Am. Zinc, pf	51½
Anaconda	72¾
Batopilas Min	1
Bethlehem Steel	104
Bethlehem Steel, pf.	100
Butte & Superior	29½
Cerro de Pasco	32¼
Chile Cop	17¼
Chino	54½
Colo Fuel & Iron	45¾
Crucible Steel.	69¾
Dome Mines	10
Federal M. & S.	18
Federal M. & S., pf.	42
Great Nor., ore ctf.	33½
Greene Cananea	40¾
Gulf States Steel	100
Homestake	107½
Inspiration Con	53¼
International Nickel	33¾
Kennecott	41
Lackawanna Steel	81½
Miami Copper	36
Nat'l Lead, com.	52
National Lead, pf	102
Nev. Consol	22½
Ontario Min	6¼
Quicksilver	1
Quicksilver, pf	1
Ray Con.	27
RepublicI.&S.,com.	81
Republic I. & S , pf.	101½
Sloss-Sheffield.	46¾
Tennessee C. & C.	16¾
U. S. Steel, com	108¾
U. S. Steel, pf	116½
Utah Copper.	98¼
Va Iron C. & C.	58

N. Y. CURB†	Sept. 11
Big Ledge.	1¼
Butte & N Y.	1¼
Butte C. & Z.	9¾
Caledonia	.76
Calumet & Jerome	2¼
Can. Cop. Corpn	2¾
Carlisle	4
Cashboy	.08
Con. Ariz. Sm.	2
Con. Coppermines	10½
Con. Nev -Utah.	⅛
Emma Con	1
Ferber	‡.60
First Nat. Cop	2¼
Goldfield Con.	48
Goldfield Merger.	05½
Greenmonster.	.75
Hecla Min	8⅜
Howe Sound	6¼
Jerome Verde	1¼
Kerr Lake.	5¾
Magma	46
Majestic	.37
McKinley-Dar-Sa	.75
Milford	1¼
Mohican	¾
Mother Lode	.35
N Y. & Hond	‡13
Nipissing Mines	9½
Ohio Cop	1¼
Ray Hercules	3¾
Richmond.	56
Rochester Mines	.53
St Joseph Lead.	18
Standard S. L.	.65½
Stewart	.31
Success	.19
Tonopah	6½
Tonopah Ex	2¾
Tribullion	‡⅛
Troy Arizona	.18
United Cop	½
United Verde Ext.	36
United Zinc	4
Utica Mines	27
White Knob, pf.	‡1½
Yukon Gold	2⅛

SAN FRAN.*	Sept. 11
Alta	03
Andes	11
Best & Belcher.	02
Bullion	02
Caledonia	10
Challenge Con	01
Confidence	05
Con Virginia	10
Gould & Curry	‡ 02
Hale & Norcross	02
Jacket-Cr. Pt	08
Mexican	08
Occidental	60
Ophir	08
Overman	01
Savage	03
Seg Belcher	02
Sierra Nevada	17
Union Con	45
Utah Con	‡ 02
Belmont	4 50
Jim Butler	90
MacNamara	11
Midway	11
Mont.-Tonopah	‡ 19
North Star	10
Rescue Eula	19
West End Con	70
Atlanta	10
Booth	05
Comb Frac	03
D'field Daisy	03
Florence	10
Jumbo Extension	25
Kewanas	10
Nevada Hills	17
Nevada Packard	20
Round Mountain	25
Silver Pick	09
White Caps	1 42½
Big Jim	‡ 69
United Eastern	4 20

BOSTON EXCH *	Sept 11
Adventure	2¼
Ahmeek	100
Algomah	50
Allouez	65½
Ariz Com., ctfs	10¼
Arnold	25
Bonanza	.21
Butte-Ballaklava.	.50
Calumet & Ariz	77
Calumet & Hecla.	535
Centennial	17
Copper Range	56
Daly West	2¼
Davis-Daly	5
East Butte.	11¾
Franklin	6¾
Granby	78
Hancock	13
Hedley	17
Helvetia	25
Indiana	2
Isle Royale	30
Keweenaw	1¼
Lake.	8½
La Salle	3¼
Mason Valley	6½
Mass	10¾
Mayflower.	1¾
Michigan	1¾
Mohawk	82
New Arcadian	3½
New Idria	14¾
North Butte	17
North Lake	1
Ojibway.	1
Old Dominion	53
Osceola	87
Quincy	84
St. Mary's M. L.	75
Santa Fe.	1⅛
Seneca	7¼
Shannon	7¾
Shattuck-Ariz.	23
So. Lake	3
So. Utah	.15
Superior	7½
Superior & Bost.	3¾
Trinity	6¾
Tuolumne	1¾
U. S. Smelting	61
U. S. Smelt'g. pf	50
Utah Apex	3½
Utah Con	15½
Utah Metal	4¾
Victoria.	3½
Winona	2¾
Wolverine	41
Wyandot.	40

BOSTON CURB*	Sept. 11
Alaska Mines Corp	50
Bingham Mines	1¼
Boston Ely	72
Boston & Mont	63
Butte & Lon'n Dev	16
Calaveras	3
Calumet-Corbin.	.01
Chief Con	2¼
Cortez	10
Crown Reserve.	25
Crystal Cop.	88
Eagle & Blue Bell	2½
Houghton Copper	75
Intermountain	1¾
Iron Cap, Com	16
Iron Cap Cop , pf	16
Mexican Metals	27
Mines of America	1½
Mojave Tungsten	40
Nat Zinc & Lead.	42
Nevada-Douglas.	1
New Baltic	1½
New Cornelia	17
Oneco.	1 35
Pacific Mines	35
Rex Cons	.20

SALT LAKE*	Sept 11
Bannack	55
Big Four	04
Cardiff	5 50
Colorado Mining	16
Daly-Judge	8 45
Empire Copper.	1 30
Gold Chain	18
Grand Central	5
Grand Gulch	‡ 19
Iron Blossom	87
Lower Mammoth.	03
May Day	05½
Moscow	15
Prince Con	98
Silver-King Coal'n	3 00
Silver King Con.	4 22½
Sioux Con	09
So. Hecla	1 02½
Tintic Standard.	1 57
Uncle Sam	04
Wilbert	34
Yankee	07

TORONTO*	Sept 11
Bailey	04
Beaver Con	37½
Buffalo Mines	‡1 00
Chambers Ferland	15½
Coniagas	3 80
Hargraves	16
La Rose	53½
Peterson Lake	12
Right of Way	‡ 05
Temiskaming	.32
Wettlaufer-Lor.	07
Dome Exten	16
Dome Lake	15
Foley O'Brien	‡ 60
Hollinger	5 00
McIntyre	1 57
Newray	80
Porcu. Crown.	41
Schumacher	‡ 42
Teck Hughes	44
Vipond	29½
West Dome	17

STOCK QUOTATIONS—Continued

COLO SPRINGS	Sept. 11
Cresson Con.	5.62½
Doctor Jack Pot.	.04
Elkton Con.	.05½
El Paso	25
Gold Sovereign.	04¾
Golden Cycle	2 05
Granite	40
Isabella	10
Mary McKinney.	.12
Portland	1 40
United Gold M	.18½
Vindicator	60

LONDON	Aug. 27		
Alaska Mexican	£0	10s	0d
Alaska Tre'dwell	1	2	6
Burma Corp.	4	1	3
Cam & Motor	0	9	6
Camp Bird	0	8	6
El Oro	0	11	6
Esperanza	0	10	6
Mexican Mines.	5	17	6
Nechi, pfd.	0	13	3
Oroville	0	16	9
Santa Gert'dis.	0	12	6
Tomboy.	0	18	6

* Bid prices. † Closing prices. ‡ Last Quotations.

MONTHLY AVERAGE PRICES OF METALS

Silver	New York			London		
	1915	1916	1917	1915	1916	1917
January	48 855	56 775	75 630	22 731	26 960	36 682
February	48 477	56 755	77 585	22 753	26 975	37 742
March	50 241	57 935	73 861	23 708	27 597	36.410
April	50 250	64 415	73 875	23 709	30.662	36 963
May	49 915	74.269	74.745	23.570	35 477	37.940
June	49 034	65.024	76.971	23 267	31 060	39.065
July	47 519	62 940	79.010	22 597	30 000	40.110
August	47 163	66.083	85.407	22 780	31 498	43.418
September	48 680	68 515		23 591	32.584	
October	49 385	67 855		23 925	32 361	
November	51.714	71.604		25 094	34.192	
December	54 971	75.765		26.373	36.410	
Year	49 684	65.661		23.675	31 315	

New York quotations cents per ounce troy, fine silver. London, pence per ounce, sterling silver, 0.925 fine

Copper	New York		London			
	Electrolytic		Standard		Electrolytic	
	1916	1917	1916	1917	1916	1917
Jan	24 008	28 673	88 083	131 921	116 167	142.895
Feb	26 440	31 750	102 667	137 895	133 167	148.100
Mar	26.310	31.481	107 714	136 750	136 000	151.000
April	27 895	27 935	124 319	133 842	137 389	147.158
May	28.625	28.788	135 457	130 000	152.522	142 000
June	26.601	29.962	112 432	130 000	137 455	142.000
July	23.865	26.620	95 119	128 409	125.500	140 409
Aug.	26.120	25.380	110 283	122.391	126 304	137.000
Sept	26 855		113 905		134 071	
Oct	27.193		122 750		142 523	
Nov	30 625		134 659		155 432	
Dec	31 890		145.316		162 842	
Year	27 202		116 059		138 281	

Tin	New York		London	
	1916	1917	1916	1917
January	41 825	44 175	175 548	185 813
February	42 717	51 420	181 107	198 974
March	50 741	54 388	193 609	207 443
April	51 230	55 910	199 736	220 171
May	49 125	63 173	196 511	245.114
June	42 231	62 053	179 466	242.083
July	38 510	62.570	168 357	242.181
August	38 565	62.681	169 870	243.978
September	38 830		171 345	
October	41 241		179 307	
November	44 109		186.932	
December	42 635		183.368	
Av year	43 480		182 096	

Lead	New York		St Louis		London	
	1916	1917	1916	1917	1916	1917
January	5 921	7 626	5 826	7 530	31 167	30 500
February	6 246	8 636	6 164	8 595	31 988	30 500
March	7 136	9 199	7 375	9 120	34 440	30 500
April	7 630	9 288	7 655	9 158	34 368	30 500
May	7 463	10 207	7 332	10 202	32 967	30 500
June	6 936	11 171	6 749	11 12	31 011	30 500
July	6 352	10 710	6 185	10.644	28 137	30 500
August	6 244	10 594	6 088	10.518	29 734	30.500
September	6 810		6 690		30 786	
October	7 000		6 898		30 716	
November	7 042		6 945		30 500	
December	7 513		7 405		30.500	
Year	6 853		6 777		31 359	

Spelter	New York		St Louis		London	
	1916	1917	1916	1917	1916	1917
Jan	16 915	9 619	16 745	9 449	89 810	48 329
Feb	18 420	10 045	18 260	9 875	97 762	47 000
Mar	16 846	10 300	16 676	10 130	95 048	47 000
April	16 695	9 459	16 525	9 289	99 056	54 632
May	14 276	9.362	14 106	9 192	94 217	54 000
June	11 752	9.371	11 582	9 201	68 591	54 000
July	8 925	8 643	8 755	8 473	50 750	54 000
Aug	8 730	8 360	8 560	8 190	51 587	54 000
Sept	8 990		8 820		52 095	
Oct	9 879		9 659		54 159	
Nov.	11 592		11 422		56 023	
Dec	10 665		10 495		55 842	
Year	12 804		12 634		72 071	

New York and St Louis quotations, cents per pound, London, pounds sterling per long ton.

Pig Iron. Pitts	Bessemer‡		Basic‡		No. 2 Foundry	
	1916	1917	1916	1917	1916	1917
January.	$21 60	$35 95	$18 78	$30 95	$19 70	$30 95
February	21 16	36 37	18 93	30 95	19 51	30 95
March	21 81	37 37	19 20	33 49	19 45	35 95
April	21 85	42 73	18 95	38 90	19 45	40 00
May	21 78	46 94	19 11	42 84	19 58	43 60
June	21 95	54 22	18 95	50 05	19 34	50 14
July	21 95	57 45	18 95	53 80	19 20	53 95
August	21 95	54 17	18 95	50 37	19 77	53 95
September	22.88		19 58		19 53	
October	24 61		21 26		21 51	
November	30 07		28 18		26 55	
December	35 16		30 95		30 79	
Year	$21 88		$20 98		$21 15	

‡ As reported by W P Snyder & Co.

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Minas de Matahambre, Cuba

By D. FORD McCORMICK

Engineer in charge, Matahambre, Prov. de Pinar del Rio, Cuba

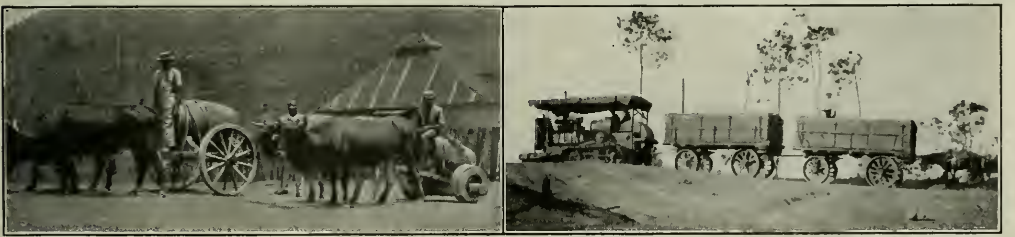
Matahambre is a bonanza copper deposit, discovered in 1913, and was financed by Manuel Luciano Diaz alone. Present yearly production is about 20,000,000 lb. copper, and 70,000 oz. silver. Fault system and occurrences of ore is interesting. Important improvements are under way, including construction of six-mile aërial tramway, storage bins and a 1350-hp. power plant at the port of Santa Lucia and, at the mine, a 400-ton concentrating plant and a 2,500,000-gal. reservoir.

MINAS de Matahambre, in the Province of Pinar del Rio in the western end of Cuba, are operated by Manuel Luciano Diaz, a civil engineer of note, of Havana, who financed the enterprise alone and has managed it from its beginning. He is often referred to as the "Cuban Copper King." The mine was discovered in 1913 by a native while out hunting for deer. The man was caught in a rain and took refuge underneath a ledge. He noticed pieces of green and blue material in the ledge and carried some chunks away with him. He interested Dr. Alfredo Porta, a lawyer of Pinar del Rio, who in turn interested Señor Diaz.

After an examination of the property by the C. L. Constant Co., of New York and Havana, it was decided to prospect the claims. Ore was found from grass roots. Development and mining were carried on through adits until late in 1914. Then a shaft was started in order to develop the deposit at lower depths. Toward the latter part of 1915 the first crosscut from this shaft reached the ore at 100 ft. below the fifth level, or lowest adit. During 1916 the shaft was sunk an additional 400 ft. (past the 10th level), or to a depth of 152 ft. below sea level. The 10th-level crosscut exposed high-grade ore during June, 1917, and the ninth-level crosscut exposed high-grade ore during December, 1916. Development work on the eighth, seventh and sixth levels has exposed great quantities of excellent chalcopyrite ore. Development work was done at the rate of nearly 2000 ft. monthly progress during the past year. During 1916 there were dispatched from the port of Santa Lucia 33 ships carrying 65,000 tons of ore to the reduction works of the United States Metals Refining Co. at Chrome, N. J., U. S. A.

The town of Matahambre is in the Province of Pinar del Rio, about 2½ hours' horseback ride from Cabezas. Cabezas is on the national highway between the city of Pinar del Rio and Guane, the present terminus of the *F. C. del Oeste* railroad from Havana. Another way to reach the mine is by launch from Esperanza to Santa Lucia, thence by road about 1½ hours' horseback ride. Both Cabezas and Esperanza may be reached by automobile from Pinar del Rio, the former takes 40 min., and the latter one hour and 40 min.'s ride.

The country is not picturesque. It is not fertile, yet it is not by any means barren, and is famous as the *vuelta abajo* tobacco district. Pines, oaks, scrub brush, palms, and a stiff, long-bladed, dry, wire-grass grow on the low hills and in the numerous *arroyos* that make up the landscape. Cyclones are common to this part of the island, and it is said that a particularly severe storm about seven years ago killed most of the pine growth. Only an occasional timber-giving tree is to be found now (except in a few sheltered spots), but a young growth has made a good start. The oak is not used for mine timbers, therefore it is only a question of a short time until mine crops will have to be imported. The dead trunks of the pines still stand, but in scant numbers compared to the original growth. The fires that are started throughout the entire district once



THE MARCH OF PROGRESS AT MATAHAMBRE MINE, PROVINCE OF PINAR DEL RIO, CUBA

On the water wagon

Caterpillar tractor and ore carts

or twice each year during the dry season, have destroyed thousands of cords of wood. Wood was formerly used as fuel at the mine, but because of the continually increasing length of haul, and the difficulty in putting the wood along the roadside for transportation, the cost became prohibitive and gradually more and more coal was used, until now coal is in general use. But coal is also expensive and oil will soon be used to furnish the power.

Eighteen months ago the camp was that of an overgrown prospect, with a floating population of 500 to 600 people; today it is a growing town, making work for possibly 1500 men. As is the case at most prospects, living was crude; but with more activity and a forced growth improvements of a permanent nature were started and today brick staff-houses, office, and surface plants; steel shop buildings, and neat frame structures with tile roofs are seen on every hand. The camp has electric lights, an ice plant and water-works; and is served by several stores; a post and telegraph office; school, military barrack, restaurants, butcher shop, shoe shop, etc. The staff has a well-built and comfortable clubhouse. The laborers' houses are mostly two-room frame structures with palm-leaf roofs, but have a lean-to kitchen with dirt floor and zinc or tar-paper roofs as a precaution against sparks from the open kitchen fireplace. The bunkhouses are large and airy frame structures with thatched roofs. Some have no partitions, but are arranged so that two rows of hammocks can be swung side by side. The greater number of bunkhouses are divided into 16 to 20 unceiled rooms, which are made private by nailing heavy slats across the top of the partitions. A bunkhouse divided into rooms gives more satisfaction than the open-type structures and houses comfortably equally as many men.

HEADFRAME, SORTING HOUSE, DUMPS AND POWER HOUSE AT MATAHAMBRE MINE

The camp is supplied with water from a spring encountered in a prospect adit. This was dammed and about 50,000 gal. of water impounded. A small electric-driven automatically controlled triplex pump forces the water into a storage tank, from which it is distributed by gravity to the camp. The town is in an unusually sanitary condition, thanks to a corps of natives who keep at their job continually and relentlessly. A hospital, drug store and operating room are at the service of all employees.

There are a number of claims adjoining the Matahambre group that are being prospected at present. Loma Mono, Vivero, and Dichosa lie to the north and east; Nieves and Cantajorra lie to the south and west of Matahambre. The general surface conditions and appearances are much the same throughout the district. The strata of sedimentaries outcrop in many places. There are gossan outcrops, quartz ledges, shale beds and layers of sandstone and the whole is covered with more or less overburden.

The Nieves and Matahambre claims embrace some hills 800 or 900 ft. in height. The Mono and Dichosa hills are lower, and the Vivero and Cantajorra shafts are in gulches still nearer sea level. The general trend of the ranges of hills is north and south. The land is eroded and shows folding and faulting in many forms, where the structure is visible. Iron-stained ground is common and shows to a marked degree over the orebodies at Matahambre, but there are no large masses of gossan. At Mono and Nieves there are gossan outcrops on the hill tops and slopes. Matahambre ore is remarkably free from pyrite. Carbonates occurred in quantities near the surface. At Nieves a wide vein of pyrite containing some galena and sphalerite was exposed. At Mono a wide zone, apparently a vein, was crosscut near the surface, and pyrite, carbonates and sulphides of copper were encountered. Limestone was found at Nieves but not at either of the other properties.

The lowest level at present is known as the 10th level, and is 544 ft. below the collar of the shaft and 132 ft. below sea level. The main crosscut has just reached the ore on this level, and the ninth, eighth, seventh and sixth levels, all driven from this shaft, have developed excellent ore in the form of solid chalcopyrite, chalcopyrite in slate, or chalcopyrite in sandstone or shales. The main crosscuts are double-tracked and range in length from 620 ft. on the sixth to 350 ft. on the 10th levels. The levels are 100 ft. apart in depth. The fifth, fourth, third and second levels are adits. Nearly all the common copper minerals have been found in the Matahambre mine. Carbonates occur from the fifth level upward; native copper most abundantly between the fifth and fourth levels; the black and red oxides occur from about the fourth level to the surface in with the carbonates and sulphides. The bulk of the ore consists of sulphides. Only a very small portion of the ore shipped has been carbonate or oxide. An unusual mineral that occurs in a neighboring district (but not at Matahambre) is known as "cubanite." It is copper-iron sulphide, very much paler in color than chalcopyrite and I have been informed that when pure it assays only slightly over 22% Cu. It occurs massive and has a greenish-black streak.

The formation at Matahambre appears to be a deposit in a cross fissure that was large at one end (the south), and tapered toward the other end. A series of parallel major faults divided the deposit into several orebodies, some large, others small; but generally speaking the orebodies diminish in size both in length and breadth towards the north. The dip of the country (slates, shales and sandstones) is from 45° to 60° NW; the strike about N 45° E. The faults strike about N 60° E and have a slight hade to the northwest. The vein strikes almost north and south, and dips about 45° west.

Where a siliceous stratum lies over the vein, and forms the hanging wall, it is slightly mineralized; but when a shale or slate hanging wall is present, there is practically no mineralization of the wall rock and, as a rule, this kind of a hanging wall (slate) is treacherous. Mineralization in the quartzose foot wall occurs in the form of grains or small pieces of chalcopyrite in the mass, and sometimes as stringers of solid chalcopyrite. In the slate walls the mineralization is more often in the form of stringers of chalcopyrite. Little quartz is present in the large orebodies, and limestone has not been found to date anywhere in the mine. A thin streak of galena was found in two different parts of the mine, but proved to be "specimens" only. The shaft intersected a vein 4 in. wide containing sphalerite, pyrite and chalcopyrite, between the eighth and ninth levels. This occurred near a vein of quartz, but seemed to be isolated completely, and no importance has been attached to it as regards the ore that is being mined at present. Limonite and hematite, sandstone, clay and kaolin, quartz, shale, and slates are associated with the ore on the fourth level. Only sandstone, quartz, shales and slates are found on the fifth level and below. To date no fossils have been discovered in the mine.

WHARF AND HARBOR AT SANTA LUCIA, THE PORT IN WESTERN CUBA FOR MATAHAMBRE MINE

Unloading coal

Barges and towing launch

There is no doubt that some replacement has occurred along parts of the walls of the vein; but in general this is not the case. Where the chalcopyrite occurs in masses 15 to 20 ft. thick, and two to three times as long, the walls are generally clean, and the drag along the fault is plainly defined. The ore does not occur as solid sulphides in chimneys, but seems to have been concentrated in different parts of the original orebody. The orebodies (portions contained between fault planes) may be rich for several hundred feet, then become poorer and again enriched lower down. In addition to the major faults, causing in the main a lateral displacement, many local faults and slips in all conceivable directions and forms have helped to cut up the ore and make trouble for the miners. The folds help to complicate the geology. An interesting fact is that at present there is a great movement occurring along a fault, and already a crosscut has been practically blocked and a wall 4 ft. high is present where the fault crosses the tunnel. On the level below the movement has been less than a foot, and another hundred feet lower, on another level, there has been only slight movement.

A single-drum Lidgerwood steam hoist was replaced by a double-drum hoist of the same make several months ago. The ore is loaded into 20-cu.ft. roller-bearing mine cars, and hoisted in balance to the surface. The sorting house is situated near the collar of the shaft. The ore to be sorted is dumped over grizzles set at ¾-in. spaces. The fines drop into storage bins, and no attempt is made to sort this material. The coarser material slides onto a sorting table, where water is sprinkled on it, in order to wash the dust and mud off, and make sorting easier. The low-grade ore is discarded into a small bin from whence it is trammed to storage piles for concentration later. The "shipping-grade" ore is shoveled from the table into the same bins where the fines collect.

Two grades of ore are shipped. High-grade ore is marketed carrying 14% copper, at and above which point the ore yields 1 oz. silver to the ton. The lower grade ore ranges between 8% and 10% copper. Any ore extracted that contains less copper than this is stored for concentration. Several of the stopes yield 22% copper ore without sorting. The mine is comparatively dry, and so low as 1 gal. of water per second was pumped during the dry season. At present two 7 x 12 x 7-in. horizontal, duplex, steam pumps are installed on the ninth level. Later two 6 x 8-in. and one 7 x 12-in. triplex, electric-driven, automatically controlled pumps will be installed, and the steam pumps will then be reserved for emergencies.

The large orebodies are mined by square-set and filling method. Where the hanging wall is heavy, only two floors are held open until filling is started. No ore had been stoped below the sixth level until about June, 1917; to date, most of the filling has been obtained from "glory-holes" on the surface. Where the vein is narrow, and the walls well defined, and of sufficient strength to stand long enough to allow the stope to be mined clean, only stulls are used as props. In many places the orebody dips 45° or more; therefore it is convenient to drive the levels in the foot wall and crosscut to the orebodies. This preserves the main haulageways from caving when the ore is mined beneath the level, and also is convenient for locating practically vertical raises to cut the ore half way between levels. The lower half of the ore between levels is removed through the crosscuts from chutes along the square sets, but the upper half is drawn through raises in the foot wall to the main-level chutes.

Near the fault planes it is necessary to timber the drifts, but ordinarily the tunnels are free of timbering. The mine timbers are framed from local pine timber. These timbers are shortlived and weak, but serve long enough to allow rapid extraction of the ore. The timber fails under the slighest load—too often to keep the timbering costs at a low figure—and necessitates cribbing. For flooring 2½-in. and 3-in. planking is used; and *rajas*, split from props 6 to 8 in. diameter, serve for lagging. Mining costs vary around $2 per ton on a 10,000-ton per month basis. Sorting costs about 33c. per ton in addition to mining. Framed mine timbers, delivered, cost $1.15 per piece, cap or post.

The present equipment in the compressor house consists of three 690-cu.ft. (of free air per minute) steam-driven, direct-connected compressors, and one 400-cu.ft. belt-driven compressor. There will be installed two 1200-cu.ft. short-belt, electric-driven units, and the steam-driven machines will then be disposed of. At present two No. 5 Cameron sinking pumps, one 15-hp. hoist, and two Little Tugger hoists, besides the 32 jackhamers, 15 stopers, and the blacksmith shop, are using air at from 70- to 85-lb. pressure.

The blacksmith and machine shops, and new oil-power plant are steel buildings. The blacksmith shop has five forges, two Leyner drill-sharpeners, and a 2¾-in. piston drill rigged up as a hammer. The machine shop contains the 30-kv.-a. direct-current electric-generating plant and ice plant, as well as a 20-in. and a 9-in. lathe, a 4-ft. radial drill, and another small drill press; a bolt threader, pipe machine, shaper, hacksaw and two emery grinders. The corners of the building are partitioned off for the tin shop and plumbers shop, and for drill repairs.

At present the ore is loaded from chutes out of the storage bins into wagons holding about four tons of ore. Five mules to a wagon make a round trip a day over a dirt road nine miles long. This road follows the high places along ridges to the coast. An average of about 250 tons per day is being hauled at present. An aërial Lawson-type tramway, six miles long, is about completed and ready for trial. The tramway is not of the usual swinging-load type, but employs low, flat cars about 42 in. square, resting on four double-flanged wheels that ride a double-cable 36-in. gage track. The steel towers that support the track and guides for the haulage ropes are placed at a maximum distance of only 200 ft. apart and the steel track ropes are 19-strand track cable of only ⅝-in. (loaded side) and ½-in. (return) diameter. The haulage rope is also only ½-in. cable, six wire, 7 strand. The tramway is divided into three sections, each about 2 miles in length. Each section is to be driven by a separate motor. It is calculated that about 45 hp. will be necessary to operate the tramway. The cars clutch and release automatically, are divided by an inverted V along the center of the bottom parallel to the track, and two swinging doors act as the flat bottom of the car. To unload a car a tripper disengages a latch on each door at the rear end of the car, and the doors swing open. The doors are closed by being dragged over a slanting track until they engage the latch again. It will take 200 min. to make the round trip, and each car will carry about 6 cu.ft. of ore. It is also expected to use the tramway for transporting material from the coast to the mine.

The ore will accumulate in the storage bins at the port of Santa Lucia, until a ship load is on hand. At present the ore is stored in stockpiles from which it has to be shoveled into cars, trammed to the wharf, dumped on barges, lightered out to the ship, and taken aboard in buckets. Auto trucks operate successfully on the road and experiments are under way with caterpillar tractors. A Ford automobile is used to make quick trips back and forth between the port and the mine.

STAFF HOUSES AND PARTLY COMPLETED CONCENTRATOR AT MATAHAMBRE MINE, CUBA

The power-house building is of steel, 120 x 45 ft., covered with corrugated zinc, roof and sides. A 15-ton crane travels the full length of the building over the engines. The building site is only 200 ft. from the average high-tide coast line, and salt water will be used for cooling water in the engine jackets. Crude oil will be delivered in tank barges, and pumped to storage tanks near the plant. The equipment consists of three 450-hp. De La Vergne oil engines, each direct-connected to a 300-kv.-a. generator which delivers current at 2300 volts, three phase, 60 cycles. There is also one 60-hp. De La Vergne engine belt-connected to a 50-kv.-a. generator, same current as above. The oil reclaimer, compressor, switchboard, and transformers will all be in the one building. The electric current will be transformed to 11,000 volts, transmitted to the mine and distributed along the tramway through a double circuit, three-wire, No. 4 solid copper line. The wires are supported on 35-ft. Bates expanded-steel poles carrying a ¼-in. ground wire on a bayonet above the high-tension line, and a metallic-circuit telephone line on brackets 6 ft. below the high-tension wires. The telephones are all protected by transformers, lightning arrestors and drop fuses.

At the mine substation the current will be stepped down to 2300 volts and distributed to the concentrator, mine, machine shop, compressor room, sawmill and town. Both 2200-volt and 220-volt motors will be used. To operate all of the equipment, 42 motors will be required.

The low-grade ore will be crushed to 1½ in. by two 10 x 16-in. Buchanan cast-steel-frame jaw crushers installed at the mine shaft. The crushed ore will then be delivered into bins for transportation, by a branch aërial tramway, to the new concentrating plant about 2000 ft. distant from the shaft. The tramway will distribute the ore in bins, and at intervals the cars will be lowered down an incline to load concentrates, and then be returned to the mine terminal for transfer to the main tramway to Santa Lucia.

The 1½-in. ore with 3% to 5% copper content will pass over belt feeders to Marcy mills, where a maximum 48-mesh product will be sought. All of the pulp will be elevated to pass over Callow screens, which will return all product over 48 mesh to be reground. The pulp will be sampled, then passed over rougher tables. The concentrates from these tables will go direct to the thickener; the pulp will flow into a drag classifier, from which the sands will be conveyed to the second ball mills to be ground to 100 mesh and thence to join the overflow from the classifier for the flotation cells. The concentrates from the cells will join the table concentrates in the thickener, then pass to a continuous filter for dewatering and then pass on to storage bins. The discard from the cells will pass over slime tables and to waste after being dewatered in thickeners in order to save as much water for re-use as is possible.

HEADFRAME AT MATAHAMBRE MINE

The concentrator, rapidly nearing completion, is situated on a hillside at the foot of which Manacas Creek (a torrent during the rainy season, but dusty during the dry season) flows about 40 ft. below the concentrate-bin floor. The material from excavation has been used to build a dam 100 ft. long and 40 ft. high and about 70 ft. wide along the crest. A spillway 22 ft. wide and 16 ft. deep was cut through solid ground and a bridge built over it to allow wagons to reach the foot of the mill building. This dam will impound over 2,500,000 gal. of water.

In conclusion it might be said that Matahambre has a bright future and promises to produce many millions of pounds of copper and thousands of ounces of silver. The first orebody developed on the ninth level showed solid chalcopyrite 18 ft. wide in a crosscut, and for 75 ft. along the drift. The work both underground and on the surface is being pushed as fast as labor can be obtained to do the work.

Production of Ammonium Sulphate in Great Britain

Sulphate of ammonia recovered in Great Britain in 1916 was 426,412 long tons. Of this amount 172,200 tons came from gas works, 159,506 tons from coke ovens and 57,988 tons from shale works, according to the 53rd annual report of the chief inspector of alkali works. Various experiments were made with new processes for saving ammonia and ammonia products, but no definite successes were recorded.

The Spirit of Service*

Jones, who was in charge of a small coal operation, got into some difficulties, to overcome which he needed the services of an engineer. He called Brown, his partner, by "long-distance," but Brown was unable to secure one.

Smith, an engineer at a near-by, larger mine, offered his services to Jones, and put in a few hours at the latter's plant, removing the trouble and telling Jones how to guard against a repetition. Smith made no charge.

Jones informed his partner of the proceeding, and Brown called Smith up on the telephone, asking him to name a price for his services.

Said Smith: "No, I'll make no charge. We fellows who are in the field learn, after a time, that it pays to help a man out occasionally. Some of us give each other the benefit of our experiences and, when we can, we give service—a sort of reciprocal arrangement, you see."

"But," said Brown, "we are not in position to return any service to you that will equal your service to us."

"As to that," replied Smith, "you can pay whatever debt you owe me by passing the service along. I feel this way about it: I didn't gain my position in the mining game by my own efforts. I've had help, and more help, all along the line. And I'd feel rather small if I failed to help a man out whenever there was a service I could render him at no cost to myself. If every man kept a record of these things, it would show him so far in debt that he'd never get out, for such services are always worth more to the man who receives than to the one who gives. So we just receive a favor, pass another one on to the next man, and call the account closed, so far as expecting any return."

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*An article by George N. Lantz, "Coal Age," Sept. 1, 1917.

Making Zinc Oxide at Palmerton Plants of New Jersey Zinc Co.*

The making of oxide of zinc at Palmerton, Penn., from the products of the New Jersey Zinc Co.'s Franklin and Sterling Forest mills is described, as well as the origin and development of the industry. Development of the Wetherill process made New Jersey Zinc Co.'s ores valuable.

THE method of making oxide of zinc direct from the ore was invented and developed at the works of the New Jersey Zinc Co. at Newark in the middle of the last century. The process was invented by Burrows, who had not the ability, financial or technical, to work out the details necessary to make it of commercial value. This was done by Col. Wetherill, whose name is commonly attached to this process. The grate bars used are also frequently called Wetherill grates, which is a misnomer because they were in common use for boiler firing at the time and he never claimed their invention.

The invention of the process was due to the efforts of the New Jersey Zinc Co. to find a profitable means of working the ores from Franklin and Sterling Hill, N. J. These are a mixture of franklinite, willemite and zincite, containing about 20% of zinc. The first attempts were to make spelter, which were not successful, owing to the low grade of the ore and the fusibility of the residue. Failing in this, the next attempt was to make oxide in large muffles and reverberatory furnaces. This succeeded, although the cost of operation was high, the recovery low, and the quality of the product uncertain. In 1855, the new process was patented and has been in successful operation ever since.

Essentially, the process is to spread a mixture of coal and ore on a body of burning coal on a perforated grate and blow an excess of air through the grate. The zinc is reduced in contact with the coal, volatilized and burned by the excess of air in the upper part of the furnace and in the flues. It is then carried to the bag rooms with the excess air and products of combustion which are forced through the flues by fans. In its main features, the process is the same today as at the time of its invention, but the details have been so modified that it would hardly be recognized by its originators.

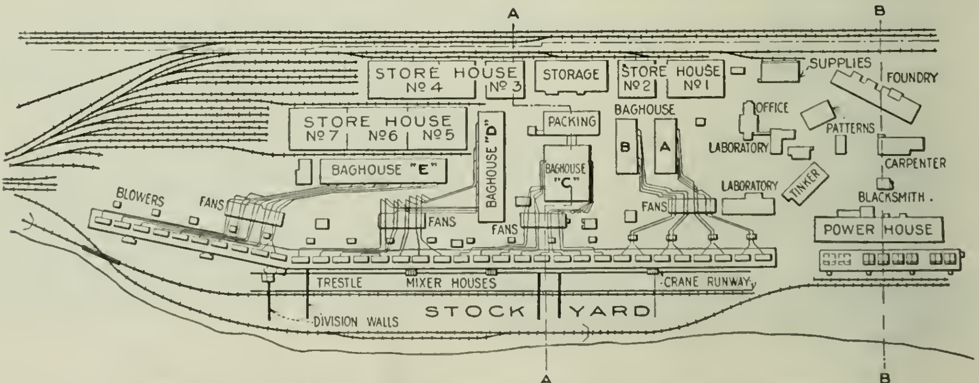

FIG. 1 PLAN OF WEST PLANT OF NEW JERSEY ZINC AT PALMERTON, PENN.

The process is applicable to all the oxidized ores of zinc and to roasted sulphides, provided the gangue is not so fusible as to leave a residue that is impervious to the blast. In many cases the ores contain impurities that make it impossible to produce an oxide of a good enough color to be available as a pigment. These impurities are any volatile metals that form colored oxides or sulphides. Cadmium is one of the worst, because it is readily volatile and its dark-brown oxide and bright-yellow sulphide both have strong tinctorial powers, so that small fractions of a per cent. seriously injure the color of the oxide. Lead, which is one of the commonest impurities in zinc ores, also injures the color, though to a much less degree, as it usually forms basic sulphates which are nearly white. On other accounts lead is often objectionable, particularly when the oxide is to be used for the manufacture of rubber goods. Sulphur may occur in oxide as sulphides, sulphates or as sulphurous anhydride, the first and last of which are objectionable; the first on account of probable injury to the color while the last is believed by many paint manufacturers to have a bad effect on the grinding properties. Opinion on the latter point is by no means unanimous. Sulphates, if soluble, have objectionable qualities for outside paints as they leach out on the paint coat, leaving discolored spots. Chlorides, in appreciable quantity, are rare, but if present would be open to the same objection.

The ores and coal are usually received at the New Jersey Zinc Co.'s works at Palmerton, Penn., in fine enough condition for use without further crushing. Nearly all the ores are either concentrates or roasted products and are inevitably finer than is necessary. As the small sizes of coal are suitable for the purpose, and are cheaper than the large, they are invariably used. If fluxes are used they are crushed to about the size of the ore and coal. With siliceous ores, limestone is sometimes added, but in general it does more harm than good, owing to its tendency to make the residue too fusible. There should not be a great difference in the size of the different materials, or it will be impossible to mix them properly. The fuel used must be one that does not give a black smoke which would ruin the color of the oxide. Anthracite is the most satisfactory fuel for the purpose and the one generally used. In the West, where anthracite is expensive, semi-bituminous coals, low in volatile qualities, are sometimes substituted for it in whole or in part but they are never so good. Coke alone does not work well, as it causes an intense local heat that makes the residue impervious to the blast. It is occasionally used as a part of the charge fuel.

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*A paper entitled "Oxide of Zinc," by George C. Stone, to be read before the American Institute of Mining Engineers at the St. Louis meeting in October, 1917.

TWO ZINC-OXIDE WORKS AT PALMERTON, PENN.

The ores used at Palmerton, Penn., works of the New Jersey Zinc Co. are almost entirely concentrates from the company's mines at Franklin and at Sterling Hill, N. J. Three of these products—franklinite, half/half and dust—are smelted for oxide. Composition of mill products treated at Palmerton:

	Franklinite %	Half/half %	Dust %
Zn	18.2	18.4	17.6
Fe	35.0	15.2	20.1
Mn	12.8	12.2	8.9
SiO_2	3.6	12.6	7.2

The franklinite is worked by itself and the residue smelted in blast furnaces for the production of spiegel. The half/half and dust are mixed and the residue wasted, as it contains too little Fe and Mn and too much SiO_2 to be a profitable smelting material. Franklinite is the easiest of these ores to work and gives the best product. The half/half and fines are mixed and worked together. The charges per furnace average: Franklinite, 2.62 tons with 1.62 tons of coal; half/half and fines, 1.95 tons with 1.36 tons of coal.

The recovery for franklinite averages about 86% and for the half/half and fines charge about 78%. Both charges and recoveries vary somewhat with changes in the ore and quality of the oxide desired. The recovery and quality of product are controlled by the selection of the ores, ratio between ore and coal and of both to the grate surface, and, what is of great importance, the balance of blast and exhaust and the proper proportioning of both to the charge being worked. Where leady ores are worked the charges and recoveries vary much more and average figures are of little value. In general, with such ores the charges are a little lighter and the recoveries lower than for the New Jersey ores. The recoveries of lead are usually rather better than of zinc, roughly as 9 to 8. For estimating purposes the make of oxide is generally taken as equaling the combined Zn + Pb in the ore, the gain in O and SO_3 about balancing the losses in Zn and Pb.

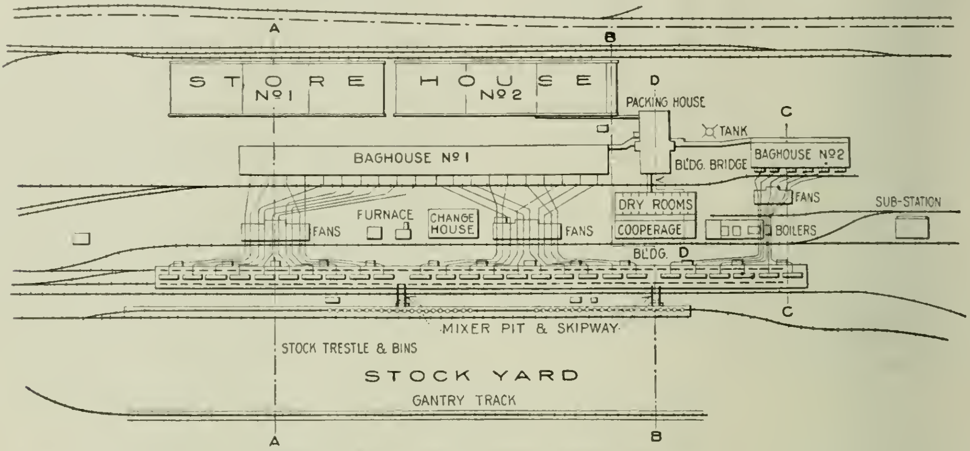
The Palmerton plants of the New Jersey Zinc Co. (of Pennsylvania) are the largest and best equipped oxide plants in the world. Fig. 1 shows the general arrangement of the West plant and Fig. 2 that of the East. They are similar, but the East plant has fewer and larger bag rooms and differs somewhat in details. At both plants the raw materials are delivered on the trestle at the south of the plant and are either placed in bins or stocked in piles. The ore and coal are taken from the bins to the mix-house by larries. The mixed charges are delivered to the bins above the furnaces and distributed by traveling cranes. Each block of furnaces is a separate unit, having its own blower, exhaust fan and bag room. The oxide is trucked from the bag rooms to the packing room and the final packages skidded or trucked to the storehouses.

The ore and coal at the East plant are delivered on the double-track, steel-and-concrete trestle, 22 ft. high with Brown tangential bins below the track next the furnace room. Materials for current use are dumped directly into the bins and the surplus is stocked back of the trestle by a bridge crane of 233 ft. 9 in. span equipped with a 10-ton Brown grab bucket. This equipment also returns materials from the stockpiles to the bins when necessary. The charges are drawn from the bins to a weighing larry which has two hoppers, each containing a furnace charge. These are carried to Ransome concrete mixers placed at one end of the furnace room. The mixed charges are elevated by a pair of counterbalanced skips to bins above the furnaces. From the bins the mixed charge is taken to the furnaces by cranes each having three hoppers holding one-third of a furnace charge each. Each hopper is placed on a scale so that the charge is equally divided among the three.

All materials at the West plant are delivered on a single-track steel-and-concrete trestle, 47 ft. high, in the center of the storage yard. The materials are taken from this by a bridge crane of 48 ft. 8½ in. span with a 2-yd. bucket and placed in elevated bins next the furnace room. The ore and coal are stocked and reclaimed by the traveling bridge and by locomotive cranes on the high trestle. The total storage capacity is 200,000 tons of ore and 175,000 tons of coal. The fuel and the various ores are taken by bridge cranes to small bins placed over the mixers. The materials are dropped from these bins into weighing hoppers and from these into the Ransome mixers. The mixed charges are elevated to bins over the furnaces and then distributed by cranes much as at the East plant, except that there are no scales on the cranes or larries. This arrangement of doing all of the weighing at the mixer on a fixed hopper is more satisfactory than weighing larries, because the latter are difficult to keep in adjustment.

ARRANGEMENT AND OPERATION OF THE FURNACES

The furnace rooms at the two plants are similar; the main difference is that at the West plant the furnaces are carried on a concrete foundation and at the East plant on the floor. In both cases the furnaces are elevated sufficiently to allow the residue to be dropped into hoppers below the floor and then into cars. The framing of the buildings is quite different, the East plant (the later one) being arranged to give more room for the charge cranes. The West plant furnace room contains 34 blocks of furnaces and the East plant 26. All the blocks are alike, consisting of four furnaces 19 ft. 6½ in. by 5 ft. 11½ in. Each furnace has independent blast and flue connections and three charge openings in the roof surmounted by hoppers. Each furnace works three charges in 24 hours. The different furnaces of the block are charged alternately at two-hour intervals in regular order. Charging in this way, there is always one furnace starting, one nearly finishing, and two working strongly, and the volume and temperature of the gases to be handled are nearly uniform at all times.



PLAN OF EAST PLANT OF NEW JERSEY ZINC CO.

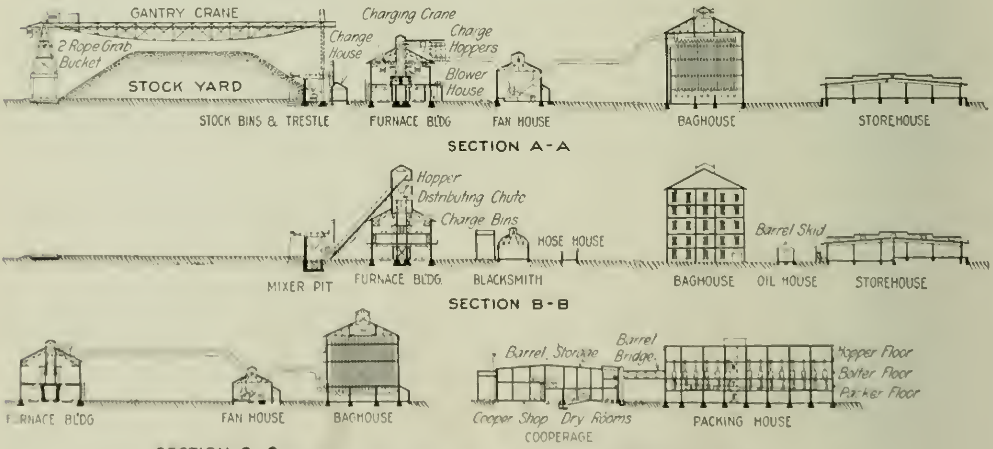


FIG. 3. SECTION THROUGH EAST PLANT AT PALMERTON, PENN.

When the furnace is worked off, the dampers in the flues are closed, cutting it off from the bag room. The blast is shut off and the working doors taken down. Three men work on the furnace at once, each at a separate door. The loose material on top of the charge is raked off and dropped on the floor close to the furnace. The clinker is then broken up by heavy slice bars and raked into hoppers under the floor. The furnace men then thoroughly clean from the side and back walls any clinker that has fused to them. When all of the old charge has been removed and the furnace cleaned, the grate is covered as rapidly as possible with a thin layer of coal, the doors closed and a light blast turned on. The coal is lighted by the radiation from the hot arch and it is important that it should light quickly and evenly. When the bed coal is burning brightly, the charge from the hopper is dropped on it and leveled. The doors are then closed, the blast turned on, and the furnace left to itself with occasional inspection to stop any blow holes that may form. With the large charges that are now worked, considerable time elapses before any zinc vapor appears. When it does, the dampers in the flues are reversed, sending the gases and oxide to the bag room.

The blowers for the oxide furnaces are direct connected to motors, the wheels of the blower being placed on extensions of the motor shaft. They are situated in small houses outside the furnace room, two in each house. Each furnace has two outlet pipes, usually 20 to 22 in. in diameter, which lead up to the drum pipe overhead. The drum has an outlet in the middle of its length leading to the exhaust fans. Formerly the gases passed through a brick settling tower between the furnaces and exhaust fan, but this is now usually omitted as unnecessary. The exhaust fans are extra heavy-plate fans with special Hyatt roller bearings and water-cooled shafts, belted to motors. Aside from the shafts, bearings and extra thickness of plate, they are of the ordinary types. For convenience in attendance, a number are placed in one building. The West plant has four fan rooms, three containing eight fans each and one containing 10 fans. At the East plant there are two with 10 fans each and one with six. From the exhaust fans to the bag rooms, in each case, run round pipes 3 ft. in diameter, made of No. 16 sheet iron and provided with numerous clean-out openings. In all cases the pipes are arranged to give as nearly as possible the same length from furnaces to bag rooms. This is done partly to equalize the friction in the different lines, but mainly to secure proper cooling of the gases before reaching the bag room.

Latest Baghouses Handle Product of Twenty Furnace Blocks

The method of collecting oxide in bags was first patented by S. T. Jones in 1852 and has been patented by others many times since. The bag rooms at Palmerton vary considerably in size, the first two built holding bags enough for four blocks, while the latest contains the bags for 20. The larger rooms are more economical in labor and do not cause any inconvenience, provided the ventilation is equally efficient. The bags used are all of heavy, closely woven cotton sheeting 22 in. in diameter and about 40 ft. long. In the majority of cases the gases enter a header at the top of the room and from there pass to a series of parallel pipes from the bottom of which the bags are connected to hoppers, four bags to each, with a single collecting bag tied to an outlet at the bottom of each hopper. At intervals the gases are shut off from the two lines of pipe connecting with a single line of hoppers and the bags shaken. This pair of pipes is again connected to the main header and the next two lines shut off and shaken. The frequency with which the bags are shaken depends upon the relative area of grate and bags, and the amount and quality of the oxide being made. The proper ratio of grate surface to bag surface has been a subject of much discussion. It varies in practice between 1: 80 and 1: 130. The amount actually necessary depends mainly on the efficiency of the ventilation of the buildings and the frequency of shaking. A well-ventilated room will consume no more muslin with a ratio of 1: 80 than a poorly ventilated one with a ratio of 1: 130. Recent experiments indicate the probability that a well ventilated bag room with a mechanical shaker operating at short intervals will allow of a great reduction in the necessary bag area.

The collecting bags are removed from the hoppers every 24 hours, or oftener if necessary, and taken to the packing room. This is done by a trucking gang that removes the filled bags and replaces them with fresh ones, trucking them by hand to one side of the bag room where the trucks are coupled together and the train drawn to the packing room by a motor.

The packing room is a four-story building of mill construction. The trucks are hauled into the ground floor and then taken one by one on a platform elevator to the upper floor. There are a number of openings in this floor leading to bolters on the floor below. Around each opening is a wide shelf on which the bags are rested while their contents are emptied into the bolters. The third floor contains nothing but the bolters, and a room for sewing and making bags. The bolters used are of the ordinary types used in flour mills. The packing machines are arranged in four lines on the second floor. They are also of a type largely used for flour. There is usually one packer below each bolter and fed directly by it. In some cases, owing to the lack of room, one bolter feeds two packers. The oxide is packed partly in paper bags holding 50 lb. each, partly in barrels with 30-in. staves and 19½-in. heads holding 300 lb. each, while export material is packed in special barrels and weights to suit the different markets.

The barrels are kept in a storage room where the hoops are driven by a machine and then nailed by a second one; and from here they are passed to the packers. All barrels are weighed empty and filled, the weights adjusted and the barrels headed. They are passed to the ends of the building and rolled on skids to the storehouses. The second floor of the packing room is high enough above the ground level to allow sufficient slope to the skids to carry the barrels to all but the most distant storehouses. The paper bags are loaded on trucks and taken to the storehouses on the same skidways.

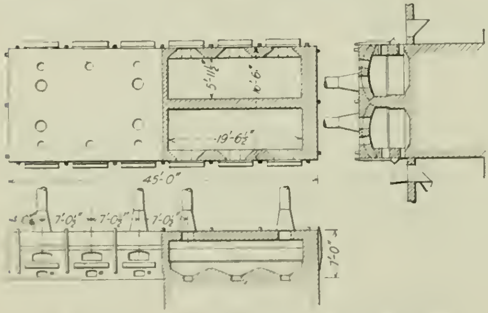
Growth of Business Required Establishment of Large Cooperage Plant

The cooperage is at the East plant, next the packing room. It is fully equipped with machinery and has a capacity of about 2000 bbl. a day. The barrels are delivered directly from it to the East plant packing room and by special railroad cars to the West plant storehouse. The storehouses are all one-story mill-construction buildings with the floor elevated to the level of a box car. Each has doors and platforms on opposite sides, one for receiving material from the packing room and the other for loading cars.

Power for both Palmerton plants is supplied from a central station at the West plant between the oxide and the spiegel furnaces. The boiler room is equipped with Edgemoor boilers of 536 hp. each, which can be fired with coal or with the waste gases of the spiegel furnaces. The engine room parallels the boiler room and is situated about 20 ft. north of it. It contains three horizontal cross-compound blowing engines for the spiegel furnaces; four direct-current generators, two of 500 and two of 600 kw., each direct connected to a horizontal cross-compound Corliss engine; three Allis Chalmers turbo-generators, two of 2000 and one of 4000 kw., 6600 volts, and three phases; two motor-generator sets used as a reserve for both alternating- and direct-current lines, as either part can be used as a motor to generate current of the other kind, if needed. In addition, the engine room contains the exciters, condensers and pumps. The engine room is entirely above ground, giving a light basement for the pipes and elevating the machinery above danger from floods. This also permits a railroad track to enter at the ground level, so that new machinery or repair parts can be brought into the building, and there lifted from the cars and put in place by a traveling crane that covers the entire space and can lift the heaviest piece of any of the machines. The switchboards are in a tower at the north side of the building where they are visible from all parts of the generator floor, but do not project into the room. The tower gives ample room for leads and anchorages of cables.

The zinc oxide produced at Palmerton is classified into five grades, two for the use of paint manufacturers, two for rubber, and an off-grade that is reworked either for oxide or spelter. For the paint trade the grading is entirely by color, samples being daily rubbed down with oil and compared with standards. For the rubber trade slight variations in color do not make so much difference and the grading in this respect is not so close, but freedom from lead and absence of small, hard particles is insisted upon. The variation in composition of the different grades is slight, the range of composition of all being nearly the same. The material as shipped, uniformly contains 99% or over ZnO, the principal impurities being: SO_3, 0.25 to 0.33%; H_2O, 0.10 to 0.50%; and PbO, 0.05 to 0.30 per cent.

The principal use of zinc oxide is as a paint pigment and for this purpose its purity of color and freedom from discoloration by gases and atmospheric conditions, fineness and uniformity make it particularly useful. As a pigment it has the disadvantage of slow drying and a tendency to become unduly hard in time. The general concensus of opinion among paint manufacturers now is that a mixture of pigments is better than any single one. In these mixtures zinc oxide is an almost invariable constituent because it prevents chalking and gives a surface that retains its color.



BLOCK OF FOUR FURNACES AT PALMERTON, PENN

Next in importance is its use in rubber goods. In the manufacture of such products zinc oxide is used for two purposes. It is used as a pigment to produce white goods and is excellent for this purpose, provided it is substantially free from lead. If this were the only effect it had it might be replaced by cheaper materials, but it also greatly increases the tensile strength of the resulting material. A mixture of pure rubber and sulphur vulcanized has a tensile strength of about 2000 lb. per sq.in. and an elongation of 960% of its original length. The effect of adding zinc oxide is to increase the tensile strength but diminish the elongation, as shown in the accompanying table. It will be seen that up to about 60% ZnO, this material increases the tensile strength of rubber. No other material tested has this effect.

EFFECT OF ZINC OXIDE IN RUBBER

Per Cent ZnO	Tensile Lb per Sq In	Elongation Per Cent
25	2,400	720
35	2,400	700
45	2,700	680
55	2,500	620
65	2,000	540
75	1,300	400

As the supply of lead-free ores is limited and the demand for ZnO is increasing, much more leaded oxide is being made. The process is the same but the charges are usually lighter and the recoveries lower. In most cases the furnaces used are double ended with one or two working doors at each of the opposite ends. This makes the furnace easier to clean, as there is no back wall, which is the most difficult part from which to cut accretions. On the other hand, this type of furnace cools off more when charging and does not, as a rule, light up as quickly. Which type is better is still an open question, the users of each claiming that theirs is superior. In making leaded oxide it is customary to have a brick combustion chamber over, or close to, the furnace. This insures a sufficient time of contact at a proper temperature to cause the lead to be converted into basic sulphate. This is essential, as all of the oxides of lead are strongly colored and injure the color of the product, while the basic sulphate is nearly white and does not have this effect. In many cases the bag rooms of the works making leaded oxide have no overhead distributing pipes, the hoppers being connected and used for this purpose.

Leaded oxide is divided into several grades, depending on the amount of lead it contains. This is always stated as the amount of neutral sulphate ($PbSO_4$) equivalent to the total lead present although it is always present mainly as a basic sulphate. It forms an excellent material for the manufacture of mixed paints. So far this grade has not proved satisfactory to the rubber manufacturers.

Six Months' Metalliferous Production in Ontario

Metalliferous production in Ontario for the first six months of 1917, compared with tne corresponding period of 1916 in parenthesis, is reported by the Ontario Bureau of Mines as follows: Gold, 228,675 oz. (235,060 oz.); silver, 10,073,787 oz. (10,267,743 oz.); cobalt, metallic, 162,250 lb. (121,817 lb.); nickel, metallic, 45,864 lb. (13,933 lb.); cobalt oxide, 153,498 lb. (410,408 lb.); nickel oxide, 5495 lb. (no reported production); other cobalt and nickel compounds, 122,076 lb. (no reported production); molybdenite, 36,777 lb. (12,631 lb.); lead, 912,934 lb. (no reported production); copper ore, 1543 tons (922 tons); nickel in matte, 20,230 tons (20,651 tons); copper in matte, 10,381 tons (11,426 tons); iron ore, exported, 24,332 tons (none reported in 1916); pig iron, 40,968 tons (none reported in 1916). Export figures on iron ore for 1916 are not available; the pig iron reported is produced from Ontario ore only.

The increase in the production of molybdenite ore during the half year is noteworthy. Concentrators are now in operation at Renfrew, Mt. St. Patrick and Ottawa and in the half year treated ore from 15 mines. At Orillia and Belleville, 80,334 lb. of ferromolybdenum, worth $200,835, was produced.

Recovery of Pyrite from Coal

Increased demand for sulphuric acid makes a market for "coal brasses," and experiments show that a washing plant can recover from 81 to 87% of the pyrite in Illinois coal, the product containing from 40 to 47% sulphur.

The occurrence of pyrite or marcasite in coal has been for many operators a source of trouble, but under present conditions the despised sulphur ore may be worth several times as much per ton as the coal. In the United States the market for pyrites has been irregular and during normal times freight rates to points of consumption have been so high as to prohibit the utilization of such a byproduct from coal mines. However, the increased demand for sulphuric acid and the uncertainty regarding future imports of raw material from Spain and Portugal have stimulated investigation regarding the possible commercial use of pyrites from various domestic sources. The results of some experimental work by the mining engineering department of the University of Illinois have just been published[1] by E. A. Holbrook.

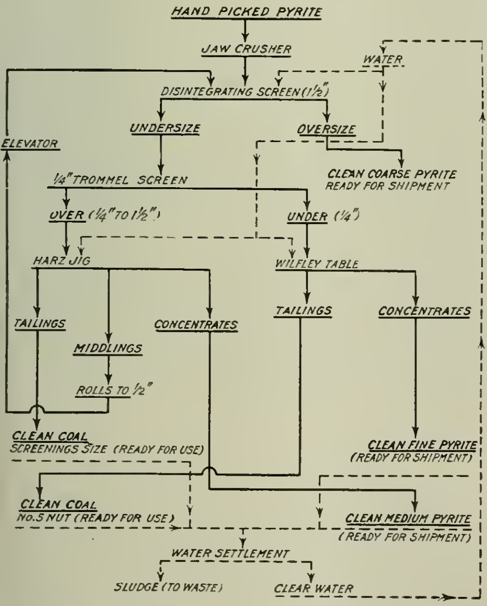


FIG. 1. FLOW SHEET[3] FOR CONCENTRATION OF PYRITE IN ILLINOIS COAL

Of the total sulphur content of Illinois coal, ranging from 1 to 6%, a small amount appears in some organic combination. Sulphate of lime, or gypsum, also occurs; usually only a small fraction of 1%., though in places certain known seams contain considerable amounts. The common form of sulphur in coal is as FeS_2; often, unfortunately, as thin flakes in vertical cleavage planes and in such a fine state of division, brittleness, and adherence to the coal that it cannot readily be separated.

Pyrite of greater commercial value occurs in the coal as bands, lenses, nodules, or balls ranging up to several inches in thickness and often to several feet in lateral dimension. Being brassy yellow in color and heavier than the coal, the sulphur ore is usually distinguishable by the miner and discarded underground. Otherwise, it may be removed by hand picking at the surface.

In Illinois only occasional efforts have been made to recover the pyrite in a condition clean enough to warrant marketing. At one mine in the Standard or Belleville district lump pyrite is picked from the coal during screening and loading, the adhering coal being removed by hand. Shipments have been made to various chemical companies for use in making sulphuric acid. At some mines in the Danville district pyrite is hand-picked from the coal by loaders underground or by pickers in the tipple during screening and cleaning. In the opencut mines of the district the sulphur ore is readily distinguished.

The Missionfield Coal Co. operates a pyrite washery[2] at Two Rivers, Ill., where the coal stripped from the No. 7 bed, or Danville seam, contains large quantities of pyrite: about one car of uncleaned pyrite being obtained for every 20 cars of coal. The plant treats about 100 tons of impure pyrite per day, recovering somewhat more than half that quantity of clean pyrite averaging about 47% sulphur.

Chemical companies generally specify that pyrite must contain not less than 40% S, and many contracts are made on a 44% minimum. Some also limit the carbon content to 8% maximum. The pyrite in Illinois coal is never pure, that of the best appearance carrying only about 50% S, due probably to carbon either combined or intimately mixed with it.

GOOD SULPHUR ORE BEING WASTED

Lump pyrite formerly brought a higher price per unit than fines, the latter often being unsalable. Within the last year or two the development of new furnaces and the utilization of the iron cinder or residue (blue billy), has increased the demand for fines. Mr. Holbrook considers that during the next two years the price for pyrites will not be lower than 15c. per unit.

At present the refuse from the coal washeries in Illinois, about 25 in number, contains from about 4% to more than 22% S, generally in the form of pyrite lumps. Pyrite from Illinois coal is free from arsenic and antimony, and also burns and decomposes easily. However, any large percentage of carbon or coal in the material causes smoky gas and dirty acid.

At some washeries large dumps of refuse have accumulated, some of which might yield a profit if retreated for pyrite content. Some mines, abandoned because of the high pyrite content of the coal, could be reopened as pyrite mines, recovering coal as a byproduct. Although the pyrite from Illinois coal oxidizes rapidly on exposure to the air, pyrite masses in heaps are often found to have been affected only at the surface. The white coating of $FeSO_4$ is soluble in water and should be easily removed during a washing process.

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[1] "The Utilization of Pyrite Occurring in Illinois Bituminous Coal," Univ. of Ill. "Bulletin," Aug. 20, 1917.

[[3] The flow sheet is reproduced from the original, in which the "screening size" and "No. 5 nut" seem to be transposed.—Editor.]

[2] Described by C. M. Young in "Coal Age," Vol. XI, No. 1, p. 9, Jan. 6, 1917.

Installations for the recovery of pyrite from coal should be simple, of low cost, and suitable for operation with unskilled labor. The uncertainty of the market makes it advisable to limit investment in such plants, especially where small quantities of pyrite are involved. The coöperation of several mines in a district is suggested, with a small plant to produce a salable product.

The tests performed at the University of Illinois lead to the conclusion that crushers, screens and concentrating machines adapted to ordinary ore-dressing work are suitable for treating pyrite from Illinois coal to obtain a commercial grade of pyrite, with coal as a byproduct. Experiments indicate a recovery of about 81% of the pyrite in the coal, or as high as 87% with retreatment of middlings product.

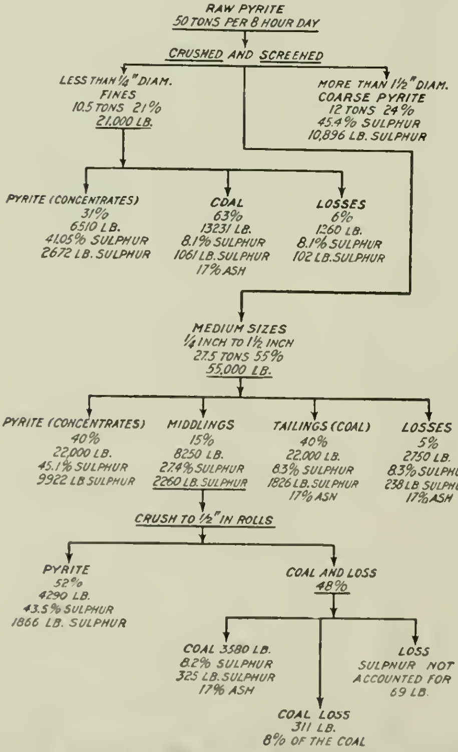

FIG. 2. PRODUCTS FROM CONCENTRATION OF PYRITE IN ILLINOIS COAL

In Fig. 1 is shown a simplified flow sheet of a treatment plant, embodying the features that the tests indicated as essential to complete treatment. The results that might be accomplished in practical work are indicated in Fig. 2, though better results might be obtained in actual commercial practice on a large scale.

In the experimental work the coal obtained as a byproduct contained about 8% S, partly in the form of pyrite. Such loss of pyrite is largest when starting or stopping the machinery and with continuous work should be lessened. The material used in the final tests was hand picked from coal of the No. 7 bed in the Danville district and contained from 25 to 28% S, or about 50% by weight of pyrite.

Iron-Ore Supplies of Japan

According to Dr. Jisaburi Yokobori in the *Lasei Keizai Jiho* the production or iron ore in Japan, as is well known, is not sufficient to meet demands. At present large quantities of iron ore come from Chosen, Manchuria and China; indeed, the Tayeh mine in the Hupeh Province, China, supplies more than half the quantity required at the government works at Wakamatsu; and the Oriental Iron Foundry Co., recently organized by Japanese business men, will get the materials from the Tao Chung mine in the Anhwei Province, China, the quality of which is even superior to that of the ore that is obtained from the Tayeh mine. Before the outbreak of the war freight rates between Chosen and Wakamatsu ranged from 2 to 3 yen ($1 to $1.50) per ton of ore, and those between the Yangtse River and Wakamatsu averaged nearly 3 yen ($1.50). Two tons of ore and seven yens' ($3.50) worth of coke are necessary to produce one ton of pig-iron, which sells for 20 yen in ordinary times. When imported materials are used, the cost of production, excluding the price of ore and refining expenses, is 12 to 13 yen ($6 to $6.50) per ton of pig-iron. The government plant at Wakamatsu, however, is getting the product of the Tayeh mine on comparatively easy terms because of its connection with the Tayehping Iron and Coal Co., which owns the mine.

Dr. Yokobori next considers the supply of coal. of which Japan produces enough in Kyushu and Hokkaido. There is every prospect of increasing the output from the collieries in the north of Kyushu, while it might be said of the coal industry in Hokkaido that it is just beginning. He is very hopeful of the future of Hokkaido as an iron manufacturing district.

Ferrosilicon Analysis

It is possible to dispense with expensive platinum crucibles in analysing ferrosilicon and to use iron crucibles, if instead of the usual carbonate of soda and potash method sodium dioxide is used in the ignition mixture. So claims Dr. Herwig in a recent issue of *Stahl und Eisen* according to a translation by *Iron and Coal Trades Review*.

Great care must be taken to reduce the ferrosilicon to as fine a powder as possible, to remove all coarse particles, and to mix the powdered silicon thoroughly and very uniformly with the dioxide, as otherwise dangerous ebullition might take place, which would nearly empty the crucible and by spattering endanger the analyst's eyes. The author gives a comparative list of 22 analyses made, one-half of these by the sulphate, the other half by the dioxide method, of ferrosilicons, ranging in silicon-content between 10.75 and 90.78%. The differences in the results obtained by the two methods range only between say +0.05 and —0.13 per cent.

Outfitting for the Amazon Country

BY HENRY THOMAS*

Time of visit important, as low water season is not uniform throughout region. Local stores cater to local custom and travelers must provide their own luxuries and special equipment.

TO determine the proper time of the year to visit the great basin of the Amazon is a matter of paramount importance. Upon this will depend the success or failure of any expedition interested in examining the geology of any part of this enormous district. Under the equator, where temperature changes are slight, the wet and dry seasons must be given careful consideration. All transportation is by water. Many points on the upper river and its tributaries cannot be reached even by stern-wheel steamers in the dry season. Owing to the flat nature of the country the geologist can only make examinations when the waters are low, consequently his itinerary should be arranged to permit him to reach the district in which he is interested toward the end of the rainy season.

Owing to the immensity of the area under consideration the wet and dry periods do not occur at the same time of the year all over the valley. The rainy reason begins in the region of the upper rivers about October. The waters in this district, which may be roughly defined as an area starting at about 1500 miles from the mouth of the Amazon and extending up to all its hundreds of sources, reach their highest point in March. By the end of June these tributaries—the Amazon proper extending only about 1000 miles from the coast—have reached their lowest point.. Therefore July, August and September are best suited for any geological work. On the contrary, the lower river is in flood during the same months. Owing to the slight fall and the general lowness of the river banks, the surplus water in the tributaries tends to spread over the adjacent forest instead of at once flowing toward the main river; consequently the progress of the flood waters toward the sea is exceedingly slow.

STEAMER SERVICE ON MAIN RIVERS

Considering conditions, transportation facilities are good. For a distance of from 2000 to 2500 miles from Para, nearly any point on the main tributaries can be reached by passenger steamer or launch. Large twin-screw steamers, comfortably equipped and with electric fans and ice machines mitigating the burden of excessive heat, travel on regular semimonthly schedules during the rainy season as far as 2000 miles from the coast. Throughout the period of low water, passengers for the upper river are transferred to stern-wheel steamers which, though much smaller, are comfortable. To give some idea of the length of time consumed in ascending the river, the trip up the Purus, one of the larger tributaries of the Amazon, may be taken as an example. From Para to Manaos requires 10 days, from Manaos to the junction of the upper Purus and Acre Rivers two weeks, from the mouth of the Acre to Cobija on the Bolivian frontier 7 days. This time is reduced about 40% on the return journey, owing to the assistance of the current.

Ocean-going steamers make weekly trips from Para to Manaos in about four days. Some time may be saved by taking this route and embarking on the river steamers at Manaos. Iquitos, in Peru, can be reached from either Para or Manaos by British steamers. Owing to the war only one boat a month is available at present. Both Para and Manaos offer facilities for outfitting an expedition to the interior. All river boats bound up any of the tributaries including and above the Madeira touch at Manaos. Para has a larger number of stores and a greater variety of equipment, and the customs authorities are somewhat quicker in their examination of imports, but Manaos has all the conveniences of Para although on a smaller scale.

IMPORTED ITEMS INVOLVE CUSTOMHOUSE DELAYS

A careful consideration of all conditions is necessary before determining whether to purchase provisions at home or in Brazil. Some money may be saved by purchasing at home, but considerable delay and endless trouble is entailed in passing goods through the customs. Every case will be opened, no matter how carefully all formalities such as consular invoices have been observed. Unfortunately considerable damage is often done by careless or ignorant handling. In the inspection of cases of canned goods, for instance, one tin in each case will be cut to ascertain contents. This is generally replaced unsealed, the case being then nailed up, with obvious future consequences. Many petty annoyances of this nature will be met, of course offset somewhat by the convenience of having exactly the type of provisions desired; since it is often difficult, particularly at present, to purchase on the Amazon those foods to which the North American is accustomed. Import duties on provisions will average about 55% ad valorem. Personal effects packed in trunks, kit bags or satchels are admitted free; also tools or instruments necessary to the profession of the importer. A delay of about two days is certain for the examination of these free articles, and for any goods on which import duties have to be paid at least two weeks must be allowed to pass the customs.

Expeditions of a purely scientific character may obtain, through the State Department at Washington and the United States Embassy at Rio de Janeiro, permission to import all articles free of duty. It must be remembered, however, that even with this permission no time will be saved; in fact the delay may be greater, as Brazilian law requires that all the formalities of importing goods be gone through as usual. Then, after all has been examined and duties have been assessed, they will be remitted by a decree published in the local official newspaper.

Passing the question of the selection of provisions, which must be governed to a great extent by the individual preference of the members of each expedition, one arrives at the question of general equipment. No matter what may be dispensed with nor how light a party

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may desire to travel, insect-proof tents are an absolute necessity. A special tent of light waterproof material, floored with canvas and lined with fine insect-proof netting, is the only satisfactory type. The walls and ends roll up in fine weather, permitting air to circulate freely; the canvas floor, coming up 6 in. on the sides is designed to prevent the intrusion of many unwelcome crawling visitors. A tent about 8 x 10 ft. in size and equipped with an extra fly will weigh not over 60 lb. complete, including canvas carrying bag. Almost absolute freedom from the wearisome annoyances of the insect pests of the jungle may be obtained with this equipment. Hammocks and mosquito nets should also be provided for each member of the expedition when visiting the small inland settlements, as it is often impossible to erect a tent. Screens and window glass are unknown in the interior. Folding cots should be taken unless the added weight is prohibitive. It is unwise to purchase those having detachable parts as dampness swells the wood and renders them useless. Duffle bags, clearly numbered in large figures, should be provided. Small cases made of strong fiber, of the style known as telescope grips, are convenient to carry instruments, etc. An ordinary kodak is the best camera for this country.

FISHING EQUIPMENT IS IMPORTANT

Throughout the Amazon basin little game is to be found. A repeating rifle and a shotgun are all that is required. The simplest type of arms should always be purchased. Thirty-eight and forty-four calibre rifle cartridges may be obtained in Brazil. Other sizes are almost unknown. Shotgun cartridges should have metal cases, as the ordinary paper ones swell and become useless. The rivers abound in fish, some of them rather unpalatable but a welcome change of diet. Heavy lines and hooks with wire attachments should be provided as the fish are generally large.

For the exploration of the smaller creeks in the interior a canoe is a necessity. The natives do not care to rent or sell the ones they have, also their canoes are usually heavy. If transport conditions permit, a canvas-covered Canadian canoe should be carried, and a small motor of the detachable type is useful. In districts that are settled to any extent gasoline is obtainable although the price is extremely high. Native helpers should be obtained in Para or Manaos. The inhabitants of the interior do not, as a rule, care for any work outside of their regular occupation. Wages average from $40 to $50 per month with board.

Medicinal equipment must be carefully considered. The ordinary tabloid tropical medicine cases are good but these should be supplemented to some extent. Liquid liniments, Warburg's Tincture, Brown's Chlorydine for dysentry, and iodine are all most useful. Pasteur serum for inoculation in case of snake bite should be carried. Quinine must be taken in quantity, both in five-grain capsules and in liquid form for injection. There has been no yellow fever on the Amazon for some time, but it is a wise precaution to be inoculated against typhoid before leaving home. Any prospector in ordinary good physical condition, who will keep under nets or behind screens from sundown to sunrise, boil all water that he drinks, shun intoxicants, and vary his diet of canned goods with some native food, can spend many months in perfect health in the forests of the Amazon valley.

Foreign Trade in Lead and Zinc

Imports of lead and zinc during June and the first six months of 1917, are reported by the Department of Commerce as follows:

Articles and Countries	June Contents, Lb.	Jan.-June Contents, Lb.
Lead Ore:		
Canada	214,630	7,654,768
Salvador	155	1,417
Mexico	1,122,476	9,522,226
Chile		1,194,749
Peru	19,767	198,503
Italy		46,719
England		81,221
German Africa	2,657,945	4,405,145
France		64,692
Others		1,891
	4,019,973	23,171,331
Lead—Base Bullion and Bullion:		
Dutch East Indies		102,874
Peru		41,655
Canada		1,165,931
Mexico	7,610,683	33,204,084
	7,610,683	34,514,544
Lead—Pigs, Bars, etc.		
Panama	7,998	41,740
Barbados	247	2,814
Colombia		3,155
Haiti	450	37,502
Canada		312,758
Guatemala		52,400
England		80,188
Mexico	265,720	2,282,809
Peru		10,012
Brazil	613	613
French Oceania	159	159
France		89,086
Chile		8,769
Others		600
	275,187	2,932,605

The gross weight of lead ore imported in June was 11,259 long tons.

The actual tonnage of zinc ore imported in June amounted to 18,864 tons. The countries of origin and the metal contents were as follows:

Countries:	June Contents, Lb	Jan.-June Contents, Lb
Canada	520,000	3,875,000
Australia	6,228,646	23,427,162
Mexico	8,387,181	57,203,256
Spain		12,166,840
French Africa		1,245,000
	15,135,827	97,917,258
Zinc in Blocks, Pigs, etc.:		
Costa Rica	802	6,220
Panama	6,287	22,805
Cuba	16,791	202,022
Mexico		3,318
Ecuador		2,580
Canada	1,519	17,186
Brazil	1,168	5,513
Colombia	3,000	6,000
Others		1,488
	29,567	272,132

Imports of zinc dust amounted to 145,600 lb. in June, 1917, and to 469,237 lb. during the first six months.

Exports of lead and zinc were as follows (in pounds):

Lead	June Contents, Lb	Jan.-June Contents, Lb
Pigs, bars, etc., produced from domestic ore	13,241,999	58,482,783
Pigs, bars, etc., produced from foreign ore	1,483,825	11,885,774
Zinc		
Pigs, etc., produced from domestic ore	23,847,236	171,932,799
Pigs, etc., produced from foreign ore	2,908,251	60,777,006
Sheets, etc	2,342,261	13,281,904

GAS FROM CAMP RUBBISH KILLED THREE, according to R. P. Albaugh, as quoted in *Chemical Abstracts* for July 10, 1917 (*Journ. Am. Med. Assoc.* 68, 1033-5, 1917). Three deaths and more than a dozen prostrations occurred among 60 men housed in a camp which was located on land filled in with mill waste, scrap, ashes and cinders to a depth of 10 to 12 ft. Ten days previous to the poisoning it had been noted that steam arose from the edge of the fill. The dump was frozen to a depth of 2 ft., but at a depth of 5 ft. red-hot cinders were found. As the ground beneath the camp was not frozen, the products of combustion found their outlet through the camp. The poisoning was that of CO, though not at first recognized as such by the attending physicians.

Some Fluxes and Methods Used in Fire Assays

By CARL J. TRAUERMAN
Mining Engineer, Butte, Mont.

Fluxes and methods for determining gold, silver and lead in different classes of ores are described. Originality is not claimed though several worth-while "kinks" are given. Particular attention is given to the assay of cyanide solutions.

IN THE following nothing is claimed to be absolutely new or original. However, there are times when an assayer must work on an ore entirely different from that which he has been handling. On arrival in a new district he usually must begin his work before he has had time to experiment with fluxes to get the best results at least expense. It would be well if an assayer, on leaving his position before the arrival of a successor, should write out his fluxes and methods and leave them on record.

Composition of Useful Fluxes

The best universal gold-silver flux, and one that has always given good results on any ores that I have tried, especially on sulphide ores, as well as on ordinary silicate, oxide and carbonate ores, is the following: 53 grams litharge, 19 grams soda ash,[1] 1¼ grams flour. Mix this charge with ½ A.T. of ore, and put on top 53 grams of litharge and a cover of borax glass. Fuse in a hot muffle for from 30 to 40 minutes. It is unnecessary, I believe, to mix the borax glass with the ore, as the borax cover will not only perform its work, chemically, if the fusion is hot enough, but will also wash down any lead buttons or mixed material that tends to stick on the side of the crucible.

Should the ore be an especially heavy sulphide, niter and flour can be used as judgment[2] indicates, or it may be feasible to use only ⅒ A.T. of the ore. I have never used a covered crucible. Should there be a tendency for the mass to boil over, as in the assay of carbonate ores, quickly insert a piece of newspaper with the cupel tongs over the crucible. My experience has proved that this will quickly take away some of the heat.

The following gold-silver flux may be used for telluride or rhyolite ores and ores having a general unaltered porphyry or hematite gangue: 43 parts (by weight) soda ash; 48 parts (by weight) borax glass; 53 parts (by weight) carbonate of potash; 240 parts (by weight) litharge; 4½ parts (by weight) flour. For ½ A.T. of ore, use about as much as will fill a 10-gram crucible and mix well in a 20-gram crucible. Add a slight cover of borax glass and fuse in a hot muffle for about 35 min., or until all action ceases.

For the assay of gold and silver in ores having andesite gangue or siliceous sulphides, the following[3] will give good results: 54 parts (by weight) soda ash; 37 parts (by weight) borax glass; 37 parts (by weight) litharge; 5 parts (by weight) flour. Use as much of this as will fill a 10-gram crucible, and mix it with ½ A.T. of the ore in a 20-gram crucible; add a thin borax-glass cover and fuse in a hot muffle for from 30 to 40 min. Should the ore be heavy in sulphides, use ⅒ A.T. of the ore and add niter. If high in silver, use iron spikes instead of niter. Where the use of niter is suggested, it should be mixed with the charge.

Often the assayer is required to determine the gold and silver in furnace products, such as the retort product from the zinc smelter. I have used the following flux on material containing a great amount of fixed carbon, lead, zinc, etc.: 2 parts (by weight) soda ash, 1 part (by weight) borax glass, 4½ parts (by weight) litharge. Fill an eight-gram crucible with this and mix with ¼ A.T. of the material to be assayed in a 20-gram crucible; then mix in as much niter as will go into an ordinary annealing cup. Add a fairly heavy cover of borax glass and fuse until all action ceases. In some cases it may be preferable to use a 30-gram crucible, or to start the fusion at a low heat and gradually raise it to a very high one.

The following may be used as a nearly universal flux for the fire assay of lead: 200 parts (by weight) soda ash; 160 parts (by weight) carbonate of potash; 68 parts (by weight) borax glass; 89 parts (by weight) argol. Mix 17 grams of this flux with 10 grams of ore, and cover with 17 grams of flux. As an additional cover, add as much salt as will fill an ordinary annealing cup. For normal sulphides, add one wire spike; for concentrates, add two spikes. Put crucible in muffle at a low heat for about 30 min., until the salt has apparently burned off. Then subject to high heat for 20 min., remove the nails and pour.

Assay of Tails from Cyanide Treatment

In the assay of finely ground tails from cyanide treatment, I have found one little difficulty which may be successfully overcome. It is customary when the ore has been ground through 100 mesh or finer before treating, to dry the tails and screen the resultant lumps through an 80-mesh, or finer, screen. Such a material tends to boil when subjected to the crucible fire-assay for gold and silver. My experience has been that this tendency remains, no matter how many times the tails have been washed with water, previous to drying. This is strange and may be due to the cyanide solution, that can not be entirely removed, making some peculiar mechanical or chemical combination with the finely divided ore particles. I overcame this difficulty by passing the dried lumps through a 20-mesh screen, instead of a finer one. This gave small lumps of ore, which could be assayed in the crucible without the slightest signs of boiling and the result was just as accurate as though the material has been put through a finer screen.

Concerning the assay of cyanide solutions, there seems to be a great deal of discussion. Many ingenious schemes have been proposed, especially modifications of the original Chiddey method.[4] I have found this to be the quickest and accurate enough for most operations. The only modifications that I use are a 20% lead acetate solution, rather than a 10%, and zinc dust rather than shavings, as the action may be more easily watched through the gathering and sponging of the dust than in the disintegration of the shavings. I do not throw the sponge on filter paper, but remove it from the beaker with a rubber "policeman" and then squeeze the sponge. I have always found it best to dry the sponge before cupeling. This may be done on any asbestos board over a flame. In cupelling, I have found that it is not necessary to have a flame in the muffle upon introduction of the sponges. The procedure that I have used is similar to that described in the *Journal* of Sept. 25, 1915.

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[1] [Sodium potassium carbonate may seem better to some, though more expensive.—Editor.]

[2] [Many assayers consider a preliminary fusion necessary.—Editor.]

[3] [This flux would be improved by carbonate of potash.—Editor.]

[4] "Eng. and Min. Journ.," Mar. 28, 1903.

MODIFICATIONS OF THE CHIDDEY METHOD

L. W. Bahney[5] proposed some radical changes in the original Chiddey methods, claiming that results are more or less dependent upon getting the right proportions of zinc and lead acetate. He would remedy this by using a zinc pencil, and other operations. This method, on account of increased manipulations, does not appeal to me for ordinary mill and test work. An experienced assayer can ascertain, as soon as the solution is boiling after the addition of HCl, whether there is a shortage in either the acetate or the zinc. If so it can be remedied by the addition of either or both. E. J. Hall[6] has discussed the Bahney method, and I agree with him that some of the gold and silver may be retained on the zinc pencil and give low results. With the use of zinc dust and fairly strong HCl the chance of any undissolved zinc remaining in the sponge, or of gold redissolving, is slight.

The original Chiddey method says nothing about wrapping the lead sponge in lead foil before cupeling. Bahney advocates this scheme as does C. E. Roodhouse.[7] I do not do this, as I find when the mass is placed in the cupel, that the foil melts first and carries with it a small part of the sponge, thus making several buttons on the cupel.

The method of evaporating a portion of solution in a lead boat and cupeling is good enough where only small amounts of solution are needed for an accurate assay and where the solution is clean. In some solutions I have found certain compounds that cause either spitting in the cupels or cracking of same.

GREATER ACCURACY BY A LONGER METHOD

Both the Chiddey and evaporation methods I have found useful and practical in daily mill work. However, during close laboratory tests, I prefer to use the following method which has given me the greatest accuracy, although not the shortest method by any means.

Take 5 or 10 A.T. of the solution and place in 400 or 600 c.c. beaker and add about one gram of unoxidized zinc dust. Stir this with a glass rod, leaving the rod in the beaker. Add about 15 c.c. of strong sulphuric acid (if commercial acid is used, add about 20 c.c.), and stir the mass again. Then heat to boiling point and filter on an 18 cm. Munktell's filter paper. The heating of the solution is to promote rapid filtering. A little knack is required in throwing the precipitate onto the filter. Shake the beaker so that the mass whirls around, then place the rod at the lip and pour, lowering and raising the beaker so as to keep the mass in agitation, and throw it toward the lip of the beaker. When the mass has filtered, pour a little cold water down the sides of the beaker and throw this water, with the slight amount of precipitate contained, on the filter paper. Then wipe the beaker and glass rod with a small piece of common gray filter paper so as to take up the last of the precipitate.

Remove the Munktell's paper from the funnel and place in a 12-gram clay crucible. Place the wiping paper on top of the Munktell's and press down so that the mass of paper is in the bottom of the crucible. Place the crucible in a hot muffle for a few minutes until the paper is burnt to an ash. Remove the crucible and let it cool for a few minutes and add, so as not to splash, about 60 grams of the flux described below, and place in a hot muffle until fused. This fusion takes from 30 to 45 min. Pour into a cold smooth mold and in such a way that the lead button will strike the center of the mold. This last precaution is necessary because the slag cools more quickly than the lead so that any lead poured down the side of the mold usually sticks there and does not enter the main button. The result of the fusion should be a clear, glassy slag, which, upon cooling, will splinter when touched with a hammer, thus freeing the lead button. This may be cupeled without danger of spitting. I find the method, on the whole, the most accurate for low-grade silver and gold solutions, although it is quite long for routine mill-work.

The flux used in the above assay is made up as follows: 26 parts (by weight) soda ash; 37 parts (by weight) borax-glass; 28 parts (by weight) potassium carbonate; 37 parts (by weight) litharge; 19 parts (by weight) powdered silica; 5 parts (by weight) flour (or 2 parts argol). The flour or argol has been proportioned to reduce all the lead out of the litharge, to give a fairly good-sized lead button. The litharge is not in excess, so that even if all the carbon from the filter papers is not burned off, there will not result a lead button too large for cupeling. Any undissolved zinc that may be present is taken up by the soda and silica and does not enter the lead button. This flux has also given good results on ores and products that contain little siliceous matter and are high in sulphur.

The same method may be used in the assay of products from the zinc boxes or precipitate press as follows: Take a good sample of the product; quarter and grind it as finely as possible, cutting any short zinc shavings with scissors. Put $\frac{1}{10}$ A.T. into a 400-c.c. beaker. Add about 150 c.c. of water and 15-30 c.c. of strong sulphuric acid; stir with glass rod, heat to boiling and follow the procedure described for the assay of solutions under this method. I have used this method at several plants, where the cyanide product was shipped to smelteries and have checked the latter closely in the assays.

EXPORTS OF NEW CALEDONIAN ORES for the four months ended Apr. 30 are reported by the *Journal du Commerce* of Noumea at 14,127 metric tons of nickel ore and 17,034 tons of chrome ore. Nearly all the chrome ore went to the United States. Exports of metals were 3321 tons of nickel matte.

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[5] Bulletin American Institute of Mining Engineers, No 98, February, 191

[6] Bulletin, American Institute of Mining Engineers, No. 101, May 1915

[7] Min. and Sci. Press, May, 1916.

National Safety Council Meeting

The sixth annual safety congress of the National Safety Council, held during the week of Sept. 10 at the Hotel Astor, New York, was a noteworthy meeting not only for the number of interesting papers presented but for the large attendance and enthusiasm manifested in safety work at each of the meetings.

The mining-section meetings were held on Sept. 12 and 13 and the large gathering was well represented by members from coal and metal districts and by the manufacturers of machinery and equipment. The mining-section committee consisted of B. F. Tillson, New Jersey Zinc Co., Franklin, N. J., chairman; H. G. Davis, coal-mining department, Delaware, Lackawanna & Western R.R., Kingston, Penn., first vice-chairman; W. A. Luce, assistant general manager, Ellsworth Collieries, Ellsworth, Penn., second vice-chairman; William Conibear, safety inspector, Cleveland-Cliffs Iron Co., Ishpeming, Mich., third vice-chairman; J. W. Paul, mining engineer, U. S. Bureau of Mines, Pittsburgh, Penn., secretary. The papers read at the three mining sessions were as follows:

"Mine-Fire Prevention and Fighting," by John Lloyd, efficiency engineer, Lehigh Valley Coal Co., Wilkes-Barre, Pennsylvania.

"Underground Mine Sanitation," by H. I. Young, manager, American Zinc, Lead and Smelting Co., Carterville, Missouri.

"Visual Mine-Safety Instruction," by E. E. Bach, mine safety director, Ellsworth collieries, Ellsworth, Pennsylvania.

"Hoisting Ropes," by M. H. Sigafoos, general manager, Hazard Mfg. Co., Wilkes-Barre, Pennsylvania.

"What Each Operator Can Do To Aid Accident Statistics," by A. H. Fay, mine statistician, United States Bureau of Mines, Washington.

"Equipment and Organization of Mine-Rescue Stations," by A. J. Moorshead, president and general manager, Madison Coal Corporation, Chicago.

"Mine-Rescue Car of the Government," by D. J. Parker, United States Bureau of Mines, Pittsburgh, Pennsylvania.

"Status of Oxygen-Rescue Apparatus and Physiological Effects on Users," by J. W. Paul, mining engineer, United States Bureau of Mines, Pittsburgh, Pennsylvania.

"Advantages in Use of Permissible Electric Lamps in Nongaseous Mines" and "Safety Precautions in the Installation of Electrical Apparatus in Mines," by George H. Deike, Mine Safety Appliances Co., Pittsburgh, Pennsylvania.

"Standardization of Mine Cars in Coal Mines, with Special Reference to Couplings, Bumpers and Brakes, Wheel Base, Gage, Clearance at Ends and Sides and Projections to Catch Clothes, by Carl Scholz (read by Thomas T. Read), Consulting Mining Engineer, Chicago, Burlington & Quincy R.R., Chicago.

"Necessity of Mechanically Produced Ventilation for Metal Mines," by G. S. Rice, United States Bureau of Mines, Washington, District of Columbia.

The papers were almost invariably followed by lively discussions and valuable additional data and comment was elicited. Prior to the technical meetings, the mining section held a cabaret dinner and smoker at the Cafe Boulevard, the entertainment features having been provided through the liberal subscriptions of the Anaconda, American Smelting, New Jersey Zinc, Cerro de Pasco, Ellsworth Collieries, Lehigh Coal and Navigation Co., Witherbee Sherman and Utah Copper companies.

At the conclusion of the technical sessions, new committees were elected, the mining-section committee being as follows: Chairman, B. F. Tillson, head of the mining department, New Jersey Zinc Co., Franklin, N. J.; first vice-chairman, H. G. Davis, efficiency engineer, coal-mining department, Delaware, Lackawanna and Western R.R., Scranton, Penn.; second vice-chairman, H. I. Young, manager, American Zinc, Lead and Smelting Co., Carterville, Mo.; third vice-chairman, E. E. Bach, sociological superintendent, Ellsworth Collieries, Ellsworth, Penn.; secretary, Thomas T. Read, New Jersey Zinc Co., New York. The remarkable growth of the organization which has sprung up in a few years from an initial membership of a dozen to three thousand members is sufficient demonstration not alone of the progress that has been made in safety regulation, but of the results obtainable from safety work. These accomplishments have enlisted the hearty coöperation of those directing the industries, in whose hands rest to a great extent the safety and welfare of the industrial workers.

Mineral Production of Greece

The following figures of production for 1914 and 1916, the latest statistics available, are given in a supplement to Commerce Reports, dated Aug. 24, 1917:

	1914 Metric Tons	1915 Metric Tons
Chrome ore	7,059	10,420
Emery	16,112	14,338
Ferromanganese	1,315	1,041
Iron ore	299,286	157,340
Iron pyrites	129,046	12,113
Lead ore	151,581	104,995
Lignite	20,002	39,745
Lead in turtles	20,684	11,595
Magnesite (crude)	136,701	159,981
Magnesite (calcined and dead burnt)	28,563	27,248
Nickel ore	13,626	20,577
Sulphur ore	31,110	24,733
Zinc ore	32,440	33,121
Zinc, calcined	22,308	20,209
Marble	2,251	877
Salt	29,717	16,856

The magnesite industry in the Athens district is growing in importance. In 1916 the total exports of this mineral from Greece were 176,383 tons of all grades. Despite the opening of deposits in North America, the United States consumed more Greek magnesite in 1916 than in the preceding year, it having received 56,504 tons of raw magnesite and 9514 tons of caustic and calcined.

Right To Dump Waste

By A. L. H. Street*

The mere fact that a mining company granted defendant the right to use a tunnel in the company's mine and to extend the same to defendant's adjacent claim implied no permission to defendant to dump waste upon the surface of the company's claim, unless defendant could not, without unreasonable inconvenience and expense, obtain dumping privileges elsewhere in connection with operation of the tunnel.

This is the gist of the decision of the United States Circuit Court of Appeals, Eighth Circuit, handed down in the recent case of Himrod vs. Ft. Pitt Mining and Milling Co., 238 Federal Reporter, 746.

Mining Dividends in August

In the table of dividend payments in August, published Sept. 1, the amount of the disbursement of the Amparo Mining Co. was incorrectly given as $30,000 instead of $60,000.

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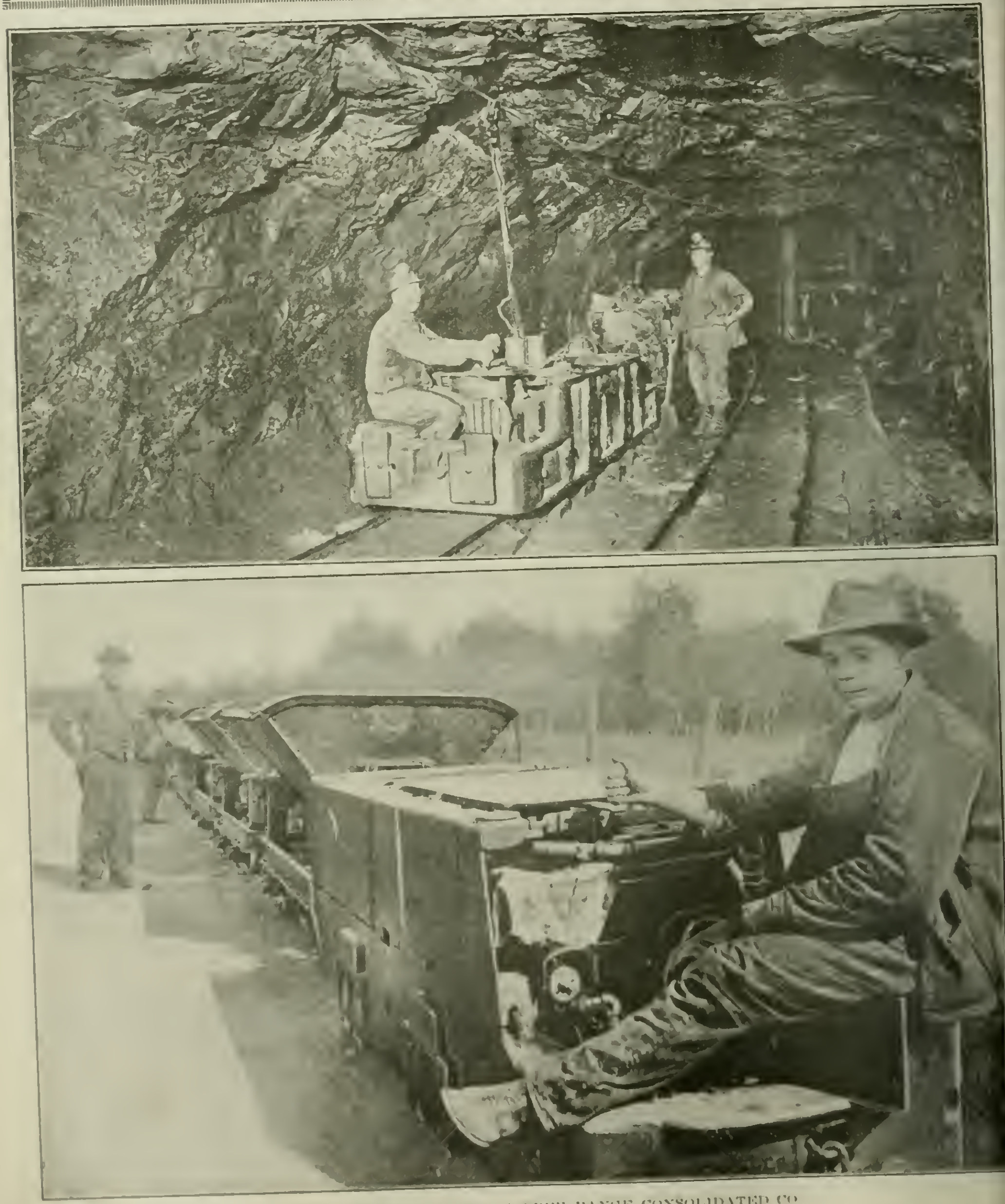
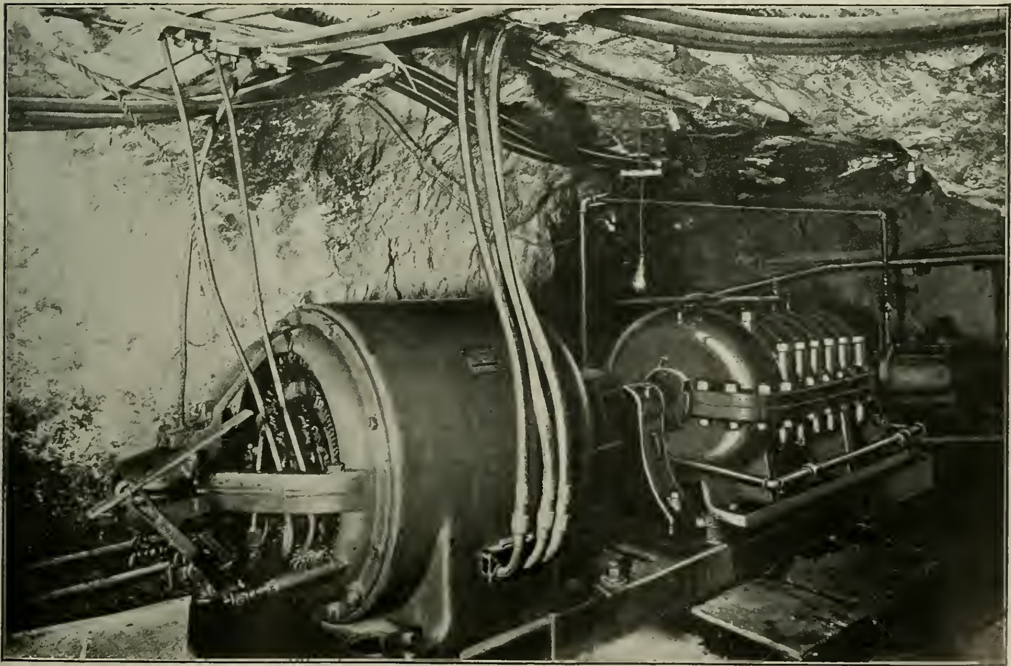
Views From Michigan Copper Region



MINE TRANSPORT SYSTEMS, COPPER RANGE CONSOLIDATED CO

In the Lake Superior copper country, hand tramming is being superseded by mechanical haulage. Owing to the wet condition in the mines storage-battery locomotives are being more generally adopted than trolley locomotives, as exemplified by recent installations in the Calumet & Hecla mines

STOPE DRIFT IN THE AMYGDALOID LODE OF THE CALUMET & HECLA MINING CO.
The drifting width in this lode makes it advantageous to use two drills in each heading



MOTOR-DRIVEN CENTRIFUGAL PUMP IN RED JACKET SHAFT, CALUMET & HECLA MINING CO.

Correspondence and Discussion

Sampling Large Low-Grade Orebodies

I have noted a statement by a mining engineer, Richard A. Parker, of Denver, in the discussion[1] on the subject of sampling large low-grade orebodies, in which appeared the following remarks: "The ore broken in mining is sure to be lower in value than that broken by sampling. This simple fact has been so frequently stated in the works on sampling that it seems out of place to state it again here, but it is a fact of vital importance in estimating the value of an orebody." I have no fault to find with the other part of Mr. Parker's contribution to this paper, but I beg to criticize the generalization above quoted. Although in the majority of cases the milling of an orebody will show the recoverable value plus tailing loss as less than what should have been expected by sampling, there are important exceptions. I operated a small but profitable gold mine in Idaho where the average of the mill recovery, plus tailing loss, was conservatively 11% above the sampling of the mine. The mine sampling was most carefully done by sampling the faces after every round. This system applied both to the stopes and to the drifts; also the mine was sampled every 5 ft. The above figure of 11% in excess of sampling was not obtained over a short working period, but the average of the entire working period of the mine.

I read an interesting article[2] by Morton G. Webber of New York entitled "Latent Errors in Mine Sampling." In this article he deals with the sampling of five classes of mines. In respect to class 4 he says, "Mines where sampling results in an incorrect subnormal value, conclusive proof being afforded by subsequent commercial results." He then proceeds to enlarge upon this class by quoting from his professional experience, as follows: "Where there are two sulphides in the same ore, one hard and dense and the other soft and friable, the latter will break more easily in sampling and will therefore be abnormally represented in the valuation. If the major richness is in the hard sulphide the inference is liable to be unfair to the property. Some years ago I examined a copper mine where the ore was chalcopyrite. After carefully sampling the ore exposed, which I estimated as a mass 550 ft. long by 8 ft. wide, and 300 ft. deep, the bottom of the mine at that time, my average was 4½% copper. My estimate of tonnage from this area was 440 tons per horizontal foot. Since that time this ore has been stoped. The tonnage actually marketed from this area has aggregated in round figures 130,000 tons or 430 tons per horizontal foot. Such a close estimate of final result clearly proves that the mass that was removed for market was practically the same as estimated in my examination. It is evident that the inclusion of waste and remaining pillars did not in this case vitiate the comparison. The subsequent marketing of this area, a question of fact, has proved my estimate of 4½% copper to be about 0.5% low; or an error of over 11% of the total copper value. It is my opinion that the unavoidable breaking down of an excessive proportion of the friable ore of lower grade was responsible for this error. For this there is no preventive under practical conditions. It is only possible to remedy the discrepancy by the addition or subtraction of a factor as the outcome of experience. Discussing the distance between sample cuts, so often the resort of engineers, in difficult cases to conserve accuracy, will have no bearing in the matter."

I trust you will agree therefore that the generalization as made by Mr. Parker merits criticism. I repeat that I agree that the majority of mines will prove to show the recovery-plus-tailing loss as less than what would be expected by sampling. In all cases this feature should be considered, but there are a minority of important exceptions. Therefore it would not do for the engineer on examining of property to make up his mind, before considering the individual facts, that an arbitrary deduction from the sampling of the mine would be essential. R. F. TWEEDY.

Wardner, Idaho, Aug. 20, 1917.

Safety Legislation

At the recent meeting of the sixth annual safety congress of the National Safety Council in New York, a number of "ways and means" for promoting the safety and welfare of industrial employees were presented. One suggestion made at the mining-section meeting strikes me as being very much to the point. The statement was made that a certain amount of legislation should be brought to bear upon the employee who had been found guilty of persistently not making use of the precautionary measures provided by the employer. To one who is operating in Arizona, where much drastic legislation has been brought to bear against the operator, I can imagine nothing more "unfair" than the lack of such measures; the promoting influences back of these labor laws would not be hard to guess. J. W. MAXWELL.

New York, Sept. 17, 1917.

Clothes Hooks for Change House

At the Silver King mine, Park City, Utah, we are building a concrete change house for our miners and we desire some information about the three-prong clothes hooks, chains and pulleys for working same, where they can be bought, etc. I should like to hear from some of the readers of the *Journal* who have had experience in change- and wash-house construction for miners. JAMES HUMES,

Superintendent Silver King Coalition Mines Co.

Park City, Utah, Sept. 4, 1917.

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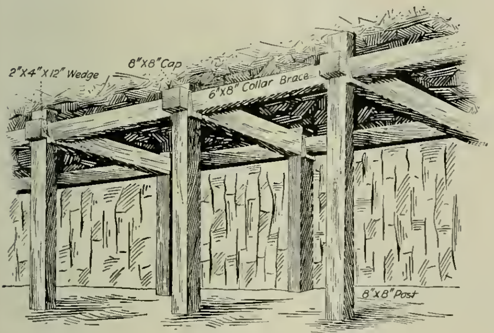
[1] "Min. and Sci. Press," June 30, 1917.

[2] "Min. Mag.," February, 1916.

Details of Practical Mining

A Drift-Set Collar Brace

Where light timbers are used in a drift set, little framing is advisable on account of the weakening effect caused by the decrease in the section of the timbers. A collar brace is intended principally to spread the caps and posts between sets and is seldom required to take weight itself. Sometimes, however, it is struck by a boulder dropping out overhead and should be so set in that it can, to a certain extent, resist pressure from above. It is seldom that side pressure has to be taken. The drawing shows a simple and effective design for a collar brace. A pair of ordinary 2 x 4 x 12-in. mine wedges are set side by side against each cap and post and nailed into place. On each end the collar brace is given the same bevel as the wedges and is placed between the sets as shown. The collar brace can be tightly wedged into place and should be dropped down a couple of inches below the top of the cap. Any blow from above will tend to tighten it. The design is far superior to the method sometimes seen of nailing a square-end collar brace into place, or of framing small timbers, or of nailing upright planks alongside the posts under the collar brace.



COLLAR BRACE FOR DRIFT SET

Mine Supplies and Their Distribution at the Old Dominion*

Few people stop to consider the system necessary for furnishing proper tools and other supplies to 700 men scattered throughout a mine.

The following data on the more important supplies will give an idea of the amount of supplies consumed in one month in the underground operations at the Old Dominion: Timber, 600,000 board feet; powder, 29,687 lb.; fuse, 147,843 ft.; blasting caps, 25,489; carbide, 8268 lb.; pipe, 5739 ft.; nails, 8318 lb.; oil, 315 gal.; hose, 1121 ft.; new steel, 3667 lb.; sharpened tools: Steel, 11,833 pieces; picks, 2373; axes, 466; saws, 325.

The timber used is known by the trade name of Oregon pine, but is really a species of Douglas fir. It is cut in the States of Washington and Oregon and shipped by water to San Pedro, Calif., whence it is transported by rail to Globe. This timber is more expensive than the native Arizona or Texas pine, but on account of its long fiber, makes the best known mine timbers. Unlike the native pine, it stands great weight and gives the miner timely notice of danger.

The Old Dominion mine might be considered a buried forest. If all the trees cut for this mine during the last 25 years had been transported to Globe and planted, the town would be surrounded by a forest of no mean size, extending for several miles on all sides.

A stock of approximately 2,000,000 ft. of timber is kept at the surface yards and 100,000 ft. in the various underground timber stations. These underground stations are placed on every important level in the mine and are in charge of the level supply men, known as the powdermen. There are 25 of these men and it is their duty to order supplies and keep up the stock in the underground stores, also to deliver and charge out the supplies issued to the various departments. Eight other men engaged in the distribution of timber and supplies are known as timber rustlers. Every day 1224 pieces of timber are lowered into the mine and delivered to the underground timber stations.

DRILLS USED AT OLD DOMINION MINE

Kind of Drill	Number	Kind of Drill	Number
MC 22 stopers	134	16 V stoper	1
BCR 430 jackhamers	20	$2\frac{3}{4}$-in. U. S	2
Bull Moose sinkers	6	$2\frac{5}{8}$-in. F. F. 12	11
C 110 piston	29	Plugger DP 33	15
18a Leyner	22	DR 6 mounted water-hammer drill	8
Dreadnaught Model 60 drifter	2		
Model 30 mountable stoper	2		
Denver clipper	3	Total	255

The last group of men engaged in the distribution of mine supplies are the nippers. There are seven of these men and it is their duty to visit every working place, pick up the dull steel and tools and send them on top. When one considers the number and variety of rock drills used, and the fact that these drills must be kept supplied with sharp steel, it is apparent that the nippers have no easy task to perform.

The various rock drills used and the number of each at the Old Dominion mine are shown in the accompanying table. Some of the machines require different kind of steel. During an average month the following steel handled by the nippers: For ordinary piston drills, Burleigh, 1041 pieces; hollow steel, 2781 pieces; stopers, 6937 pieces; pluggers, 1074 pieces; total 11,833 pieces, an average of 422.6 pieces per day.

In order to handle these supplies promptly without confusion and at the same time to charge out the material to its proper account, a system has been installed similar to that used by any large wholesale house in getting its goods to the consumer. On receiving an order for supplies from the retailer, the wholesale house fills the order, loads the car and turns it over to the transportation company which assumes the responsibility of delivering it to the retailer, who in turn sells it to the consumer. At the mine the general warehouse corresponds to the wholesale house, the hoisting and tramming department to the transportation company, the underground timber stations and storehouses to the retailers, and the miner to the consumer.

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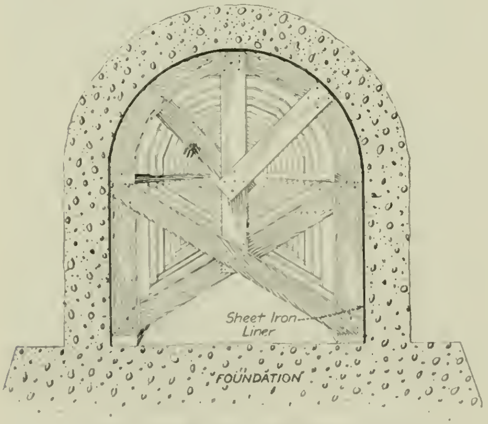
*An article by A. B. Calhoun, reprinted from the "Old Dominion Bulletin," June, 1917.

As a rule, all supplies that can be placed in a car are loaded therein, properly tagged for their respective underground stores and then turned over to the transportation department which assumes the responsibity of delivering it to its destination. Orders for supplies are sent up at the end of the day shift, filled and delivered to the underground stores on the following day.

Forms for Concrete Culverts

In concreting culverts, small sewers or other continuous work where the wooden forms are taken out from under concrete that has set and used again for new concreting, trouble is often experienced by the forms adhering to the concrete so tenaciously as to cause the boards to split, thereby ruining the forms when attempting to remove them.

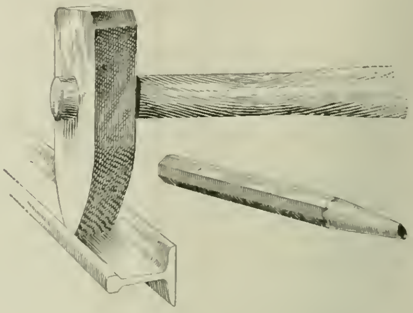


STEEL-PROTECTED CONCRETE FORM

This annoyance and expense may be obviated by using a 28-gage sheet-iron liner over a wooden frame as shown in the accompanying illustration. (Standard corrugated iron hammered out flat may be used to good advantage.) One set of sheet-iron liners will outwear two or three sets of the wooden forms

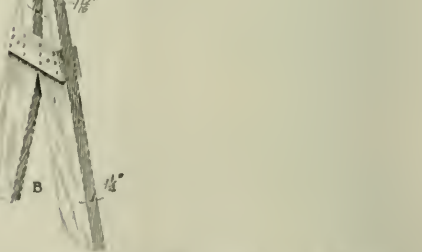
Handy Tools for Cutting Rails

Mine rails up to 25 or 30 lb. weight may be cut and holes for fish-plate bolts made quickly and satisfactorily by the use of a cold cutter and a cold punch. The illustration shows the general shape of a cold cutter mounted on a short handle. The trackman holds the cutter over the point where it is desired to cut the rail and his helper strikes blows until a good mark is left on head and flange of the rail and on each side of the web. The rail is then parted by a few good blows with a double-jack. A cold punch, made moil-shaped, can be similarly mounted. As shown in the drawing, the moil point is cut off on a bevel at a diameter dependent on the size of holes desired. A hole is simply made by laying the rail on its side over another rail spiked in place and the hole is punched by a few blows from a hammer. This method is superior in point of time and cost to the use of the hack saw and drill when the work has to be done underground, and the final joint made is quite as good.


COLD CUTTER AND COLD PUNCH

A Handy Trestle

The sketch shows a trestle which may be readily taken down and stored in a small space and without danger of breakage. The top bar is provided with grooves at each end formed by nailing strips of wood on each side to a bare clearance for the upper ends of the legs. The legs are framed with a slot at the top which is a close fit for the top bar.—*Engineering News-Record.*



TRESTLE OCCUPIES LITTLE SPACE WHEN KNOCKED DOWN

Details of Milling and Smelting

Volume of Material in Conical Piles

By W. F. Schaphorst*

Inasmuch as the angle of repose of ore in piles averages about 37°, it is a simple matter to develop a formula that will give the volume in cubic feet by performing a simple multiplication. The formula is

$$Y = 0.0995d^3$$

where Y is the total number of cubic feet in the pile and d is the diameter of the base of the pile in feet.

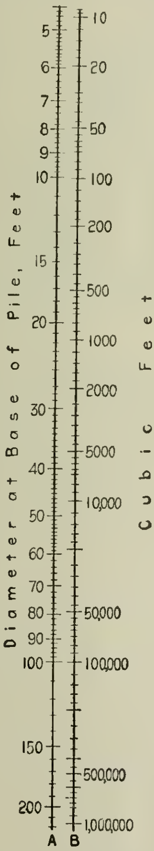


CHART FOR DETERMINING VOLUME OF MATERIAL IN CONICAL PILE

To make the operation still simpler the writer has leveloped the accompanying chart, in the use of which ne simply has to glance across from column A to column B, or vice versa.

For example: How many cubic feet of iron ore in a conical pile whose base diameter is 30 ft? The answer is: About 2700 cu.ft. Inversely, if it is desired to know the extent of the plot of ground on which, say, 10,000 cu.ft. may be piled, one has simply to glance in the other direction—from column B to column A—and there's the answer: About 46.5 ft. in diameter at the base.

The range of this chart, it will be observed, is wide enough to cover piles that are most ordinarily found in practice, running from 5 to 200 ft. in diameter at the base.

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*Engineer, Woolworth Building, New York.

Formation of Quicklime in Roasting Ores from Manhattan, Nev.

By Walter S. Palmer

Professor of Metallurgy, University of Nevada, Reno, Nev.

About three years ago, while experimenting on the base antimonial gold ores from Manhattan, Nev., it was noticed on roasting the ore that there was formed a large amount of quicklime which not only interfered with the extraction secured by cyaniding, but also separated from the solutions, coating the laboratory apparatus which came in contact with the same. Recently some experiments were made to determine the effect of different roasting temperatures on the amount of quicklime produced. The ore used in the tests contained the following minerals: Quartz, calcite, pyrite, stibnite, limonite and traces of realgar, orpiment, cervantite, kermesite and basic iron sulphates and carbonate. An analysis of the ore showed approximately 18% of calcite. The roasting tests were carried out on ore ground to —80-mesh and were conducted in a muffle with free access of air.

The results of the tests are shown in condensed form in the table. The first test was started in a cold muffle and brought up to a maximum temperature of 650° C. in 20 min. and held approximately at this temperature for 52 min. Sample analyzed 0.8% free lime or 16 lb. free lime per ton of roasted ore. Test No. 2 was conducted in the front of the muffle when test No. 1 was being run, but was heated just enough to ignite the ore and roasted with little help from the muffle. Length of test, 52 min. Sample analyzed 0.2% free lime, or 4 lb. per ton of roasted ore. Test No. 3 was conducted at a maximum temperature of 720° C., reached in 20 min. and continued for 52 min. Sample analyzed 2.4% free lime or 48 lb. of free lime per ton of roasted ore. Test No. 4 was conducted at temperatures ranging from 630° C. to 830° C., total length of test 90 min. A first sample was taken

QUICKLIME FORMED IN ROASTING MANHATTAN ORE

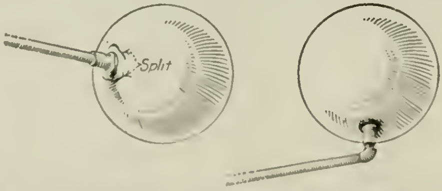
Test	Maximum Temperature C°	Length of Test in Minutes	Free Lime in Roasted Ore, %	Free Lime per Ton, Lb.
1.	650	52	0.8	16
2.	Below 600	52	0.2	4
3.	720	52	2.4	48
4.	760	40	3.2	64
	830	90	4.9	98
5.	790	40	4.0	80
	845	90	5.3	106

at the end of 40 min., when the maximum temperature was 760° C., showed 3.2% free lime, or 64 lb. per ton of roasted ore. The final sample showed 4.9% free lime, or 98 lb. per ton of roasted ore. Test No. 5 was conducted at muffle temperatures ranging from 680° C. to 845° C., total time 90 min. A first sample, taken at the end of 40 min., maximum temperature 790° C., showed 4.0% of free lime, or 80 lb. per ton of roasted ore. The final sample showed 5.3% of free lime, or 106 lb. per ton of roasted ore.

As calcium carbonate begins to decompose below a red heat it would probably be impossible to give an ordinary roast to such an ore without forming some quicklime; while at the higher temperatures excessively large amounts of quicklime are formed. It would be expected that this excessive amount of lime would cause trouble in several ways. The usual amount of lime in treating gold ores running from one to five pounds per ton of ore treated, such amounts as indicated by the above tests, if present, would probably cause the formation of scums and possibly foaming, filling up of pipes, coating of filters, coating of zinc during precipitation, and retard the solution and precipitation of the gold. From a large number of tests made in the laboratory it appears that to treat this ore successfully it must be roasted, and that during roasting the temperature must not be carried to too high a degree or prolonged beyond the proper length of time or excessively large amounts of quicklime will be formed, interfering seriously with the treatment of the ore.

Improved Float Connection

In connection with a number of large tanks, writes M. A. Saller in *Power* for Sept. 13, 1917, we used float-controlled water regulators, and the valves being of large size, the floats were called upon to exert quite a lot of force. We had considerable trouble with the floats giving way around the socket to which the arm was attached, the float and rod being placed in a horizontal line. We turned one to a vertical position so that the float pulled at right angles and the lifting stress was distributed around the entire circumference of the float. This was found to cure the trouble, and since changing all our floats, no trouble from splitting has been experienced.



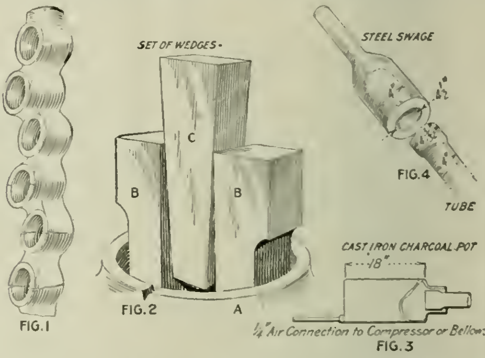
FLOAT CONNECTED TO AVOID DESTRUCTIVE STRAIN

Renewing Cast-Iron Headers in B & W Boilers

We are constantly being reminded of the high cost of fuel and the rapidly increasing cost of supplies, labor and the like. It is not only necessary for the engineer of a power plant to economize along the lines mentioned above, but he must also cut the cost of repairs to a minimum. Any plan that will tend to do away with costly repairs, therefore, should meet with particular favor at this time, and the following is written in the belief that it will prove of practical utility at many mine power plants, says J. L. Ball in *Coal Age* of Sept. 15, 1917.

In a certain boiler plant consisting of several batteries of Babcock & Wilcox boilers, considerable trouble was experienced from the breaking of the cast-iron headers. The boilermaker's bill reached such proportions that it became necessary to devise some means of renewing headers without outside help. The following method is now used in performing this work, and it has proved quite satisfactory:

Fig. 1 shows a nine-tube, vertical, cast-iron header. In case such a header cracks, or is broken, the first thing to do is to free the damaged header from the tubes. Fig. 2 shows a set of wedges used for this purpose. The face of the handhole is nicked deeply, the side wedges put in place and then the wedge *C* driven in until the header breaks. This method usually, but not always, makes a clean, square break, leaving the tube end free. After all the tubes are clear, the iron around the circulating tube and mud-drum nipple can be broken with a hammer.



FIGS. 1 TO 4. METHOD AND TOOLS FOR BREAKING OFF THE HEADER AND SWAGING DOWN THE TUBES

Fig. 3 is a cast-iron charcoal burner, 18 in. long and 8 in. in diameter, with a connection for air to a bellows or an air compressor. After a good fire is started in the burner, the end is placed over the end of a tube. When the end of the tube is heated to a cherry red, the swage, Fig. 4, is placed over the end and sledged until the tube end is brought to its regular size. The diameter of the hole at the end of the swage is large enough so that the enlarged end of the tube will enter, but is reduced a short distance into the regular size of the tube.

The end of the circulating tube is brought to size the same way. It saves time to use a new mud-drum nipple since the old nipple is usually damaged when removed.

For heating the nine tubes of a header about 30 quarts of charcoal is required. This is much cheaper than replacing new tubes and having the old tubes reended. Also, with a repair outfit of this kind much time is saved.

Events and Economics of the War

Stability of government in Russia has been tested by the quickly changing events; with Korniloff's army gone and Korniloff arrested, the rebellion is broken and a Russian republic has been proclaimed. In Italy Monte San Gabriele has fallen to the furious pounding of the Italians. In France Painlevé has formed a cabinet without Socialists who refused to serve because Ribot was retained. Sweden has removed her foreign minister and asked explanations from Berlin in regard to Lansing's disclosures. Argentina has dismissed the German envoy and sealed the German wireless; anti-German riots have occurred in Buenos Aires. Uruguay has seized 11 German ships.

Secretary Lansing has further revealed that the former Swedish envoy in Mexico had acted as a German spy; the trading-with-the-enemy act has passed both Houses and is now in cenference; the war insurance bill has passed the House, and a resolution to draft aliens was adopted by the Senate; Holland has recalled her minister from Washington and will send another; beginning Oct. 1, Hoover will license the sugar industry; farmers in the Northwest are said to be holding back their wheat, and some mills have shut down; 80,000 tons of export wheat were seized at New York. A strike of 25,000 ironworkers and mechanics has begun in San Francisco shipyards.

To Spend Eighteen Billions

The following detailed accounting of moneys appropriated and expended in connection with the war was presented to the House last week by the chairman of the Appropriations Committee:

Current appropriations applicable to war expense	$910,000,000
June emergency deficiency	3,281,000,000
Pending deficiency bill	4,769,000,000
Aviation bill	640,000,000
Food survey bill	11,000,000
Food control bill	162,000,000
War risk insurance bill	45,150,000
Expenses of the first bond act	7,063,000
Soldiers' insurance bill	176,000,000
Trading with the enemy bill (pending)	150,000,000
Expenses second bond issue	17,000,000
Loans to our allies	7,000,000,000
Interest on public debt	200,000,000
Total contemplated expenditure, war and current, for year	18,288,228,085
Estimated revenue current year:	
From ordinary sources	$1,333,000,000
Pending revenue bill	2,400,000,000
Postal revenues	334,000,000
Bond issues, proceeds, net	11,538,945,460
Total estimated revenue, all sources, for year	$15,605,945,460
Deficit in sight for year to be raised by taxation or further bond issues	2,682,282,625

Inquisitive persons will wonder about the $920,015,085, not itemized, but included in the "total contemplated expenditure."

Will Cut Ocean Rates

Ocean-freight tariffs will be cut 60 to 75% if the plans of the Shipping Board and the Council of National Defense materialize. The new rates will be effective for all boats of American register engaged in war trade. Ships not so employed may ask high rates but the Government will take all profits that are more than 5% above the rate it will set. No agreement has yet been reached with the Allies as to a universal freight rate. The Government through its Export Council, which controls bunker coal and practically all exports, and through the Shipping Board and Chartering Commission, has built up an organization with large powers which are ready for use.

Airplane Motor Standardized

The development of a standardized motor for airplanes has been announced by Secretary Baker. He states that the new engine, designated by the Signal Service as the "Liberty motor," has passed gratifying final tests. In power, speed, serviceability and minimum weight it is said to invite comparison with the best that have been produced by the war. It was brought about through the coöperation of more than a score of engineers who pooled their skill and trade secrets in the war emergency, working with the encouragement of the Aircraft Production Board, the War Department and the Bureau of Standards. Standardization was the engineering objective because of the necessity for speed and quantity production.

Two of the best engineers in the country, continues the statement, were charged with the task of developing the desired motor and, within 28 days after their first conference, had the first engine in running order in Washington. Parts of it were turned out at 12 different factories, located all the way from Connecticut to California. Untried construction was not permitted in the design, and the new motor embodies the best thought of engineering experience to date. It is possible to build it in four models, ranging from four to 12 cylinders, and under the standardization plan now worked out, an eight-cylinder or a 12-cylinder model can be made, using the same standard cylinders, pistons, valves, cam shafts, and so on. This will make the question of repairs back of the lines a comparatively simple matter. The parts of wrecked eight-cylinder or twelve-cylinder engines will be interchangeable, and a new engine may be assembled from the parts of wrecked machines.

British and French machines as a rule are not adapted to American manufacturing methods. They are highly specialized machines, requiring much hand work from mechanics who are in fact artisans. It would require a year or more to teach American manufacturers and their mechanics to turn out such highly specialized airplanes.

Opposition To Purchasing Plan

Opposition by navy officials to the purchasing plan of the new War Industries Board has developed, and an effort to have Congress test its legality has been made. The decision of the new board not to advertise publicly for bids nor to give information about bids, contracts or prices lies at the bottom of the whole affair, it is said. Officials of both army and navy claim that this is contrary to law; that bids must be advertised and statements be filed and returns made at the Department of the Interior. They fear that the Government will be gouged of millions, if secret noncompetitive bidding is permitted. As a striking instance of this, the New York *Sun* says that the War Department regulated the price of zinc for classes A and B at a price of 13½c., which subsequently was changed to 12½c., and contractors were told they must accept this price for large orders without comment or discussion. The market price later dropped to 10c., so the contractors were forced to gouge the Government by charging more than they wanted to ask, and simply because this was the "Government regulated price" for zinc. This example, it is said, is typical of how the price-regulating idea is working.

Stevens' Work in Russia

The American Railroad Commission which, under the direction of John F. Stevens has been investigating transportation conditions in Russia, has planned to commission a number of practical transportation men as officers in the corps of engineers for immediate service in Asiatic Russia, according to the New York *Evening Sun's* special correspondent. Division superintendents will generally receive the rank of major. Trainmasters, yardmasters and roadmasters will be captains and first lieutenants, while shop foremen, train despatchers and bridge and building foremen will rank as second lieutenants. At present it is not intended to send enlisted men to Russia, as the disorganization there is the result of lack of intelligent direction rather than shortage of labor.

The men who are accepted for service will find themselves faced with problems which will call for their best efforts. Not only have the roadbed and rolling stock of the Trans-Siberian line been permitted to deteriorate, but the organization has completely disintegrated so that operation of trains over the 6000-mile line has been reduced to a minimum in the face of maximum demands. Only five or six short trains are being run each day out of Vladivostok, and material urgently needed for the Russian armies has overflowed the docks and is piled on the ground. German agents have added to the confusion in various ingenious ways. Cars have been deliberately misrouted so that they were sent to points thousands of miles from their proper destination; sand has been mixed in the packing of car journals, causing them to run hot and burn, and numerous other forms of sabotage have come to light. It is probable that the plan adopted will call first for American control of the Vladivostok terminals and that American officials will subsequently assume the operation of one division after another.

Embargo on Sicilian Sulphur

The export of sulphur and its products from Sicily, without license, has been forbidden by the Italian government. Crude and refined stocks, accumulated since Aug. 1, are to be inventoried by the Consorzio; all persons, including mine owners, holding sulphur must declare it. The Consorzio is empowered to send its agents to the mines to determine the amount on hand or subject to sale under foreign contract. Trade returns of the supplies on hand must be made on the first of each month to the Commission of Industrial Mobilization. Production of sulphur in Sicily has declined, owing to conditions of labor, food, machinery and transport, and hoarding for speculation has been common. The embargo serves to hold up large quantities contracted for by neutrals.

To Regulate Coal at Retail

To apportion the coal supply and regulate the retail sale of coal, the Fuel Administrator, Dr. Harry A. Garfield, has adopted a plan of appointing a representative and a committee of citizens in each state and territory who will assume direction of the sale of coal in their state. No one connected with the local coal industry will be selected. Each state representative will, in turn, directly choose a subcommittee of citizens to represent the Fuel Administration in each county of the state and in each city having more than 2500 population.

The state committee will at once ascertain the amount of coal in the state available for use during the coming winter and the amount needed to meet any deficiency, based on last year's consumption. It will be the duty of the various committees to ascertain the reasonable retail margin, namely, the cost of local distribution plus a reasonable profit. This margin when fixed by order, together with the cost at the mine named by the President, the transportation charge and the jobber's commission (when sold to a jobber), will constitute the price to the consumer. The Fuel Administration will make public through its local committees in each community sufficient data to enable the individual consumer to ascertain for himself the established price. The Administration may, if necessary, apportion the supply of coal with regard to the greatest existing needs. Much of the coal available for the coming winter is subject to contracts which are allowed to stand for the present, but which greatly limit the amount to be placed on sale at prices based on the President's order.

England's Scheme for Coal Supply

With the object of saving 700,000,000 ton-miles annually in the transport of coal by railway for inland consumption, England has been divided into 20 areas, according to a consular report from London. The scheme does not affect water-borne coal, or coal for export, bunker fuel, anthracite or coke. It is based on four principles: (1) That consumption of coal should take place as near the producing point as possible; (2) that in view of the superior facilities afforded by the main trunk lines, the movement of traffic should follow these routes wherever possible; (3) that the movement of coal should, as far as possible, be in well-defined directions, such as north to south, or north to southeast; (4) that an area producing a smaller quantity of coal than suffices for its own needs should not send any portion of its output to other areas, and that one producing more coal than it requires for consumption within itself should distribute the remainder only to adjacent or convenient areas. Where fuel of a special type not obtainable in the area is needed for certain purposes, such as for mechanical stokers, gas producers, etc., certificates may be obtained authorizing such supplies.

The new regulations will not affect the movements within an area of the coal produced and consumed in that area and contracts for such coal remain valid. Other contracts, however, were abrogated as from Sept. 8 and all new contracts involving movement between areas became effective Sept. 10. District committees on coal and coke supplies in each area are charged with carrying out these arrangements. To protect consumers' interests, one member, unconnected with the coal trade, has been appointed to each committee. By this scheme, collieries in each area will be placed in direct touch with the consumers whose supplies they will have to provide. The question of prices will be in the hands of the coal controller's department who will be bound by the coal prices limitation act.

Less Coal to Canada

The recent order of Judge Robert S. Lovett, forcing the railroads to give priority to coal shipments to lake ports for trans-shipment to the Northwest, was ineffective; the coal reached the lake ports but more than 30% of it went from there into Canada. Hereafter Dr. Harry A. Garfield will supervise all coal exports. No coal will be exported from the United States without a specific license and shipments to Canada will be curtailed until the situation in the Northwest is relieved. Rembrandt Peale, president of Peale, Peacock & Kerr, of New York, and John P. White, president of the United Mine Workers of America, have been appointed as Dr. Garfield's advisers. Mr. Peale has severed his official connections to serve.

Organizing Gas Defense Service

Gas masks and other appliances to protect United States troops against asphyxiating and poisonous gases used in warfare must be supplied by the Army Medical Department. To that end, therefore, a Gas Defense Service, including the necessary over-sea repair sections for work abroad, is being organized. The Surgeon General has announced that 50 men are wanted immediately who have skill and experience in one or the other following lines of work: Mechanics, glass blowing, pipe fitting, electricity, carpentering, blacksmithing and chemistry. In addition there is an opening for about 100 men to do routine factory work.

Cars Ordered South

Over 115,000 empty freight cars were ordered into the South and Southwest, between May 1 and Aug. 31, by the Car Service Commission, without regard to ownership, to protect the movement of food products and to assure prompt delivery of lumber to cantonments and shipyards. Several thousand were also used to ship more phosphate rock and materials for munitions. Similar action is being taken at present throughout the country wherever necessary.

Lumber Is Replacing Steel

The scarcity of steel and iron is compelling greater use of timber for structures of all kinds. In response to a strong demand for information as to timber construction the engineering bureau of the National Lumber Manufacturers Association is coöperating with the General Fire Extinguisher Co. in furnishing typical plans for mill buildings. This is to be followed by drawing up proper specifications for the construction of such buildings. A bulletin is also being prepared by the bureau upon "Heavy Timber Highway Bridges" for the same reason. The bureau has made recommendations to the Council of National Defense in regard to the construction of army storage buildings.

Liberty Loan All Paid In

The final instalment of the Liberty Loan brought into the Treasury on Aug. 30 almost $400,000,000. Approximately $1,615,000,000 had already been paid in representing principal and interest on the bonds. The bonds themselves are expected to be ready for distribution in a short time. Subscriptions to the second Liberty Loan will be opened not later than Oct. 1 and will close on Nov. 1, Secretary McAdoo announces. The size of the loan and the interest rate have not yet been made known.

Limiting Preferential Shipments

Business men who wish to apply for preferential shipment under the terms of the recent act of Congress are warned, in a special bulletin of the Chamber of Commerce of the United States, that preference can be granted only when essential to national defense and security. When such applications come to be considered, attention will probably be given to the way in which such business men are contributing to defense and security.

Bromate Defect in Ammunition

Potassium bromate in the chlorate of potash used in the primer is said to have been the cause of the defective ammunition shipped to the American Expeditionary Force in France. The bromate in the presence of free sulphur, which exists in these primers, causes deterioration after a few months, resulting in hangfires and mis-fires.

Hoover's London Representative

Louis P. Sheldon, associated with a London banking firm, is now representative of the Food Administration in London. He will deal with the British food controller to secure close coöperation between this country and England in regard to the control of food. He is a Yale graduate and will probably become an attaché of the American Embassy.

APPLICATIONS FOR LICENSES TO EXPORT gold from the United States will be passed upon by Albert Strauss, of J. & W. Seligman & Co., of New York, who has been appointed as official expert by the Federal Reserve Board.

Industrial News from Washington

BY OUR SPECIAL CORRESPONDENT

Senate Passes Explosives Bill

After ineffectual efforts to place the licensing of explosives in the hands of the Secretary of War, and to make it apply to small arms- and shotgun-ammunition, the Senate passed the explosives bill as amended by the Senate Committee on Mines and Mining. Owing to the radical changes made in the House bill and the addition of an appropriation of $400,000, it is anticipated that considerable difficulty will be met before an agreement can be reached in conference. The House bill empowered the United States Bureau of Mines to formulate rules and regulations to govern the handling of explosives. The Senate committee objected to delegating this authority to the Bureau and, in conjunction with the Director of the Bureau and the agents of explosives manufacturers, worked out a definite set of laws. These regulations are modeled after the English act controlling the handling of explosives.

The principal opponent of the bill was Senator Bradey, of Idaho. He objected strenuously to delegating the administration of the bill to the Bureau of Mines. His argument was that the bill is a war measure, providing means for the common defense and should be administered by the Secretary of War. His amendment to this effect, however, was lost overwhelmingly. Senator King, of Utah, opposed the bill because "it superimposes the Federal authority upon the states and establishes a licensing system that certainly must be obnoxious to any person who has any idea as to the powers of the states to regulate their own internal affairs."

Decision on Pyrites Imports Wanted from Shipping Board

In view of the evident reluctance of capital to invest in the further development of deposits of domestic pyrites, so as to meet the increased demand for sulphuric acid, the Shipping Board is being urged to state its intentions definitely as to releasing ships for importing Spanish pyrites. If it decides that more vessels cannot be spared, domestic producers would be insured a market and would, therefore, probably succeed in obtaining the capital necessary to cover the initial expense of development work. If, on the other hand, it decides that the situation warrants the placing of additional vessels in Spanish trade, sufficient to remedy the shortage of pyrites, it would relieve several Government agencies of the extensive work now going on to encourage pyrites production.

The Shipping Board inquired of Government specialists why the United States, a large exporter of sulphur, should be a large importer of pyrites, and why sulphur ordinarily exported could not be kept at home, thereby offsetting, to some extent, the need of importing pyrites. In reply it was stated that the pure sulphur exported goes into explosives and acid. If it were not sent, these products would have to be exported, thereby forming more bulky and dangerous cargoes and requiring a greater amount of tonnage than the easily handled dry sulphur. Estimates that 1,500,000 tons more of acid will be required next year than were used this year are much too high, in the belief of the specialists. Means of economizing in the use of sulphur are also being studied. Two-thirds of the output of this country is used in making paper. In the treatment of each ton of paper pulp, one-eighth of a ton of sulphur is used.

Favorable Report on Potash Bill

The potash-leasing bill has been reported favorably to the House by the Public Lands Committee. Minor amendments were made, one extending the authority of the Secretary of the Interior to issue licenses to such public land as may contain potash in Sweetwater County, Wyo.; if the lands contain coal, the coal is to be reserved to the United States. Another amendment limits prospecting rights to two years and specifies that the leases must be renewed every 20 years. It is also provided that funds collected from royalties or rentals are to become part of the reclamation fund.

Before reporting, the committee heard a number of witnesses, including the following: George Otis Smith, director of the United States Geological Survey; Judge E. C. Finney, representing the Secretary of the Interior; J. D. Penock, chairman of the subcommittee on soda and potash of the Council of National Defense; John M. Rankin, of the American Potash Co. and others Director Smith, Judge Finney and Mr. Penock presented such an array of facts and figures, showing the urgent necessity of developing the potash contained in Searles Lake, that the numerous objections to the bill offered by members of the committee were soon overcome.

Mr. Penock expressed the opinion that plants capable of extracting 100 tons of potash daily from Searles Lake can be completed in six months, provided the Government will facilitate the furnishing of steel plates needed for the evaporating cans. He declared that private capital is ready to finance plants that will cost a million dollars.

Profit in Kantishna Gravels

Placer gravels in the Kantishna region of Alaska may be worked at a profit when the Government completes the railroad along the Venana River, because of the reduction of costs due to better transportation, states Stephen R. Capps of the United States Geological Survey. Coarse gold is found in encouraging quantities along many streams in the region.

All the Government's requirements of metals have been met in full to date. This has been made possible, said a member of the War Industries Board, only through the coöperation of producers.

Editorials

Revised Statistics of Copper Production

In our issue of Jan. 6, 1917, we published our preliminary statistics of the copper production of the United States and the world. In accordance with our usual custom we present herewith our revised statistics, compiled in the light of later and more complete information than it was possible to obtain within a day or two after the termination of the calendar year. We are tardy with this revision, but the alterations from our preliminary figures are so slight that our delay has been immaterial.

With respect to the copper production of the United States the revised figures are but slightly different from the preliminary, the change in the grand total being less than 1,000,000 lb.

WORLD'S PRODUCTION OF COPPER (*)

(In Metric Tons)

Country	1913	1914	1915	1916
United States.......	555,990	525,529	646,212	881,237
Mexico	58,323	36,337	30,969	55,128
Canada.	34,880	34,027	47,202	47,985
Cuba	3,381	6,251	8,836	7,816
Australasia.........	†47,325	37,592	32,512	35,000
Peru	27,776	27,090	††32,410	††41,625
Chile	39,434	40,876	47,142	64,636
Bolivia	†3,658	1,306	**3,000	**4,000
Japan	†73,152	§72,938	‡75,415	‡81,280
Russia	†34,316	†31,938	‡34,918	**31,500
Germany	†25,308	†30,480	**35,000	**45,000
Africa.	†22,870	24,578	27,327	34,572
Spain and Portugal..	54,696	†37,099	**46,200	**42,000
Other Countries.....	†27,158	†25,176	**25,000	**25,000
Totals	1,008,267	931,217	1,092,143	1,396,779

* The statistics in this table are our own compilations, except where specially noted to the contrary. † As reported by Henry R. Merton & Co. ‡ As officially reported. § Privately communicated to us from Japan. ** Estimated. †† Communicated by L. Vogelstein & Co.

However, in figuring the supply of crude copper available to American refiners we made an error in figuring the imports, which were in fact about 66,000,000 lb. less than we reckoned last January. This reduced the apparent surplus of production of crude copper as compared with refined copper, the actual surplus for 1916 being only about 130,000,000 lb., instead of 200,000,000 lb. previously reckoned.

The most interesting of the tables that we now present is that of the world's production of copper. The grand total is only 100 tons different from what we reported last January. This is not so much a tribute to our accuracy as it is the result of accident, early errors plus and minus having proved to balance each other. However, the present total is subject to further revision, for there are countries for which we still lack true figures. But any changes that may result from further revisions will not affect the grand total in any such way as to alter its commercial significance.

The statistics of this table are computed upon the uniform basis of crude-copper production, and would be found to differ somewhat from statistics of refined-copper production, if such were available, for reasons well known to experts. The statistics for the United States, Mexico, Canada and Cuba are based on reports from all the producers directly to us. It will be observed, perhaps, that our statistics of Canada differ from the Canadian official statistics. The reason for such difference is that a good deal of Canadian ore comes into the United States for smelting. We do not reckon it as production until it has been smelted and the copper actually produced. The statistics for Peru and Chile, moreover, will be found to differ from the official statistics of those countries, a similar reason applying in their cases.

The statistics for Africa are derived from the official reports of the Union of South Africa and Rhodesia, to which we have added the production of the Union Minière du Haut Katanga and copper smelted in the United States from ore imported from Africa.

With regard to the production of Spain, we have the official report of ore mined. We arrived at our figures by estimating an average yield of 2% copper from that ore. We cannot arrive directly at the production of blister copper, for the portion of the Spanish output that is smelted in England is not reported. The official reports as to crude copper smelted in Spain indicate the substantial accuracy of our totals derived in the manner above described. As to Russia we have had nothing but information that the copper production in 1916 was about 10% less than in 1915, and we have estimated on that basis.

SMELTERS' PRODUCTION OF COPPER IN THE UNITED STATES

(In Pounds)

State	1913	1914	1915	1916
Alaska	24,452,000	24,288,000	72,621,844	115,933,315
Arizona	399,849,745	387,978,852	444,089,147	692,630,286
California..........	32,390,272	29,515,488	37,935,893	51,358,334
Colorado...........	7,670,090	10,104,579	8,126,000	9,802,183
Idaho	8,434,028	4,856,460	5,602,000	6,741,001
Michigan..........	159,437,262	157,089,795	241,123,404	270,058,601
Montana	285,336,153	243,139,737	268,027,557	351,995,058
Nevada	84,683,961	60,078,095	66,394,906	100,143,431
New Mexico........	46,953,414	64,338,892	75,515,138	83,013,805
Utah	147,591,955	153,555,902	180,951,174	225,396,808
Washington	448,805	165,023	*	*
East and South.....	24,333,014	19,213,965	18,858,677	20,018,261
Other States........	4,155,135	4,257,088	4,452,420	15,685,226
Totals..	1,225,735,834	1,158,581,876	1,423,698,160	1,942,776,309

* Included in "Other States."

SMELTERS' TOTAL PRODUCTION

(In Pounds)

Source	1913	1914	1915	1916
North American ore.	1,438,565,881	1,327,488,479	1,612,450,828	2,187,328,864
Foreign ore.........	55,803,202	50,101,308	44,749,105	73,391,517
Scrap	22,427,889	20,894,559	29,827,203	37,380,759
Totals	1,516,796,972	1,398,484,346	1,687,027,136	2,298,101,140
To foreign refiners...	36,682,605	36,765,920	39,734,120	38,423,577
To American refiners.	1,480,114,367	1,361,718,426	1,647,293,016	2,259,677,563
Crude copper imported	169,315,869	131,125,076	140,415,341	171,391,347
Total crude copper	1,649,430,236	1,492,843,502	1,787,708,357	2,431,068,910

As to Germany our figures for 1915 and 1916 are pure conjecture. Previous to the war Germany used to produce about 25,000 tons of copper per annum, without much variation from year to year. We know, of course, that since the beginning of the war Germany has been using every effort to increase her copper production, not only from the Mansfeld mines, but also by the exploitation of deposits of very low-grade copper-bearing pyrites. Henry R. Merton & Co., whose statistical reports are reliable, credited Germany with a production of 30,480 tons in 1914. We imagine that the German production must have risen to as high as 45,000 tons in 1916, perhaps higher. In 1916 Germany probably obtained copper also from the mines at Bor, in Servia, which are included under "Other countries," the estimates for which are also nothing but conjecture.

The statistics of the world's copper production show clearly enough why copper was scarce and high in 1916. In 1915, there was a gain of only about 9% over the production of 1913. In 1916 the gain over 1915 was about 300,000 tons, which was something less than 30%. These figures have reference to crude-copper production. The refined-copper production was less. In 1915, the North American production and importation—the total crude copper available to American refiners—was about 125,000,000 lb. in excess of the production of refined copper. In 1916, the excess was about 130,000,000 lb. These excesses reflected the deficiency of refining capacity and implied the existence of large accumulations of crude copper at the beginning of 1917. Had it not been for them, the refiners would not have been able to operate so long as they did after the curtailment of production by the strikes beginning last June. These figures refer only to the position of American refiners, but, inasmuch as they handle the bulk of the world's copper, the situation abroad, whatever it may have been, does not affect conclusions materially.

If the world's consumption of copper previous to the war was about 1,000,000 tons per annum, it is clear that the consumption in 1915 was no larger, while the consumption in 1916 or rather the delivery, was probably 30% higher. It used to be a rule, before the war, to estimate an average increase of about 10% per annum in copper consumption for normal purposes. The production and consumption in 1916 was no larger than might reasonably have been expected had there been no war. Rising prices, even up to the quotational average of 27.2c. for 1916, were necessary to stimulate the required production. Comparing 1916 with 1913, it appears immediately that the United States has supplied the bulk of the new production, Chile being the only other country to exhibit a phenomenal gain, which even in that case was due to the enterprise of American capital. In making any governmental regulations to check the profits of American copper producers, it is important to consider what may be the effect upon the production elsewhere of a metal that is greatly needed, and not very easy to get.

Silver Above $1 Per Ounce

THIS week silver has been quoted at $1.05½ per oz. This is the highest price since the early '90s. The quoted figure is the official price, which is based on the London price, less cost of transportation to that market. However, transactions have been made by American producers for delivery to other markets, especially to the Far East via Pacific ports, at $1.07@1.10.

The extraordinary rise in the price for silver is due primarily to diminished production and to large demand from the Far East, and also to European demand for coinage purposes. Even the American Government has been a buyer of silver for coinage, though why it should be so, when it holds about 350,000,000 oz. of silver against certificates issued for currency, is a mystery. Washington bought that silver during the '90s at prices considerably below the present market.

If American silver certificates should be called in and replaced by other forms of currency, and if the hoarded silver should be offered for sale, further advance in the price for silver would probably be checked. The American hoard is about two years of world's production at the rate of 1916. However, it is not expected that Washington will do anything so sensible as to sell its silver.

Government Purchasing of Copper

THREE weeks ago everybody looked for the price of copper to be fixed before the day was ended. Two weeks ago, ditto. One week ago, ditto. Today, ditto. Everybody has been talking about "fixing the price of copper" as if it were analogous to fixing the price of wheat and of coal. We do not think it is anything of the sort, for the simple reason that nobody in Washington has any such authority. Congress conferred upon the President authority to fix prices for wheat and coal, but nothing else.

The matter of copper is rather a negotiation between the Government and the producers for the supply of what the Government needs. The producers naturally want what they consider to be reasonable terms; and, on the other hand, the Government wants to buy as cheaply as possible. As a lever for the latter purpose, the Government caused a report on cost of production to be made by the Federal Trade Commission. Finally, the Government, if unable to get what it regards as a fair price, has as a club the right to commandeer for its requirements, but it can not commandeer for other purposes.

If there had been any subordinate central authority in Washington, we imagine that the negotiation between that authority and the producers would have been consummated long ago, but there is none such. If the War Industries Board had entered into an agreement, the Navy Department as a whole would have been inclined, very likely, to repudiate it. If the purchasing department of the Navy Department had entered into an agreement, the Secretary of the Navy would likely have repudiated it. Such things have actually happened. Even now there are some officials of the regular bureaus who are charging that all arrangements made by the War Industries Board are illegal, the laws providing that goods may be bought for the Government only upon competitive bidding. Certain arrangements have lately been rescinded and competitive bids have been requested. As a side light upon these views is the knowledge that when the War Industries Board needs to buy copper for the Allies, it goes ahead and does it, not being subject in that matter to the vagaries of the bureaus.

Therefore in the matter of the copper negotiation, which, as we have said above, relates to the Government purchase of copper and not to any arbitrary price-fixing for the commodity, we conjecture that things have come to such a pass that the only expedient is to negotiate a price and put it up to the President for confirmation, so that the controversial and contrary officials of the several bureaus will thereafter and forever hold their peace.

We fancy that the delay has been due partly to inability to obtain the prompt attention of the President, who has many other things to think about. In the meantime, as we said last week, on the direct authority of Mr. Baruch and Mr. Meyer of the War Industries Board, no intimations respecting the probable price have been made. Owing to the fact that any information which looked authoritative or reasonable has been used effectively in the stock market, all possible care has been taken to keep secret the progress of the negotiations.

Taxation of Mining War Profits

NOW that the main lines of the revenue bill have been fixed, we may begin to see how the war-profits tax is going to fall on mining companies, especially the copper companies. Apparently the conferees, who are adjusting the differences between the bills passed by the House of Representatives and the Senate, are going to abandon the idea of excess profits, are going to allow corporations an exemption of 8% on their capital in the taxable year and are going to tax profits in excess of that exemption by a graduated scale running up to 60%.

That the system is full of complications and uncertainties with respect to many mining companies and is outrageously unfair to all of them is immediately evident to any expert. Yesterday we telegraphed to the members of the conference committee as follows:

> We urge conferees to discriminate respecting war profits of mining companies. The yield of a mine is exhaustion of principal. A mine yielding 10% on investment affords only 7% net when it has assured production of 20 years. Few mines have any such assurance. For probable life of 10 years gross yield must be about 16% to afford 7% net, the difference being return of principal. Taxation that fails to recognize this borders on confiscation.

The above summarizes the great injustice. But there is another that is equally unjust, or nearly so. That is the exemption based on capital. Many of our important mining companies are capitalized at low figures, although the market has long capitalized them at figures running anywhere from five to 10 times their nominal par value. In figuring exemption on the basis of capital some of these companies will show excess profits at the rate of 1000 or 1200%, and taxation will take more than 50% of their entire net profit.

Finally, the revenue bill is extremely indefinite as to what is capital. Section 207 says that it does not include money or other property borrowed, but means (1) actual cash paid in, (2) the actual cash value for property paid in other than cash for stocks or shares in such corporation or partnership at the time of such payment, and (3) paid-in or earned surplus and undivided profits used or employed in the business. The term "capital for the taxable year" means the capital as of the first day of the second half of such year.

The construction of those vague provisions on a subject respecting which a bulky treatise might be written is going to be difficult. For example, who is going to define and determine what is "earned surplus and undivided profits used or employed in the business?" Let us point out, moreover, that the determination of capital as of the middle of the year corresponds with the custom of but a few companies in publishing financial statements.

Price Fixing—How It Works

EVIDENTLY the authorities in Washington are discovering that price fixing is not all that it was cracked up and supposed to be. Many disagreeable things have happened that have given the price fixers jolts.

It has been notorious that the cost-plus-10% theory, applied to construction and manufacturing, was a direct invitation to exorbitant demands by the workmen and extravagance on the part of the contractors, who readily acceded to demands of the workmen, and other things which increased the cost and consequently the profit at 10%. Knowledge of this condition has seeped back into Congress, where this week it has been the subject of angry representations.

The price of bituminous coal was fixed arbitrarily and operators in several districts were obliged to go to Washington to protest that they could not afford to produce at the price fixed, and that if the Government adhered to it and wanted the coal from their mines, it—the Government—would have to operate the mines on its own account. Now there is talk of the Government raising the price.

The Government bought zinc both at a fixed price and by competitive bidding. Since then the price of zinc has gone down. Manufacturers to whom the Government is allotting zinc supply are protesting against being billed for it at the Government price, when they could buy it in the market for less. Of course, that is a sort of baby talk of the order of "What I might have done but didn't." However, it is an indication to the Government of the advisability of letting things alone.

The Government has been buying lead at 8c. per lb., but has so stirred up things by its mischief-making that it has paid considerably higher prices in purchases for the Allies. Now the lead market is declining and may possibly go below the price fixed by the Government (we do not say that it will, but, supposing that it does, we may expect to hear of more squealing and repudiation by the Government, which does not appear to be influenced by the ordinary business ethics of facing the music). In the meantime, the difficulty of making an equitable allotment at what are supposed to be bargain prices becomes increasingly evident. Not long ago, the *Deseret Evening News*, of Aug. 23, 1917, reported as follows:

> At the meeting of the lead producers of the state, in the offices of the Utah Chapter of the American Mining Congress, it was decided yesterday afternoon that on account of many of the producers' representatives being out of town a committee be appointed to draw up a statement of the many complaints that are made as to the present method of the Government in demanding a portion of the lead production. The latest request is for one-fifth of the lead output of the mines for August, September and October, f.o.b. East St. Louis, at 8c. per lb., while the local settlement price is 11 cents.
>
> It was pointed out that lead was the only metal that was being treated in this way; that the market should be left free and Government purchases should be made in the open market as is being done with other metals; that the Government could fix a tax that would be better than fixing an arbitrary price; that the little operator with a hand-to-mouth existence would be hurt by giving up one-fifth at the Government price; and that the present method tends to breed uncertainty and tends to hold back the development of lead-silver mines.
>
> One point that was brought out rather forcibly was whether it was not necessary to present the matter of consenting to selling one-fifth of the output for a quarter to the

stockholders, whether the directors could handle it or whether the matter was in the hands of the manager.

Besides these points there is the question of whether the state will demand a net proceeds tax on the Government sales, whether the Federal Government will allow this as a proper deduction in the income tax, and as to just how it will work out with the various city, county, state and Federal taxing bodies.

From the Coeur d'Alenes come wails from the producers, with whom the American Smelting and Refining Co. splits the excess over 4c. in the price of lead, over the fact that their lead is supplied to the Government at a cut price, and there are intimations that this arrangement plays especially into the pocket of the American Smelting and Refining Co. This was the talk when lead was around 10 to 11c. If the price should decline below 8c., the talk would be different.

(Since this article was written the price for lead has indeed declined to 7¾@8c.)

We are not at present expressing any opinion about the several complicated matters, except to point out the hazards that the Government is introducing in disturbing the balance of trade. What has been done in Washington with respect to the metal industries (other than with iron and steel, whereof we do not know so much) has been the tampering of amateurs. There is nobody in the Government councils, that we have heard of, who has more than a kindergarten knowledge of the copper, zinc and lead industries and trades. Notwithstanding all of its facilities, its power to command and enforce obedience, the Government does not possess an intelligence department that would hold a candle to those of some private concerns. We doubt if it has any intelligence department at all. It talks about cost of production and consults amateurs of the Federal Trade Commission, who report their immature opinions of what costs *have been*, while the Government is in ignorance of what conditions *are*. The advice of experts who are producers is flouted on the theory that they are disingenuous.

What the Government ought to have done in the beginning was to appoint a metal board of disinterested experts. This suggestion was made to responsible authorities at a very early date, but was simply acknowledged with a reply that the ground had already been covered. It is by this time perfectly evident that not only was the ground not covered but also that the authorities did not know what the ground was or is. They do not yet know. Therefore it is high time that they begin to learn. It is not yet too late to correct the mischievous bungling that heretofore has characterized operations in the metal industries. Some day it may be too late.

A great university cannot be created or maintained by merely appointing a president. A single individual cannot by his own unaided efforts make such an institution successful. This can only be accomplished when its head succeeds in getting every individual connected with it to be enthusiastic for his plans and working whole-heartedly for their fruition. For several years Colorado's School of Mines at Golden has been floundering in the turbulent seas of internal dissension and political influence to the great disgust of its loyal and once enthusiastic alumni. Its former president has again been placed at its head, despite the expressed opposition of many alumni and others who have been closely associated with the development of the institution. There will be little chance of the school being restored to its former usefulness with a man as president who is such a storm center as Dr. Alderson. The marked opposition of numerous alumni was sufficient to have disqualified him. Without reference to the qualification of Dr. Alderson—and many alumni protest this point—the appointment is not one to bring harmony to the institution, and its president, like Caesar's wife, should be above reproach. The rehabilitation of the school requires the hearty coöperation of faculty, students and alumni, which seems doubtful under the present régime.

We have been unable to secure a statement regarding the Minerals Separation-Miami flotation decision, in which the attorneys for both sides concur, and therefore still withhold an announcement of the result of this suit.

BY THE WAY

It would appear from recent disclosures that in Jerome "those who drill for copper" drill also for gold.

Our idea of zero in "inside information" is the following from a Western broker's letter to customers: "Information we have from reliable sources is to the effect that gold will increase from its present price of $20 an ounce to $30 an ounce." Then comes the usual offering of their discovery of an exceptional mine, and then this clinches: "Canadian and British syndicates are searching this country for gold properties because gold is staple and the ratio of its buying power is sure to increase to meet the present unusual world conditions. The credit of the European countries is overdrawn, and they must have gold reserves."

Representative Jeanette Rankin, of Montana, appearing on Sept. 18 before the House Mines and Mining Committee, at a hearing on her resolution to amend the food-control law to give the Government control of all metal mines, renewed her attack on the Anaconda Copper Mining Co. Miss Rankin reiterated that the copper operators through the "rustling-card system" have practically created a black list. Through control of the votes they elect their own Federal judge and for 20 years have controlled the government of Montana, she declared. Miss Rankin charged that men are discharged if they attempt to form a union or enter any complaint about working conditions. The workmen's compensation law is so juggled that it means nothing in the long list of copper-mine casualties, she insisted. Miss Rankin said the rumored price to be set for copper—24c. per lb.—is very much too high. The last Government contracts, she pointed out, had been closed at about 16c. (On this subject the lady from Montana would do well to consult her constituents. They do not want 24c. copper, much less 16c. They want it at about 30c.) Chairman Foster of the House Committee on Mines and Mining was instructed by his committee to ask the Federal Trade Commission and the Council of National

Defense for information on the cost of producing copper. This action was taken after Miss Rankin had said that production costs would probably be found to be between 5 and 10c. per lb. She stated that the Council of National Defense and the Trade Commission had refused information to her and that she had written to Bernard Baruch, asking him to refuse to buy copper for war use from the Amalgamated Copper Co. unless that corporation should modify its attitude toward labor.

As the years roll by, the American language gathers in new words from all sources, as is quite proper in such a polyglot nation. Of late, the war has brought us some expressive terms that we have adopted instinctively. Of these the greatest is camouflage. What is camouflage, do you ask? Camouflage is old. It is the serpent in the Garden of Eden. It is the hairy glove of Jacob. It is the horse of Troy. It is the wooden nutmeg of Connecticut. It is the mermaid of the side show. It is the lovely, pointed beard of the youthful medico with a receding chin. It is the rouge and the powder of the passé chicken. It is the "fraction of 1% oil" in the flotation process.

According to press items, a "new scheme for tunneling the English Channel, originated by J. K. Hencken, New York civil engineer, is being considered by the British Cabinet. With his tunneling machinery cutting at the rate of 100 ft. per hour, with eight machines working, four from each shore, the inventor thinks the tunnel might be put through in 35 days, and that it may be possible to have four tunnels in operation for use of the Allies within a few months." The myth of the tunneling machine is a good deal of a nuisance. In view of the fact that no one has yet been able to develop a useful machine for peaceful purposes, although many have tried, we do not think that anybody is going to drive a tunnel under the English Channel in 35 days or that the British Cabinet will give any serious attention to any such proposition.

Statement Regarding Drilling Fake at the Jerome Verde

Through unfaithful drillers, in the employ of the Jerome Verde Copper Co., a false report was circulated regarding a supposed orebody. The drillers claimed to have made the strike just before they went off shift, the morning of Apr. 19, 1917. Both are understood to have realized handsome profits by stock-market dealings, placing their buying orders early by routing a local broker out of bed in the "wee small hours."

Consulting Engineer H. P. Henderson suspects a conspiracy, since a crosscut driven to the point in question failed to confirm the results indicated by the drill core that was submitted by the drillers. In order to place the company in a proper light in the estimation of the public, Mr. Henderson has issued a signed statement regarding the incident that boosted the Jerome Verde stock. The statement is as follows:

> During the morning of Apr. 19, it was reported to J. B. Harper, superintendent of the Jerome Verde Copper Co., that the diamond drill operating in the Verde property had passed through 2 ft. of rich copper ore. Mr. Harper immediately inspected the core, from which a representative sample assayed 27% copper. The drill runners stated that this was drilled from depth of 469 to 471 ft., and the core had been placed in the core box in this position.
>
> ### Unfaithful Drillers Discharged
>
> Mr. Harper soon ascertained that the drill operators had reported this discovery to individuals not connected with the Jerome Verde Copper Co. some time before reporting to him, and, in fact, the information was widely disseminated in Jerome by the time he was informed. The drill runners were immediately discharged for their dishonesty From information I have gathered, both from Mr. Harper and from acquaintances in Jerome, I believe there is no doubt of a conspiracy between the drill operators and certain individuals, resident in Jerome, for personal gain in the stock market.
>
> Shortly afterward we started crosscutting for the point at which the ore was reported. We have recently exposed the drill hole for 15 or 20 ft. on each side of the point reported, without exposing any ore whatsoever, although there are traces of copper not far distant.
>
> It appears, therefore, that the drillers not only delayed their report but "misreported" the facts. We are not certain whether the core was drilled from an earlier part of this hole, some other hole, or was drilled from fragments of ore obtained elsewhere. In such a case it is easy to detect the fact of collusion, but, from the nature of diamond drilling, difficult and expensive to determine the truth. The Jerome Verde Copper Co. has been put to considerable useless expense by this dishonesty.
>
> The number of stockholders in the Jerome Verde Copper Co. is so great that it is impracticable for the company to report to them directly at short intervals. The most feasible way of informing stockholders of developments is by making the information public, and Mr. Harper has been instructed to do this immediately after informing the officers of the company. We intend to make this information as accurate as possible.
>
> ### Drilling Program Will Be Continued
>
> The diamond-drilling program which we are carrying out on the Jerome Verde property is not intended to measure the amount of ore which may exist on the property, and is not planned primarily to discover ore directly. Since the ore-bearing formations are capped by sedimentary rocks, we have no knowledge of the distribution of the various formations below the cappings on the most of the property, and our diamond drilling is planned to determine the position, throughout the area of the property, of the more important geological features which have some relation to the ore deposits of the district, and to enable us to map the various underlying rocks, greenstone, schists and porphyries, the faults, and the zones of shearing, oxidization, jasperization and pyritization which may occur on the property.
>
> It is possible that some of these drill holes may encounter ore, but it should be remembered that the results of an ore exposure by a diamond drill hole should not be regarded as conclusive until confirmed by drifts and crosscuts, except possibly in the case of very large regular orebodies. For example, 5 ft. of core may be produced by a drill hole extending along a 5-in. stringer.
>
> By the comparatively cheap diamond drilling, therefore, we may or may not find the position of orebodies directly, but we confidently hope to secure geological knowledge that will enable us to direct our drifts and crosscuts in those parts of the property where conditions are most favorable to the presence of orebodies, thereby developing the best possibilities on the property with the greatest possible speed and economy.
>
> ### Effect of Fake Reports on Future Development in Jerome District
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> The success and economy of such a plan depends upon the accuracy of the work, and it is certainly outrageous that some of our results should have been falsified by certain residents of this district, through bribery or conspiracy with the former diamond-drill employees.
>
> Public sentiment in Jerome will be largely instrumental in determining whether further attempts of this sort are made. If any other of our employees are found willing to accept bribes it is probable that they will find it easier and more convenient to attempt a fake than to await a real discovery. Jerome can be made either a desirable or undesirable place of residence for persons who care to participate in such dishonesty, and both the reputation of Jerome and ultimately the amount of money available for opening up the undeveloped property of the district will depend largely on the prevalence of fake reports.

Personal

John M. Fox is in Telluride, Colo., on professional business.

Donald M. Liddell is making a two-weeks' trip through the Wyoming oil fields.

Lawrence Coman, lately on the Minnesota iron ranges, has joined the Engineer Corps.

A. L. Ferris, superintendent at Yaeger Hill, near Prescott, Ariz., has joined the army.

Robert E. Cranston left for Alaska on Sept. 1 for a six-weeks' trip on professional business.

E. K. Soper, of the University of Idaho, has been appointed dean of the Oregon School of Mines.

E. J. Haug has been appointed superintendent of the White Caps Extension mine at Manhattan, Nevada.

Stanley H. Zimmermann, lately at Morococha, Peru, has returned to this country to enlist.

James Cooper has returned from Chile, where he has been with the Chile Exploration Company.

F. Arthur Rigby, chief engineer for Witherbee, Sherman & Co., at Mineville, N. Y., has joined the army.

Irving A. Palmer has accepted the position of professor of metallurgy at the Colorado School of Mines.

F. W. Denton, vice president of the Copper Range mines, is making a trip to Boston and other Eastern points.

W. C. Phalen, of the United States Bureau of Mines, is inspecting manganese developments under way in California.

J. E. Johnson, Jr., of New York, has gone to the Pacific Coast on a professional trip which will require six or seven weeks.

Edward E. Free, of Baltimore, has been commissioned a captain in the Ordnance Corps, U. S. R., and called for active duty.

James MacNaughton, first vice president of the Calumet & Hecla Mining Co., has returned from a week's hunting trip in Canada.

H. D. Mullan, recently engineer at the Mass mine in northern Michigan, is superintendent at the Chippewa mine, near Ely, Minnesota.

Rodolphe L. Agassiz, president of Calumet & Hecla Mining Co., has returned to Boston after an extended visit in northern Michigan.

C. L. Kohlhaus, salesman for the Denver Rock Drill and Machinery Co., in the Michigan iron districts, is at the Battle Creek cantonment.

A. Chester Beatty has offered his London house as an American Officers' Hospital under the supervision of the Columbia Hospital Unit now in England.

W. A. Richelson, superintendent of the Victor Extension mine, at Jerome, Ariz., who has been taking a vacation at Houghton. Mich., has returned to the mine.

B. O. Pickard, assistant to the chief mining engineer of the United States Bureau of Mines, has returned from South Carolina, where he sampled various pyrite deposits.

A. T. Meyer has resigned his post as secretary to Van. H. Manning, director of the United States Bureau of Mines, to become chief clerk at the Lake Superior experiment station.

C. S. Ross, of the United States Geological Survey, has been detailed to coöperate with the North Carolina State Survey in investigating manganese and pyrites deposits in that state.

James Buchanan, of Washington, D. C., for a time with the United States-Canadian Boundary Survey, has joined the engineering staff of the Quincy mine, in northern Michigan.

Capt. A. M. Yonge, manager of the Costa Rica Manganese and Mining Co. on the Nicoya Peninsula, who has been in Washington for some weeks, has left for Playareal, Costa Rica, where he will be for about three months.

W. J. Croze and **B. E. LaLonde**, geologists for the Oliver Iron Mining Co., have just finished a test of manganese ores at the Michigan College of Mines with the assistance of J. B. Cunningham, instructor in the metallurgical department.

Fedor F. Foss, **Ivan M. Goubkin**, **Avenir A. Snietkoff** and **Alexander Stepanoff**, who constitute the Russian Mining Commission, now in this country, are on their way to the Michigan copper country on a trip arranged by Franklin Lane, Secretary of the Interior.

F. G. Cottrell, chief metallurgist of the United States Bureau of Mines, and **A. E. Wells**, superintendent of the Salt Lake City station, are visiting the more important Western smelteries in connection with the smeltery-fume work being done by the Bureau.

R. A. Lewis, general superintendent of the Lehigh plant of the Bethlehem Steel Co., has been appointed general superintendent of the Bethlehem plants, including Lehigh, Saucon and Northampton plants. **L. W. Adams**, superintendent of the Saucon plant, has resigned and has been succeeded by **Timothy Burns**, of the Maryland plant of the company.

M. A. Hanna & Co., Cleveland, has undergone the following changes in the firm: **Robert L. Ireland** has retired from membership and **L. C. Hanna, Jr.**, and **James D. Ireland** have entered the firm, which now includes in addition L. C. Hanna, Sr., Mathew Andrews, H. M. Hanna, Jr., F. B. Richards, William Collins and R. F. Grant. L. C. Hanna, Jr., has been for some time in Alabama. James D. Ireland has had charge of an iron property in Minnesota.

Societies

Coming Meetings

American Institute of Mining Engineers.	St. Louis...	Oct. 8-13
Exposition of Chemical Industries.....	New York..	Sept. 24-29
American Electrochemical Society..	Pittsburgh..	Oct. 3- 6
American Iron and Steel Association..	Cincinnati .	Oct. 26-27
American Institute of Metals	Boston	Sept. 25-28
National Association of Purchasing Agents	Pittsburgh..	Oct. 9-11

American Society of Civil Engineers—A paper entitled "Three 15-Cubic Yard Dipper-Dredges as Supplied and Used on the Panama Canal" was presented for discussion at a meeting in New York on Sept. 19. This paper was printed in the August, 1917, Proceedings.

American Association of Engineers, at its meeting on Sept. 5, organized chapters in St. Paul, Indianapolis and Milwaukee, making a total of seven chapters. The national organization has over 2200 members. Membership is being extended to all technical engineers in military service without payment of initiation fees or dues.

Mining and Metallurgical Society of America, New York Section, held its annual meeting and dinner on Sept. 12. The following were elected as officers for the ensuing year: H. H. Knox, chairman; J. V. N. Dorr, vice chairman; F. F. Sharpless, secretary. Fedor F. Foss and Ivan M. Goubkin, members of the Russian Mining Commission, were entertained as guests.

Iron and Steel Institute of Great Britain held its autumn meeting at the Institution of Civil Engineers, London, on Sept. 20-21. The following papers were presented: "Present Practice in Briquetting of Iron Ores," G. Barrett and T. B. Rogerson; "Microstructure of Commercially Pure Iron between A_3 and A_2," W. J. Brooke and F. F. Hunting; "The Influence of Heat Treatment on the Electrical and Thermal Resistivity and Thermo-electric-potential of some Steels," E. D. Campbell and W. C. Dowd; "New Impact Testing Experiments," G. Charpy and A. Cornu-Thenard; "Heat Treatment of Grey Cast Iron," J. E. Hurst; "Effect of Mass on Heat Treatment," E. F. Law; "Investigation upon a Cast of Acid Open-Hearth Steel," T. D. Morgans and F. Rogers; "The Acid Open-Hearth Process," F. Rogers; "The Eggertz Test for Combined Carbon in Steel," J. H. Whiteley; "Failure of Boiler Plates in Service and Investigation of Stresses Occurring in Riveted Joints," E. B. Wolff.

Industrial News

Karl Hanselmann & Co. have moved their offices to Laredo, Texas.

H. Kramer & Co., buyers and sellers of metals of Chicago, have removed their office, warehouse and foundry, to 1324-41 W. 21st Place.

Borden Co., Warren, Ohio, shipped recently to a customer in Oklahoma a full carload of Beaver Easy Working die stocks and Square End pipe cutters. It claims that this is the largest shipment ever made, consisting entirely of hand cutting and threading tools for pipe. The company is at present shipping on an average more than 100 Beaver tools per day for use on Government work. To date Beaver tools have been furnished in quantities up to 300 to 14 of the 16 army cantonments being built.

Trade Catalogs

Volute Centrifugal Pumps. Worthington Pump and Machinery Corp., 115 Broadway, New York. Bulletin W-600-A. Pp. 32; 6 x 9 in.; illustrated.

Pressure, Open Top, Elevated and Tank-Car Tanks, Reservoirs and Vats. Walter A. Zelnicker Supply Co., St. Louis, Mo. Bulleten No. 224. Pp. 2: 3½ x 8¾ inches.

Belt Buyers' Guide. Chas. A. Schieren Co., 30-38 Ferry St., New York. Booklet. Pp. 24; 4 x 8½ in.; illustrated. This contains data on the care of belting of value to those charged with the purchase or care of belts.

Hardinge Conical Ball and Pebble Mills. Hardinge Conical Mill Co., 120 Broadway, New York. Sectional Catalog No. 7. The several sections of which this catalog is composed are devoted to descriptions and uses of the different types of mills.

1918 Year-Book. Western Electric Co. Pp. 1160. Contains over 50,000 items. A handbook of electrical supplies. In addition to the plan of uniform list-price and basic discount, inaugurated three years ago, manufacturers' list prices are shown on certain standard lines for the convenience of those who prefer to buy on the manufacturers' discount or who desire an independent means of checking invoices.

New Patents

United States patent specifications listed below may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

Alloys—Process of Treating Alloys. Harold Edwin Cleaves, Washington, D. C. (U. S. No. 1,235,655; Aug. 7, 1917.)

Ammonium Fluorides—Process of Producing Ammonium Fluorides. Howard F. Chappell, New York, N. Y., assignor to Mineral Products Corporation, New York, N. Y. (U. S. No. 1,235,552; Aug. 7, 1917.)

Casting Apparatus—Edwin C. Washburn, Englewood, N. J. (U. S. No. 1,235,744; Aug. 7, 1917.)

Centrifugal Casting-Machine. William H. Millspaugh, Sandusky, Ohio, assignor to Sandusky Foundry and Machine Co., Sandusky, Ohio. (U. S. No. 1,235,994; Aug. 7, 1917.)

Furnace—Electrical Induction Furnace. James R. Wyatt, Philadelphia, Penn., assignor to the Ajax Metal Co., Inc., Philadelphia, Penn. (U. S. No. 1,235,629; Aug. 7, 1917.)

Furnace—Lateral-Channel Induction-Furnace. James R. Wyatt, Philadelphia, Penn., assignor to the Ajax Metal Co., Inc., Philadelphia, Penn. (U. S. No. 1,235,628; Aug. 7, 1917.)

Furnaces—Improvements in and Relating to Furnaces. Alexander Constatine Ionides, Jr., London, W., England. (Brit. No. 105,810.)

Furnaces—Improvements in and Relating to Tilting Furnaces. Samuel William Price, London, W. C., England. (Brit. No. 105,381.)

Magnesium Deoxidizer—Process for the Production of an Alloy Containing Magnesium and Serving for the Deoxidization of Cast Iron or Steel. Chemische Fabrik Griesheim, Frankfort-on-Main, Germany. (Brit. No. 100,848.)

Metallic Sulphides—An Improved Process for the Production of Metallic Sulphides. Chas. Owen Griffith, Fife, Scotland. (Brit. No. 105,830.)

Mine Air—Improved Method and Apparatus for Cooling Mine Air. Hugo Junkers, Frankenburg, Germany. (Brit. No. 102,730.)

Moulds—Hot-Top for Moulds. Charles E. Duncan, Buffalo, N. Y. (U. S. No. 1,236,068; Aug. 7, 1917.)

Safety Lamps—Improvements in Miners Safety Lamps. John Henry Rothwell and John Roberts, Lancaster, England. (Brit. No. 106,045.)

Steel Ingots — Improvements in Casting Steel Ingots. W. G. Armstrong, Newcastle-on-Tyne, England. (Brit. No. 105,617.)

Steel Ingots—Improvements in the Manufacture of Steel Ingots. George Alexande Wilson, Middlesbrough, England. (Brit No. 105,875.)

Washing and Classifying — Improve Washing and Classifying Apparatus fo Ores. Gustave Pinette, Saone-et-Loire France. (Brit. No. 105,690.)

Editorial Correspondence

SAN FRANCISCO—Sept. 15

Shasta County Labor Trouble, according to dispatches, is settled and operations have been resumed by Balaklala, Mountain Copper Co., Mammoth Copper Mining Co. and other small producers. The strikers went back on a basis of former wages subject to revision after a state board of investigation makes its report of cost of living in district.

Comstock Exploration and Development was rapidly advanced during the month of August and included both the North End and the Gold Hill mines, particularly the Union-Mexican and the Sierra Nevada in the North End and the Jacket in the Gold Hill district. The Union is sinking on ore at the 2700-ft. level and the Mexican is driving west on the 2900-ft. level with face of drifts in porphyry and stringers of quartz. On the Consolidated Virginia, the east winze from the 2500 to 2800 was equipped with a view of extending the crosscuts to the main Comstock and east veins on the 2700- and 2800-ft. levels. Development from the winze is now practically under way. The Sierra Nevada is working on the 2500- and 2600-ft. levels and advancing a new east crosscut on the 2700-ft. level near the Union north line and in the vicinity of the ore development on this level in the Union. The Jacket, in the Gold Hill district, has completed a large amount of development at the surface tunnel workings. The tunnel from point near collar of Jacket shaft has been opened back to the west vein nearly to the north boundary line. Milling-grade ore has been disclosed on the vein. In the early days the extraction in this tunnel was confined chiefly to the high-grade ores; some of the old filling recently taken out assays as high as $12 a ton. The vein contains two kinds of ore, free gold to the north and manganese-silver to the south. The free-gold ore is crushed and submitted to the ordinary processes of amalgamation, concentration and cyanidation. The silver ore goes from the rock breaker to a Hardinge steel-ball mill, which grinds to 150 mesh and the process is then through Dorr thickener, Pachuca agitators and Oliver filter. This improvement in the mill is of recent installation and was completed about Aug. 1. The Comstock-Phoenix, situated in Six-Mile Canyon, east of the Comstock main lode, is advancing development work by deepening the winze beneath the stopes of the upper level. This mine has made great progress both in development and extraction of ore of high grade and has every apparent prospect of developing into a larger producer at depth. In the entire Comstock region the indications are for great advancement in development and production.

Blue-Sky Law of California initially applied only to original issues of shares of stock or other securities and was frequently evaded by wildcat companies organized in other states, who issued all their shares to promoters. These promoters brought them into California for resale as their personal property, thus evading the supervision of the State Corporation Department. In many of these cases the purchaser was defrauded. A new act was drafted by H. L. Carnahan, commissioner of corporations, and adopted by the last legislature, requiring that every person or company engaged in the sale of securities in California, whether issued in this state or elsewhere, must secure a certificate of authorization to act as a broker. The law (in effect July 28, 1917) provides that a broker must bear a good business reputation and that the license may be revoked if it appears that the person or company is about to engage in a fraudulent transaction. This makes it possible for the commissioner to exercise a degree of supervision over all securities sold in the state. It is provided also that copies of advertising such securities for sale must be filed with the department so that misleading or otherwise fraudulent advertising may be prohibited. A more explicit and simple form of procedure is also provided in the application for authority to issue securities, and adequate powers of examination and inquiry are given. The law provides also for a new fee system based upon a percentage of the par value of the securities proposed to be issued. So the department has greater opportunity to assist in the reorganization and reconstruction of failing enterprises which may require assistance. An amendment of the Civil Code adopted by the last legislature providing for partial distribution of assets when of advantage to stockholders and without injury to creditors, also gives greater opportunities for corporations to conduct their business in a business-like and unrestricted manner. The blue-sky law as first adopted by the legislature and put into effect by the corporation department, worked a hardship on a great many corporations and especially upon small mining operators. There is a disposition now upon the part of corporations, large and small, to obey the law, although there are still some clauses that could be improved to the betterment of industries operated by corporations and companies. The mining industry of California has usually received a setback every time a new law was passed. In the last two years, however, the California Metal Producers Association has brought about, by active work in and out of the legislature, some changes which have been of direct benefit to the industry. The association was fortunate in its initial organization in securing the services, as president, of Albert Burch, a mining engineer of high standing, and the services of Robert I. Kerr as secretary. Mr. Kerr was at the time of his appointment a member of the legislature, which position enabled him to be of greater benefit to the mining industry in preventing the passage of bad laws than one outside of the legislature.

BUTTE—Sept. 18

(By Telegraph)

Anaconda Resumed Operations at its mines and smelteries on Monday, Aug. 17, many men among strikers and "locked-out" employees returning to work. However, force at both mines and smelteries is comparatively small and operations will necessarily be limited for some time.

BUTTE—Sept. 15

Anaconda Interest in Gas Fields of Montana is assured by a deal arranged with the Montana Canadian Oil Co., whereby a large acreage of oil lands in northern Montana will be controlled by C. F. Kelley, vice president of the Anaconda Copper Mining Co., John D. Ryan and others. It is now proposed by the Montana Canadian Oil Co. to sell outright all of its holdings to Mr. Kelley and associates who proposed to organize an operating and a selling company. The Montana Canadian stockholders are to be given a stock interest in the new companies in exchange for their present holdings. The company has developed one large gas well, and it was understood that the Anaconda company was to pipe the gas to Great Falls for fuel at the smeltery there, and that Anaconda would advance the money for a controlling stock interest. A circular letter sent to stockholders, announcing a special meeting for Oct. 1, gives the first information about a different deal. A Montana company is to be formed for development and operating purposes, and a foreign corporation to handle and sell the product. It is announced that Montana Canadian stockholders will be given, in exchange for their stock, one-tenth of the capitalization of the two new companies "up to $9,000,000 expended by such corporations in developing the fields and marketing the product." It is predicted that Montana-Canadian will be another Montana Power Co. in importance.

DENVER—Sept. 14

Colorado School of Mines trustees elected Dr. V. C. Alderson president despite the large amount of sworn testimony filed against him. His reappointment is in direct opposition to the desires of many alumni members of the mining profession. Three members of the board of trustees, H. M. Rubey, a small banker and politician, of Golden, J. T. Smith, a newspaper reporter of Denver, and A. E. Carlton, of Cripple Creek, voted for Alderson; Frank G. Willis, president of the board, and mining engineer, of Cripple Creek, and O. R. Whitaker, mining engineer, of Denver, and member of the alumni association of the school, voted against him. Practically the whole faculty was reappointed with the exception of H. B. Patton, head of the department of geology, and the only man on the faculty of national reputation. His removal is purely the result of spite work. The reappointment of Alderson could have been prevented by prompt action by the governor, and it is deeply regretted by many alumni that for the good of this famous school of mining engineering Governor Gunter lacked the courage to act.

LEADVILLE, COLO.—Sept. 14

Large Manganese Orebody has been discovered in the Bohn property on Carbonate Hill. The shoot as now opened is 15 ft. wide, 12 ft. high and 45 ft. long. Neither the top nor end of the deposit has been cut. The ore lies close to the Cloud City fault. Numerous assays taken from the deposit show it to run 40% manganese, 8% silica and 14% iron; no test for phosphorus yet made. An output of 100 tons daily will be extracted.

Harrison Recovery Works is the title assumed by a new company of Leadville men recently organized for the purpose of recovering the metals from the slag dumps of the old Harrison smeltery, situated near the south end of Harrison Ave. These dumps represent the discard from the first smelting industry of the Leadville district; and thorough assaying has shown them to contain from six to 300 oz. of silver to the ton. Several large pieces of bullion have been found on the dumps during the sampling campaign. The plan of the new company is to repair the old blast furnaces and resmelt the slag, recovering the metals in a ratio of 10 tons of slag to one ton of matte. At this rate, out of every 500 tons of slag treated, 50 tons of matte will be recovered which will contain a minimum of 3000 oz. silver. Preparations are being made to handle 200 tons daily or 6000 tons a month.

SALT LAKE CITY—Sept. 14

Utah Coal Operators on Sept. 1 set coal prices according to the President's recently published order, awaiting meanwhile a possible adjustment. A statement by coal-mine owners in this section—submitted to Doctor Garfield through Utah representatives in Congress—sets forth that before the war, contracts were generally entered into at prices much below the President's schedule and that—in view of increased operating costs—companies filling contracts at prices much lower than the schedule will not be able to operate their mines except at great loss, if they are prevented from filling other orders at prices higher than those published by the President. Eighty per cent. of the product for the coming year, it is stated, has been sold in advance, either under contract or on standing orders, and the companies are now prohibited from selling the prepared grade, known as lump coal, at prices they have been receiving. It is pointed out that Utah coal mines furnish fuel to six states, including Utah, and that the supply is falling short of the demand.

WALLACE, IDAHO—Sept. 15

Bunker Hill & Sullivan company's right to smelt its own ores will be contested in the courts. The first step toward this end will be taken when argument upon the application for an injunction restraining the company from smelting its ores and to compel compliance with the 25-year contract with the American Smelting & Refining Co. will be heard in the Federal court in Portland on Oct. 18. The complaint filed by the A. S. & R. Co. is a voluminous document and gives much interesting information regarding the relations of the two companies and the great value of the Bunker Hill product in the profitable operation of plaintiff's smelting plants. The story begins in 1905, when the Bunker Hill contracted its ores running from 30 to 75% lead to the smelting company, it being optional with the smelter to take the product below 30% or above 75%. The contract was entered into following the purchase of the Tacoma smeltery from the Bunker Hill company, and it is alleged in the complaint that plaintiff would not have purchased the Tacoma plant had it not felt secure in obtaining the Bunker Hill ores during the 25 years covered by the contract. The contract provided for revision every five years, and at these periods the Bunker Hill company would be entitled to the same freight and treatment rate at which the majority of the ores of the Cœur d'Alene district was being shipped. In 1910, the end of the first five years, the Bunker Hill was given a concession which amounted to about 85c. per ton, but the real clash occurred in 1915.

On May 31, 1915, the Hercules contract with the A. S. & R. Co. expired and the smelting company refused to renew it on the same terms. It had been entered into three years before and presumably has some connection with the elevation of Harry L. Day to the presidency and management of the Federal Mining and Smelting Co. It was the most favorable A. S. & R. contract in the district, providing for a freight and treatment rate of $14 per ton, said to be $2 lower than the Bunker Hill. The refusal to renew the Hercules contract was soon followed by the retirement of Mr. Day from the head of the Federal and the negotiations by the Hercules people for the Northport smeltery. The day following the expiration of the Hercules contract, June 1, was the date for revision of the Bunker Hill contract. With the Hercules out of it, the majority of the ores shipped from the district were represented by the Federal, owned by the smelting company, and shipping under a lower contract than that of the Bunker Hill. Under the circumstances the demand of the Bunker Hill for a revision of the terms of its contract was refused. The following October the Bunker Hill & Sullivan company made definite announcement that it would build a smeltery for the treatment of its ores and those of other mines of the district. The smeltery was completed about three months ago, but up to this time only one furnace has been blown in on account of inability to get coke. It is also learned that no ore from the Bunker Hill mine has yet been treated and that shipments are going forward as usual under the contract with the A. S. & R. Co. The Bunker Hill smeltery is under contract to treat Hecla ore, which with other smaller producers requires all present capacity. The feeling here is that the Bunker Hill company must have gone thoroughly into the legal points involved in the alleged violation of contract before making the large investment in the smeltery and therefore feels secure in its position.

JEROME, ARIZ.—Sept. 12

Labor Union Local, No. 79, of the International Union of Mine, Mill and Smelter Workers, held a special election on Friday to choose a new president and vice president. Daniel Jones was elected president receiving 166 votes to 58 for Andrews. The small number of votes cast was a disappointment to union leaders, but the election of Jones was a disappointment to mine superintendents. Jones is considered the worst agitator in the union. Temme was bad enough but Jones is worse. He is commonly regarded as an I. W. W. at heart if not a member. The first thing Jones did after his election was to advocate the repeal of the present constitution and by-laws and the adoption of new ones enabling the union to strike on a moment's notice. He wishes the executive committee to be given power to call strikes. There is some talk of a strike for minimum wage of either $5 or $6 a day, the more radical wanting to demand $6. The mining operators do not expect a strike to materialize. The union has not the funds to carry on an extended strike and can expect no help from Butte, Miami, Globe, Clifton, Morenci or Bisbee.

ST. LOUIS, MO.—Sept. 7

Missouri Cobalt Co., which has taken over the old North American Lead property, at Fredericktown, in Madison County, is spending approximately $1,000,000 in its new development. The main output will be nickel, cobalt and copper, with lead as a by-product, secured from the "sulphide zone" that usually underlies the lead-bearing "St. Joe" dolomite and occurs in the top of the "LaMotte" sandstone. A 500-ton mill is being erected and a furnace plant that will be operated under the Kirkpatrick process for the separation of the nickel from the cobalt. The former North American plant has been scrapped, as it used the Hibenette process and produced about five tons of copper and three to four tons of metallic nickel and cobalt oxide per day. The company is being financed by M. J. O'Brien, of Canada, with T. J. McTeer, as superintendent. The adjoining Schulte property has been extensively drilled and a shaft was being sunk by the late H. J. Cantwell, of St. Louis, but since his death, the work has stopped. This property will now be taken over by a stock company under A. P. Mackley, the Desloge banker, who will continue the shaft, now over 240 ft. deep, to the lead-bearing horizon and later continued to the sulphide zone for nickel, cobalt and copper. The lead occurs at about 270 ft., while the other sulphides are about 40 ft. deeper.

JOPLIN, MO.—Sept. 15

Sale of Sequoah Lease and Mill to the Haynes company, of Miami, is announced, for $250,000. C. A Farnum, of Joplin, was principal owner of Sequoah, which was developed about five months ago. J. W. Hawthorn, of Miami, is principal stockholder and manager for Haynes company.

Entertainment of Members of A. I. M. E. when they come here from St. Louis early in October is being arranged. Number of local operators will attend the St. Louis meeting and return with the engineers. A book is being prepared here offering full information about this district, and the program of business and entertainment is such that virtually every moment of the visitors' time will be taken up after they reach the district. Victor Rakowsky, of Joplin, is chairman of the general committee for the meeting, and B. P. Butler, of Joplin, is secretary.

Horizontal Core Drilling is to be tried out for the first time in this district in the drifts of the Blue Mound Mining Co., west of Baxter Springs, Kan. The core drill that has been working for some time putting down a test hole for the Ramage mine, at Century, Okla., will be moved to the Blue Mound property next week. The hole at the Ramage property was put down about 400 ft. by diamond drill, and 70 ft. of ore was shown. At times the going was slow, particularly in some blue flint that was encountered, and it is reliably reported that while the Ramage people paid $3 per ft. for the work it cost the Sullivan company, which owns the drill, nearer $5 per foot.

TORONTO—Sept. 15

Continued Rise in Silver Price is stimulating production at the Cobalt mines, and as employees are getting a bonus of 25c. a day for every 10c. rise above 60c., the wages are so high that there are plenty of men. Miners are now getting $4.50 a day and the prospects are that they will shortly receive $4.75 if silver continues to sell over $1. There is talk of reopening several old properties that were unable to pay under former prices but should yield good returns now, and probably several of these properties will be opened. High silver is having a bad effect on some of the outside industries, as the high wages at the mines are drawing men from all other industries. Some of the big lumber companies are having a hard time to get men and the pulp companies have been forced to increase wages to meet the competition from the mines.

New Gold Discovery is reported in Coulson Township, about 10 mi. northeast of the town of Matheson on the Temiskaming & Northern Ontario Ry., and adjoining Munro Township. The mineralized zone is about 50 ft. in width and is cut with numerous small veins and stringers in which visible gold and tellurides occur. About 50 claims have been staked. The original discovery claims are under option to Edward A. Clark, of Boston, Mass., and have been sampled by Leighton Stewart, mining engineer of New York. Development work will be immediately undertaken. Another important find has been made on the Anderson farm, near Bourke's Station, where a vein has been stripped for 300 ft. and is stated to show high gold content. About 50 sacks of ore have been taken out. Prospectors are actively at work in the vicinity.

The Mining News

ALASKA

COPPER SHIPMENTS for August of ore, matte, etc., to United States were 11,787 gross tons containing 3,891,621 lb. copper.

KENNECOTT (Kennecott)—Production of copper for August amounted to 7,048,000 lb. comparing with 3,580,000 lb. in July and 5,818,000 lb. in June. The strike ended July 7; running now at normal capacity.

ARKANSAS

Marion County

AUGUST SHIPMENTS from the northern Arkansas field was 62 cars of zinc ore and one car of lead ore. Much ore is still in bins, operators hoping for higher price.

KING MINES (Buffalo)—Leased by owner, H. T. Hule, to W. N. Anderson. Development work will start at once.

GROUNDHOG (Buffalo)—Lately taken over by the J. & N. Co. Mill site surveyed and erection of mill will start as soon as machinery can be purchased. Charles Holman, engineer; Andrew Christensen, general manager.

ARIZONA

LABOR CONDITIONS in copper mines to be investigated by commission appointed by President Wilson is proposed by American Federation of Labor, whose head, Samuel Gompers, charges that I. W. W. agitators were encouraged by copper producers to discredit the labor movement. Most of miners deported from Bisbee were union members, it is claimed, and not I. W. W. men.

Gila County

MIAMI (Miami)—Running four sections of mill or about two-thirds normal capacity. Reported that during shutdown alterations have been made in mill to avoid infringing flotation patents.

Greenlee County

LABOR SITUATION in Morenci reported to be unchanged, the Detroit, Shannon and Arizona properties closed down since early in July show no signs of resumption. Proposal of local business men to have arbitration board appointed by the Government not acted upon either by mine managers or union leaders. No disturbances.

Maricopa County

ARIZONA MOLYBDENUM (Wickenburg)—Mill operating, making 1500 lb. of concentrates in eight-hour shift. Present capacity of 50 tons will be doubled.

Mohave County

UNITED EASTERN MINING CO. (Oatman)—During August treated 7200 tons of ore, yielding $177,000. Extraction was 96.8%.

NEW TENNESSEE MINING CO. (Chloride)—Good ore in North drift, 240-ft. level, and sinking resumed. Contract made for sinking to 500-ft. level. G. J. Ridenour, superintendent.

C. O. D. (Chloride)—Taken on lease and bond by Rico Consolidated Mining Co. which plans to reconstruct and operate old mill and mine. Noted producer in past. Rico Consolidated headed by R. W. Wilde, vice president, Desert Power and Water Co. W. J. Hennessy, superintendent.

Yavapai County

ARIZONA BINGHAMPTON (Mayer)—Diamond-drill exploration to be started soon on lower levels. Mill treating approximately 200 tons daily of 3% ore. Shipping ore averages between 13 and 14%.

JEROME VERDE (Jerome)—Drift southwest from crosscut within 25 ft. of U. V. Extension line discontinued; 4-ft. width shows copper specks. Performed 550-ft. underground work last month. New 800-cu.ft. air compressor ordered. North drill hole where strike was reported last April continued but without results.

CALUMET & JEROME (Jerome)—No. 1 crosscut shows over 100 ft. of slate formation with mixed ore. No. 2 crosscut opened same material. Drift from No. 1 in about 75 ft. with no change encountered. Winze sunk in No. 1 and drift started with better showing. No high-grade ore found, but low-grade in considerable quantity proved.

VENTURE HILL (Jerome)—Special directors' meeting held to borrow $25,000 for immediate development. Prescott and Los Angeles stockholders advancing money on 10% basis and 25,000-share bonus, secured by mortgage. Shaft down 200 ft. within 60 ft. of tunnel level. Will attempt to sink

600 ft. below tunnel level without any new machinery. Shaft in schist carrying chalcopyrite and bornite, making good showing. E. L. Bartholomew, superintendent.

CALIFORNIA

Amador County

BUNKER HILL CONSOLIDATED (Amador City)—Licensed to construct flume to carry sand and tailings.

Butte County

CHROME MINING reported started at Big Bar Mountain on property owned by Swayne Lumber Co. Estimated that 1000 tons of ore may be mined before winter. Ore will be shipped by trucks to the Western Pacific Ry.

CALAVERAS AND MORGAN (Melones)—Recently reopened and being operated. Idle for the last 30 years.

ROYAL MINE (Mokelumne Hill)—H. S. Chapman, superintendent of Stockton Ridge, taken bond on this and Lucas property. Lucas mine in past produced about $100,000 above 146-ft. depth. Main tunnel is 830 ft. long. Royal is south extension of Lucas. Situated about 1½ mi. from Mokelumne Hill and within short distance of electric power lines.

Inyo County

SKIDDOO (Skiddoo) — Reported ore worked out and mine closed down permanently. Some powder and other supplies being sold. Similar reports have been circulated before and it is not improbable that the old mine may again be reopened. Has been large producer, sometimes properly and sometimes badly worked.

Kern County

R. S. STOCKTON, of San Francisco, reports company is being formed to take over property consisting of 16 patented claims in old Kernville district. Property, idle for years on account of litigation, was formerly large gold producer.

Nevada County

EAGLE BIRD (Washington)—Unwatering progressing rapidly. Compressor recently installed. Water cleared to below 300-ft. level and retimbering shaft begun.

UNION HILL (Grass Valley)—Rich ore reported disclosed on lower level. Shaft recently deepened and extensive development undertaken to open this and Georgia vein.

Shasta County

MAMMOTH COPPER (Kennett)—Estimated production for August is 1,725,000 lb. copper. Continued to house and board strikers until they returned to work.

AFTERTHOUGHT (Ingot)—New flotation plant operating on trial run of ore. Employing 20 miners. Old dump being sorted and shipping to Mammoth smeltery at Kennett. Product hauled by motor cars to Bella Vista and thence by rail.

Siskiyou County

BORSE, GREEN & DUCK COPPER CO. (Hornbrook)—W. J. Green to begin developing holdings in Ike's Gulch, adjoining Gray Eagle property on northwest.

GOLD MINES (Hornbrook)—D. M. Watt, of Butte, Mont., and David D. Good, of Ashland, developing group of gold mines in Sterling district, purchased for $10,000. Expect to sell to Butte residents.

McKEEN (Callahan)—James McKeen, of Los Angeles, owner, reports necessary to reduce number of men on account of shortage of water; 15 men now employed in development. Unless there is rain will have to close down. Experiments to discover successful metallurgical method for ore treatment. Flotation not altogether successful.

Stanislaus County

GUSTINE MAGNESITE CO. (Oakland)—Permit to issue 6656 shares capital stock at $1 to A. E. Needham and C. H. Johnson for lease to operate unpatented magnesite claims and to sell 3328 shares to W. J. Maguire for $4000, to be used in installing equipment.

Trinity County

FIELDS (Weaverville)—Situated on Mt. Bally, 10 mi. from Weaverville. Development contract completed, disclosing some high-grade ore.

Tuolumne County

NYMAN CONSOLIDATED (Sonora) — Recently inspected by R. W. Barrett and F. G. Mudgett, of San Francisco.

YOSEMITE (Jamestown) — Shaft below 500-ft. point and crosscuts being driven to intersect veins that produced good ore in old workings. Equipped with modern machinery.

COLORADO

Boulder County

LULU B (Ward)—Being unwatered and repaired.

BOULDER TUNGSTEN PRODUCTION CO. (Boulder)—Producing regularly; mill running at capacity.

Gilpin County

CROWN POINT (Central City)—This property at head of Virginia Gulch will be reopened.

TEXAS (Central City) — Property on Yankee Hill reopened. Development work on shoot of lead-silver ore.

NELLIE B (Central City)—New shaft house built and electric hoist installed; property on King Flat, above Nevadaville.

Gunnison County

NEW GRAPHITE DISCOVERY made in Slaughterhouse Gulch, near Pitkin.

ETHIOPIAN (Pitkin)—Small crew of men mining graphite.

DAY STAR (Pitkin)—Development work under way.

Lake County

DAVIS (Leadville)—Shoot of manganese ore opened on bottom level. Contract made and will ship soon.

BARTLETT TUNNEL (Leadville)—High-grade lead-silver ore opened by lessees on this property in Sugar Loaf district. Shipping 100 tons per month.

FIRST NATIONAL (Leadville)—This Iowa Gulch mine worked by lessees. Shipping lead-silver ore, opened on 300-ft. level. Shaft will be retimbered and development resumed on this level.

La Plata County

BESSIE G (Laplata)—Shipping high-grade telluride ore.

COLUMBUS (Laplata)—Main vein cut 1080 ft. from portal and raise connection made with old shaft workings. Large shoot good-grade ore opened.

Mineral County

HAPPY THOUGHT (Creede)—Producing silver ore from stopes and drawing old stope filling. Ore treated at Humphreys flotation mill.

Ouray County

CAMP BIRD (Ouray)—Tunneling at rate of 16 to 17 ft. in 24 hours. Boarding and bunk house to be built at tunnel.

Park County

THREE JAY (Alma)—Operating Paris mine. Shipping from tunnel level. Mill operating about two-thirds capacity. Electric power will be installed.

MAY QUEEN (Alma)—Being opened by crosscut tunnel, now in 800 ft.; expect main vein will be cut 100 ft. further. Four small veins cut; winze on one opened 18-in. shoot, lead-copper ore.

San Miguel County

AUGUST CONCENTRATE SHIPMENTS from Telluride district: Liberty Bell, 12 cars; Smuggler-Union and Black Bear, 8 cars to Durango and 53 to Blende; Tomboy, 6 to Durango and 41 to Blende; Carruthers Leasing Co., 2 cars; Modena, 1 car.

JURICH LEASING CO. (Ophir)—Large shoot milling-grade ore opened.

MAYFLOWER (Telluride)—Old 13,000-ft. aërial tramway sold; being dismantled. Will be used in Gunnison County.

CARBONERO (Ophir)—Power line of Western Colorado Power Co. extended to mine from Ophir Loop. Recently installed compressor and other machinery will be electrically operated.

Summit County

RARE METAL (Breckenridge) — Gold producer years ago being cleaned out and repaired to produce molybdenum ore.

BALD MOUNTAIN (Breckenridge)—New road from Golden Edge mill to upper workings completed; shipping.

KOKOMO MILLING CO. (Kokomo)—Mill remodeled and two Wood flotation machines installed. Test runs being made on molybdenum ore from Bryan mine.

Teller County

BERTHA B (Cripple Creek)—Shipping-grade ore opened on 300-ft. level. New ore bins built.

NEW BOSTON (Cripple Creek)—Lessees producing milling-grade ore from this Stratton Estate mine on Womack Hill.

GEORGIA

BAUXITE properties in Wilkinson and Floyd Counties are under negotiation by the Anaconda Copper Mining Co. Report also states that a representative of the company was sent to Georgia to perfect arrangements for operation of the properties.

IDAHO

Shoshone County

PINE CREEK RAILROAD contract for construction work was awarded to Twohy Brothers. Work will begin at once. Company estimates branch will cost $400,000 and with favorable weather conditions it should be completed within three months.

CHICAGO-BOSTON (Wallace)—Crosscut from shaft at 200-ft. depth encountered oreshoot developed in tunnel and in crosscut 100 ft. above. Crosscut penetrated vein 10 ft. all in lead ore. Property being developed under bond to the Days.

HIGHLAND-SURPRISE (Kellogg) — Shipments interrupted by closing of Anaconda smelteries. Announced that new smelting contract secured and shipments will be resumed at once. Assessment levied of 1c. to pay up all indebtedness. Enlarging mill and putting in new compressor and hoist.

STEWART (Kellogg)—Development on Denver claim consists of two levels, 90 ft apart vertically connected by raise. Upper tunnel driven 200 ft. exposing 4 ft. high-grade, lead-zinc ore carrying silver. Nabob claim also showing favorable results. At Tuscarora, Nev., new mill being installed to be in operation in 60 days; hoist and other new machinery ready. Work on original Stewart claim expected to show profitable results. W. A. Beaudry, in charge.

MICHIGAN

Copper

KEWEENAW (Calumet) — Increased force with new boarding house and has opened new stopes.

FRANKLIN (Demmon)—Hoisting 1100 tons daily; some times as high as 1400-1500.

MICHIGAN (Rockland)—Bought motor truck for hauling rock to railroad; will mill 6000 tons at Winona soon.

HOUGHTON (Houghton) — Paying expenses from small workings until Superior finds something on 31st level recently opened.

CALUMET & HECLA (Calumet)—Daily tonnage now 9491, including 810 tons of Tamarack rock. By transference of Tamarack's conglomerate rock to its own mills, three stamps are now unemployed; well suited for amygdaloid rock.

SOUTH LAKE (Lake Mine)—Connected 6th level with that of Lake on South lode No. 3, by 1650-ft. drift ending in 75-ft. inclined raise, holing most accurately, for ventilation. Makes available the four south lodes.

NAUMKEAG (Houghton) — Pres. J. Parke Channing, after inspecting workings says, "About 400 ft. below the adit or surface level a northwest drift on the Pewabic lode, about 200 ft. from shaft, was in rock well charged with copper."

MINNESOTA

Cuyuna Range

NORTH THOMPSON state lease in Crosby will ship less than estimated amount. This is partly due to car shortage.

HILL CREST (Ironton)—Will ship for season about 200,000 tons.

ONAHMAN (Ironton)—Stockholders have agreed to consolidation of Onahman and Algoma mines.

CUYUNA MILLE LACS (Ironton)—Will have two new electric locomotives and two hoists. New cement-block dryhouse has been completed. Cement-block boiler and engine house is under construction. New steel headframe being built.

MISSOURI

Joplin District

ADMIRALTY ZINC (Century, Okla.)—Will build another 400-ton mill, its fifth, on lease north of other plants. Sinking on two shafts started. Ore run at about 200 feet.

EAGLE-PICHER (Joplin)—Has completed "G" plant at Picher, a 300-ton mill. Jigs are built unusually high and large. One 6-cell sand jig has cells 32 x 42. Separate sludge building housing 12 tables, and two 50-ft. Dorr thickeners.

RAMAGE (Joplin)—To change new 350-ton plant at Century from steam power to electric. With only one shaft opened into ore, now making 90 tons of concentrates weekly while operating mill but single shift. Will sink shaft to 200 ft. soon, which will give 75-ft. face of ore.

INSPIRATION (Joplin)—Completed 400-ton mill on lease northwest of Picher, Okla., in Kansas. Has field shaft in good ore at 250 ft.; heavy water encountered and sinking of last 16 ft. was made under water head of 700 gal. per min.; 7-in. Gardner pump used. Amos Gipson, Joplin, principal owner. Gustave Hovel, superintendent.

CENTRAL LEAD AND ZINC (Tar River, Okla.)—Is sinking shaft to 350 ft., which will be deepest workings in Picher-Century-Tar River section. Good lead shown at this depth by drill holes. Plant now making two cars of lead and one of zinc concentrates weekly from 250-ft. level.

MONTANA

Lewis and Clark County

TRUE FRIEND (Helena)—Galena ore in 175-ft. shaft.

SOUTHERN (Helena)—Gold ore in tunnel face.

STEMWINDER (Helena)—Sinking main shaft begun. Steam power used.

EASTERN STAR (Helena)—Gold ore coming from south 100-ft. drift.

TOWSLEY MINING CO. (Marysville)—One 20-ton carload from Nile mine netted $993 at smeltery.

MARYSVILLE GOLD (Marysville)—Large development. Blocking ore for milling plant.

COFFEE MINE (Helena)—Surface ore showing high assays in silver and lead contents. Taking out ore.

Silver Bow County

EAST BUTTE (Butte)—Resumed smelting Aug. 11 after month and a half shutdown due to labor troubles. Last 20 days of August produced 1,676,360 lb. copper.

NORTH BUTTE (Butte)—First suit for damage for death of victim of recent fire filed Aug. 31, by Fred Sangwin, administrator of estate of Harry Sangwin. Damages of $67,000 are asked. Numerous suits have been brought against company by survivors seeking damages for suffering and injuries.

NEVADA

Nye County

TONOPAH ORE PRODUCTION for week ended Sept. 8 was 8356 tons valued at $146,230, comparing with 9374 tons the previous week. Producers were: Tonopah Belmont, 2184 tons; Tonopah Mining, 1900 tons; Tonopah Extension, 2380 tons; Jim Butler, 750 tons; West End, 909 tons; Rescue, 125 tons; Halifax, 48 tons; Cash Boy, 50 tons.

MANHATTAN RED TOP MINING CO. REORGANIZED (Manhattan)—Machinery installed and expect shaft unwatered shortly. Lease granted by Union Amalgamated covering portion of Granny claim adjacent on east of Red Top. Will allow following any veins into the Granny property.

WHITE CAPS MINING (Manhattan)—From fifth level, 155 ft. from shaft, south crosscut struck fault, which is regarded as being near the East orebody. Started Magazine crosscut and advanced 20 ft. Roaster shut down in mill owing to brickwork in fireboxes requiring reinforcement, and causing mill to close for five days; expect to resume shortly as brickwork practically completed.

White Pine County

SALT LAKE-TUNGSTONIA MINES (212 Kearns Building, Salt Lake City, Utah)—Situated at Tungstonia, 40 mi. west of Gold Hill, Utah, has tunnel extended 165 ft. and cut three veins showing 2% tungsten as stated by L. W. Robbins, general manager.

NEW MEXICO

Grant County

EL NORTE COPPER CO. (Hanover)—Has taken over 29 claims formerly under option to Chino Del Norte Copper Co. W. A. Ulman, of New York, and associates are raising funds for development. G. E. Coxe, of Hanover, general manager.

OREGON

Jackson County

MOLYBDENITE DEPOSITS under lease and being developed near Jacksonville by E. H. Richards and A. W. Bartlett, of Grants Pass.

QUICKSILVER CLAIMS near Gold Hill operating with three-pipe Johnson & McKay furnace; nine retorts to be added soon. Other owners ordered same retort installed. R. H. Spencer, manager.

Josephine County

DIAMOND CREEK CINNABAR mine is in operation. First shipment of quicksilver ready. J. W. Ehrman, manager.

COPPER CAMP (Waldo)—This mine, recently examined by Eastern men. Body of low-grade ore in sight. Last year several cars of the highest grade shipped to Tacoma. Situated on Diamond Creek, 18 mi. west of here. G. W. Gravlin, manager.

LOGAN-SIMMONS (Waldo)—This placer mine sold to George M. Esterly and associates, of Seattle, for $140,000 on option taken 10 months ago. Sampling done by Lewis Lavensaler and others. Netted $40,000 annually and only 2% of placer ground worked and remainder shows gold content equaling that of ground already worked. George M. Esterly, manager.

UTAH

Salt Lake County

SILVER SHIELD (Bingham)—New shaft completed to 100-ft. level.

CARDIFF (Salt Lake)—Production increased to 135 tons ore daily; hauled by teams. Roads down cañon in good condition.

Summit County

PARK CITY shipments for week ended Sept. 7 amounted to 4,185,170 lb. crude ore and concentrates. There were eight shippers.

BIG FOUR (Park City)—Effort being made to clear up affairs of this company owning mill and having lease on tailings dump at Atkinson. Report of committee of milling men—G. T. Hansen, E. Gayford, K. O. Williams and C. I. Glassbrook—shows 40,000 tons tailings available, carrying 4.7% zinc, 1.6% lead, 3.2 oz. silver per ton. Estimated 50% of sulphide zinc, 20% of lead, and 35% of silver can be saved. Water necessary and also some alterations to mill. With operating cost of $1.66 per ton and revenue of $1.85, might earn money for creditors.

Tooele County

POLE STAR COPPER CO. (Gold Hill)—In Kessler winze put down from No. 2 tunnel, bismuth-copper ore, carrying gold and silver, being found. No. 1 tunnel being driven toward point under inclined shaft and expect to mine large tonnage when connection is made. Main shaft going down rapidly. Pumping plant to supply water from adjacent property has been ordered. Hauling by truck to railroad.

Utah County

MILLER HILL (American Fork)—Prospecting fissure opened 160 ft. from portal of tunnel. Mineralization showing. Bunk house in process of construction. Knights interested.

SILVER SIDE (American Fork)—Good-grade silver-lead ore reported on limestone-quartzite contact in inclined shaft 35 ft. deep. Tunnel being driven to cut this at greater depth. J. E. Beveridge, president.

WEST VIRGINIA

Marshall County

UNITED ZINC SMELTING CORPORATION (Moundsville)—Smeltery completed and ready for operation, but policy at present is to await advance in price of spelter. Now producing about 50 tons sulphuric acid per day and shipping roasted ore to Clarksburg plant. Otto Proelfs, superintendent.

CANADA

British Columbia

GRANBY CONSOLIDATED (Victoria)—Reported to have acquired large area of coal lands in district between Ladysmith and Nanaimo on Vancouver Island for the manufacture of coke for its own use.

Ontario

BUFFALO (Cobalt)—Has taken option on group of claims in Boston Creek.

TRETHEWEY (Cobalt)—Has optioned property in Gowganda.

VIPOND (Porcupine)—Is considering the shutting down of the property until return of more normal conditions.

PROVINCIAL (Cobalt)—Closed down for several years, has been purchased by brokerage firm of Mark Harris & Co. and will be reopened.

UNITED KIRKLAND (Kirkland Lake)—This recently organized company, capitalized at $2,000,000, secured group of claims known as the Dodge-Ellis.

TECK-HUGHES (Kirkland Lake)—Arrangements being made for installation of additional crushing equipment to be installed to give 100-ton capacity per day.

ADANAC (Cobalt)—Development on the 310-ft. level opened series of rich veins, one proved up for 125 ft., varying in width from 3 to 10 in., and good milling ore for about one foot on each side.

LAKE SHORE (Kirkland Lake)—Group of Buffalo men have taken 300,000 shares of treasury stock at 10c. a share, providing ample money to complete the mill and put the property on a producing basis.

DAVIDSON (Porcupine) — Preliminary report states that 15,000 ft. of surface and underground development accomplished during the last nine months. Main shaft down 317 ft. and a large tonnage of low grade ore in sight.

HOLLINGER CONSOLIDATED (Timmins)—Development has added largely to reserves. Drilling to depth of 2000-ft. showed that numerous veins on upper levels persist at depth. Force now numbers 1200 men; old mill operated nearly to capacity.

MEXICO

AMERICAN SMELTING AND REFINING (120 Broadway, New York)—Semi-annual report shows that all its Mexican mines and smelteries are now operating except properties at or adjacent to Chihuahua and Velardeña. Work, however, is carried on under difficulties and to limited extent. Government of Mexico is encouraging operation and labor is abundant. Company purchased cars and locomotives and is managing its own railroad transportation. High cost of living causes much suffering and company is importing and selling necessities at cost and has increased wages. Is stated to be earning a net income from Mexican properties for first time in three years.

VENEZUELA

SOUTH AMERICAN MINES SYNDICATE (Aroa)—Production has been greatly increased according to consular report. Most of copper exported is mined by this company. Copper ore exported from Jan. 1 to Aug. 15 amounted to 20,519 tons, including 690 tons of matte, valued at $452,065.

CHILE

BETHLEHEM CHILE IRON MINES CO. (La Higuera, Coquimbo)—Capitalization increased from $4,000,000 to $10,000,000.

BRADEN (Sewell)—August production of copper amounted to 4,512,000 lb., comparing with 6,015,000 lb. in July, and 2,616,000 lb. in August, 1916.

CHILE COPPER (Chuquicamata)—Report for second quarter ended June 30, 1917 shows 22,513,314 lb. copper produced comparing with 22,525,796 lb. in the first quarter. Ore treated was 741,371 dry tons, averaging 1.68%. Net copper saving was 82.90%. Cost of copper produced, including all items, is given as 12.22c. per lb., high delivery cost of 3.69c. due to abnormal ocean freights and insurance. Undivided profits for the quarter were $2,807,898, computed on a basis of 27.71c. per lb. for copper.

SPAIN

RIO TINTO STRIKE was ended in latter part of August and miners have resumed work.

BELGIAN CONGO

UNION MINIERE DU HAUT KATANGA (Elizabethville)—August production of copper was 5,445,362 pounds.

SOUTH AFRICA

TRANSVAAL GOLD PRODUCTION in August was 756,658 oz., or $15,640,120. This is a decrease of 1189 oz. from July, and a decrease of 24,522 oz., as compared with August, 1916. For the eight months ended Aug. 31, the total output was 6,174,204 oz. in 1916, and 6,087,433 oz.—or $125,827,240—in 1917; a decrease of 86,771 oz., or 1.4% this year.

GOLD PRODUCTION of Rhodesia in July was $1,575,167, a decrease of 10.4% as compared with July, 1916. For the seven months ended July 30, the total was $12,197,639 in 1916 and $10,089,662 in 1917; a decrease of $2,107,977, or 17.3%, this year. Production in Rhodesia other than gold in July included 18,428 oz. silver, 366 tons copper, 4 tons wolframite, 993 tons asbestos, 8233 tons chrome ore and 14,690 tons coal. There were 55 carats of diamonds reported.

GEDULD PROPRIETARY MINES, LTD. (Johannesburg, Transvaal)—Report of 16th general shareholders' meeting shows capacity of plant increased to monthly average of 26,915 tons, or 19,540 tons yearly increase. Average yield was $3.77 per ton; working cost per ton of ore milled was $2.66, the increase owing to higher cost of supplies, war bonuses and payments to dependents of employees on military service amounted to 20c. per ton; total profit was $776,361 plus $76,953 from sundry revenue; net profit was $730,540.

CHOSEN

ORIENTAL CONSOLIDATED (Unsan)—Cable report August cleanup, $112,850. July bullion amounted to $94,989, divided as follows: Tabowie mill, $22,108; Taracol, $17,009; Maibong, $12,834; Taracol cyanide plant, $10,039; Maibong tube mill $12697. Milled in July 25,000 tons, compared to 25,970 tons in June. Poor cleanup for July owing to severe rains partly flooding Taracol mine and ore was taken from dump and other lean places. Also low extraction in all reduction works.

The Market Report

SILVER AND STERLING EXCHANGE

Sept.	Sterling Exchange	Silver		Sept.	Sterling Exchange	Silver	
		New York, Cents	London, Pence			New York, Cents	London, Pence
13	4 7550	98⅝	50	17	4 7550	102½	52
14	4 7550	100½	51	18	4 7550	103½	52½
15	4 7550	100½	51	19	4.7550	105½	53½

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

DAILY PRICES OF METALS IN NEW YORK

Sept.	Copper	Tin	Lead		Zinc
	Electrolytic	Spot.	N. Y.	St. L.	St. L.
13	26@26¾	62¾	8½@9	8½@8.90	7⅞@8⅛
14	26@26¾	62¼	8⅜@8⅝	8¼@8½	7⅞@8⅛
15	26¼@26¾	62¼	8⅜@8⅝	8¼@8½	7⅞@8⅛
17	26@26½	62¼	8⅜@8⅝	8¼@8½	7 95@8 15
18	26@26½	62	8	7.90@7.95	7.95@8 15
19	26@26½	61½	7¾@8	7.75@7.90	7 95@8.15

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

The quotations for electrolytic copper are for cakes; ingots and wirebars. Electrolytic copper is commonly sold on "regular terms" (r.t.), including freight to the buyer's works and is subject to a discount for cash. The difference between the price delivered and the New York cash equivalent is at present about 0.25c. on domestic business. The price of electrolytic cathodes is 0.05 to 0.10c. below that of electrolytic. Quotations for spelter are for ordinary Prime Western brands. We quote New York price at 17c. per 100 lb. above St. Louis.

Some current freight rates on metals per 100 lb. are: St. Louis-New York 17c.; St. Louis-Chicago, 6.3c.; St. Louis-Pittsburgh, 13.1 cents.

LONDON

Sept.	Copper			Tin		Lead	Zinc
	Standard		Electrolytic				
	Spot	3 Mos.		Spot	3 Mos.	Spot	Spot
13	120	119½	137	243½	243	30½	54
14	120	119½	137	245½	244½	30½	54
15	...	...		...	...	.	.
17	120	119½	137	246¼	244¼	30½	54
18	120	119½	137	246¾	246½	30½	54
19	120	119½	137	245	243½	30½	54

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2,240 lb. For convenience in comparison of London prices, in pounds sterling per 2,240 lb., with American prices in cents per pound the following approximate ratios are given, reckoning exchange at 4.80. £15 = 3.21c.; £20 = 4.29c.; £30 = 6.43c.; £40 = 8.57c.; £60 = 12.85c. Variations, £1 = 0.21⅜c.

Metal Markets

NEW YORK—Sept. 19

The most interesting thing in the metal markets this week was lead, which experienced a sharp decline. The other metals were dull and about stationary in price.

Copper—The little burst of activity that we reported last week continued through Thursday, Friday and Saturday, on a diminishing scale, although with a slight further advance in price. Beginning with Monday, the market became very dull and offers to sell at small concessions were made. However, for those days quotations are scarcely more than nominal, any weakness in tone simply reflecting nervousness in quarters that become uneasy whenever inquiries cease. It is doubtful if any considerable quantities of copper could have been bought at concessions, especially in view of the fact that one of the largest producers is out of the market owing to the result of the strikes, while another important producer withdrew this week in order to conserve its supply for Government requirements.

The situation in Montana has greatly improved. According to advices dated Sept. 18, the Anaconda company had about half the normal working force in its mines, producing about half the usual quantity of ore. At Anaconda, four sections of the concentrator had been put in operation and preparations to resume smelting were being made, more men being available than were needed.

Copper Sheets are quoted at 35c. per lb. for hot rolled, and 1c. higher for cold rolled. Wire is quoted nominally at 31c. per lb., f.o.b. mill.

Tin—This market was about stationary during the week. The aggregate of transactions was smaller than in the previous week, total sales having probably been in the neighborhood of 500 tons. At the close, Straits tin was quoted at 61½c. and Banka at 59½.

Lead—The reduction in price by the American Smelting and Refining Co., which we foreshadowed in our last report, materialized quickly, a cut to 9c. being made at about 11 a.m. on Thursday. This price was immediately cut by other producers, offers to sell at as low as 8½c., New York, being made on the same day. On the following day a round lot was sold at 8.45c., September delivery, while on Monday a large lot for prompt delivery was sold at 8⅜c. The American Smelting and Refining Co. having failed to develop business, naturally, in view of the circumstances, on Tuesday, at 3 p.m., reduced its price to 8c., and at that figure made sales, but on Wednesday its price was again shaded. Sales of about 2000 tons during the week were reported to us. There is some encouragement in the fact that on the decline producers were able to sell.

Zinc—Small sales were made at but little change in price. The sales included a few lots for export. The efforts to lift this market proved futile, sellers being unable to induce buyers to take the step from 8⅛ to 8¼ cents.

The arrangements that were made on Aug. 24 between the Navy Department and the Zinc Committee for 10,000,000 lb. of grade A spelter at 12½c., and 2,750,000 lb. of grade B spelter at 12c., have been abrogated and the Navy Department is now proceeding to obtain by direct bids such quantities of these metals as it needs.

Zinc Sheets—Price of zinc sheets has not been changed. Market is still at $19 per 100 lb. f.o.b. Peru, Ill., less 8% discount.

Aluminum—Further decline occurred in this metal, No. 1 ingots at New York being quoted at 42@43c. per lb., with market weak even at that price.

Antimony—This market was a little firmer, but the amount of business transacted was very small. We quote spot at 15c. and futures at 14½@15c., c.i.f. in bond.

Bismuth—Unchanged at $3.50 per pound.

Cadmium—This metal is quoted at $1.40 @1.50 per pound.

Nickel—Steady at 50c. per lb., premium of 5c. per lb. for electrolytic.

Quicksilver—There were two drops in price during the week, first to $112, then to $110, and we quote the latter price at the close. San Francisco reports, by telegraph, $112.50.

Gold, Silver and Platinum

Gold in the United States, Sept. 1, is estimated by the Treasury Department as follows: Held by Treasury against gold certificates outstanding, $2,103,511,429; in Treasury current balances, $199,475,578; in banks and circulation, $758,004,371; total, $3,060,991,378. This is an increase of $511,749,905 over Sept. 1 of last year.

Silver—This metal has advanced rapidly the last few days, not so much on account of the volume of the business, but owing to small spot supplies. The demand for futures is not very keen owing to the uncertainty of the general situation. The price on Sept. 19 was $1.05½, the highest quotation at New York in about 27 years.

Mexican dollars at New York: Sept. 12, 78c.; 13, 78c.; 14, 80c.; 15, 80c.; 17, 82c.; 18, 83c.

Platinum—Firm at $103@105.

Palladium—We quote $125, at which price sales were made.

Zinc and Lead Ore Markets

Joplin, Mo., Sept. 15—Blende, per ton high-grade, $78.80; basis 60% Zn, $75@65; calamine, basis 40% Zn, $40@35. Prices a year ago were $65.70, $65@55 and $45@30, respectively.

Shipments for the week amounted to 9336 tons comparing with 12,922 tons for the previous week and 8690 for corresponding week last year. For the year to date shipments amount to 364,269 tons, an increase of 108,269 tons compared with last year.

Platteville, Wis., Sept. 15—Blende, basis 60% Zn, market weaker but quotations unchanged at $70 base for premium grade down to $65 base for medium grade. Lead ore, basis 80% Pb, $85 per ton. Shipments reported for the week are 2822 tons of zinc ore, 112 tons of lead ore, and 374 tons of sulphur ore. For the year to date the figures are 101,347 tons of zinc ore, 4981 tons of lead ore, and 20,016 tons of sulphur ore. Shipped during the week to separating plants, 3892 tons of zinc ore.

Other Ores

Chrome Ore—Transactions covering a long period on the basis of 90c. per unit per ton of 2000 lb., f.o.b., California, for 48% ore, are reported. In another district on the Pacific Coast, the following prices are offered: For ore of 50% grade, 85c. per unit; 45% grade, 75c. per unit; 40% grade, 70c. per unit. One important buyer, which uses the lower grades of ore, within the last few days advanced its price to 60@70c. per unit, according to grade. In the Eastern part of the country, ore as low as 30% chromic oxide has been selling at 70c. per unit ever since the beginning of September. There appear to be wide ranges in the prices offered for chrome ore according to district and according to buyers; and contracts are closed at widely varying prices according to the foregoing conditions and the knowledge or ignorance of sellers as to market conditions.

Manganese Ore—Metallurgical ore continues strong on the basis of $1 per unit for ore assaying 48% manganese.

Molybdenum Ore—Small business was done at $2.20 per lb. for molybdenite containing 90% of molybdenum sulphide. Ore of 50% grade was reported sold at $1.35.

Pyrites—Spanish lump quoted at 15½c. per unit on basis of 10s. ocean freight, buyer to pay war risk, excess freight and any duty. Ocean freights are 35s. for northern ports, 40s. for south Atlantic and 42s. 6d. for Gulf ports.

Tungsten Ore—This market continued firm at unchanged prices. We quote $23@25 for high-grade wolframite and $26 for high-grade sheelite.

Iron Trade Review

NEW YORK—Sept. 19

The fuel situation has become more serious since the fixing of the $2 basis for bituminous coal and present and future effects upon the steel industry are giving no small concern. Eastern producers of plates and shapes, says "Iron Age," have been facing a shutdown for the last 10 days because of short shipments of gas coal, and it appears that the Government must actually get into the business of supplying coal to some iron and steel producers from whom it has bought material.

Dissatisfaction with present war buying methods grows and manufacturers who recently ceased to act on advisory committees in view of the legal nuestions raised are not likely to resume this relation. Sentiment is being made daily in favor of larger powers for the War Industries Board and the recognized need of further centralization may explain the delay in announcing iron and steel prices, though the impression in Washington is that the question will be settled this week.

It is becoming clearer that recent contracting at concessions from the lately firm levels is to fix with a certainty the supply of material. Consumers may believe that the quantities available at Government prices after Government needs, general contracts and spot demands are cared for will be small.

PITTSBURGH—Sept. 18

The finished-steel market shows no distinct signs of returning activity. There have been expectations in the last fortnight that jobbers would do a fair amount of buying for fourth quarter but they are not taking hold to any extent and it seems probable that with their policy of reducing stocks to the absolute minimum, and with the amount of undelivered tonnage due them on previous contracts they will not have much occasion to make further purchases in the next few weeks.

Manufacturing consumers are well covered by contracts to the end of the year and some of them probably have a larger contract tonnage than they will specify against. The next buying activity of this class would be for the first quarter or first half of next year, and for that period they show no disposition to take hold. Their position is that the market has changed from a sellers' market to a buyers' market and they expect sellers to make the first move, and as the mills are still well filled with business there is no disposition to make this move.

Prices continue to show a yielding disposition at various points. Galvanized sheets, which until recently could scarcely be bought at 10c., are now offered at 9.50c. Black sheets are offered at 8.25c., representing a slight decline. Steel bars, which recently declined from 4.50c. to 4c. are reported to have sold at 3.50c. in one or two cases, but this is not an open-market quotation.

Mill operations have shown only a slight improvement, with the passing of the hot weather, the chief curtailing influence being the insufficient supply of coke. The Steel Corporation has several blast furnaces out of commission on this account. A strike yesterday caused the banking of four of the six Eliza furnaces of the Jones & Laughlin Steel Co.

Hearings will begin on Sept. 21 in Washington before the Senate Committee on Interstate Commerce on the Pomerene bill to regulate the production, sale and distribution of iron ore, iron and steel and their products.

Pig Iron—Market prices continue to be practically nominal, there being no inquiry except for an occasional small lot for prompt shipment. The furnaces appear to be well sold up and pig iron is regarded as scarce. We quote: Bessemer, $50; basic, $48; foundry, $50; malleable, $51@52, f.o.b. valley furnaces; 95c. higher delivered Pittsburgh.

Steel—It is reported that there have been offerings of billets at $65 and of slabs at $75, while sheet bars could probably be had at $75 also. Offerings are probably confined to middle interests, as the mills generally refuse to quote. Demand is extremely limited.

Ferroalloys

Ferromanganese—The continued light demand and the offering of lots at cut prices has developed into an open decline of about $25 a ton. Prompt is available at $350@375, while fourth quarter is not over $350, and this figure could probably be shaded for first quarter. Consumers show no disposition to take hold for next year.

Coke

Connellsville—Coke operators have lately been offering 1918 contracts, both at flat prices and on various sliding-scale bases, depending on monthly prices of pig iron. The evident object of closing contracts at this time would be to anticipate the fixing of a price by the Government, whereupon the consumer having a higher-priced contract would be assured of full deliveries, but the blast furnaces appear to be in a mood to take chances, and the only contracts reported are two, for about 15,000 tons a month each for 1918, at the flat price of $8.50. Spot coke is a shade easier, at $12.50@13 for furnace and $13@13.50 for foundry, per net ton at ovens.

STOCK QUOTATIONS

N. Y. EXCH.†	Sept. 18
Alaska Gold M	4
Alaska Juneau	3
Am.Sm.& Ref.,com.	94
Am. Sm. & Ref., pf	107
Am. Sm. Sec., pf, A	93
Am. Sm. Sec., pf. B	‡93
Am. Zinc	18
Am. Zinc, pf	52
Anaconda	69
Batopilas Min	1
Bethlehem Steel.	95
Bethlehem Steel, pf.	85
Butte & Superior.	26
Cerro de Pasco	32
Chile Cop	17
Chino	50
Colo.Fuel & Iron.	42
Crucible Steel	67
Dome Mines	9
Federal M. & S.	15
Federal M. & S., pf	39
Great Nor., ore ctf.	32
Greene Cananea	40
Gulf States Steel	92
Homestake	100
Inspiration Con	49
International Nickel	32
Kennecott.	40
Lackawanna Steel	78
Miami Copper	33
Nat'l Lead, com.	50
National Lead, pf	104
Nev. Consol	20
Ontario Min	7
Quicksilver	1
Quicksilver, pf	1
Ray Con	24
Republic I.&S.,com.	78
Republic I. & S., pf	100
Sloss-Sheffield	42
Tennessee C. & C.	15
U. S. Steel, com.	105
U. S. Steel, pf	115
Utah Copper.	91
Va. Iron C. & C.	54

N. Y. CURB†	Sept. 18
Big Ledge.	1
Butte & N. Y.	1
Butte C. & Z.	9
Caledonia	75
Calumet & Jerome.	2
Can. Cop. Corpn.	2
Carlisle.	4
Cashboy	06
Con. Ariz. Sm	2
Con. Coppermines	9
Con. Nev.-Utah.	07
Emma Con	75
Ferber.	‡.60
First Nat. Cop	2
Goldfield Con.	41
Goldfield Merger.	05
Greenmonster.	[illegible]
Hecla Min	8
Howe Sound	5
Jerome Verde	1
Kerr Lake	5
Magma	45
Majestic	35
McKinley-Dar-Sa	69
Milford	1
Mohican	[illegible]
Mother Lode	36
N. Y. & Hond	‡13
Nipissing Mines	9
Ohio Cop	1
Ray Hercules	3
Richmond	56
Rochester Mines	50
St. Joseph Lead.	17
Standard S. L.	.65
Stewart	.31
Success	19
Tonopah	6
Tonopah Ex	2
Tribullion	25
Troy Arizona	18
United Cop	.75
United Verde Ext	36
United Zinc	4
Utica Mines	25
White Knob, pf	‡1
Yukon Gold	2

SAN FRAN.*	Sept. 18
Alta	03
Andes	10
Best & Belcher	03
Bullion	02
Caledonia	10
Challenge Con	01
Confidence	05
Con. Virginia	18
Gould & Curry	‡ 02
Hale & Norcross	03
Jacket-Cr. Pt	08
Mexican	08
Occidental	60
Ophir	07
Overman	01
Savage	04
Seg Belcher	† 02
Sierra Nevada	10
Union Con	58
Utah Con	‡ 02
Belmont	4 70
Jim Butler	90
MacNamara	18
Midway	09
Mont.-Tonopah	1 10
North Star	09
Rescue Eula	18
West End Con.	65
Atlanta	09
Booth	05
Comb. Frac	03
D'field Daisy	03
Florence	10
Jumbo Extension	22
Kewanas	09
Nevada Hills	12
Nevada Packard	24
Round Mountain.	26
Silver Pick	.08
White Caps	1 27
Big Jim	‡ 60
United Eastern	4 25

BOSTON EXCH.*	Sept. 18
Adventure	1
Ahmeek	98
Algomah	.50
Allouez	61
Ariz. Com., ctfs	10
Arnold	‡ 25
Bonanza	21
Butte-Balaklava.	50
Calumet & Ariz	76
Calumet & Hecla.	525
Centennial	16
Copper Range	54
Daly West	2
Davis-Daly	4
East Butte	11
Franklin.	6
Granby	77
Hancock	13
Hedley	17
Helvetia	25
Indiana	1
Isle Royale	30
Keweenaw.	1
Lake	8
La Salle	3
Mason Valley	5
Mass	10
Mayflower	1
Michigan	1
Mohawk	80
New Arcadian	3
New Idria	12
North Butte	15
North Lake	75
Ojibway.	1
Old Dominion	46
Osceola	86
Quincy	84
St. Mary's M. L.	71
Santa Fe.	1
Seneca	7
Shannon	6
Shattuck-Ariz.	23
So. Lake	3
So. Utah.	.15
Superior	7
Superior & Bost.	3
Trinity	5
Tuolumne	1
U. S. Smelting	61
U. S. Smelt'g, pf	49
Utah Apex	3
Utah Con	14
Utah Metal.	4
Victoria.	3
Winona	2
Wolverine	10
Wyandot	.80

BOSTON CURB*	Sept. 18
Alaska Mines Corp.	50
Bingham Mines.	11
Boston Ely	65
Boston & Mont	58
Butte & Lon'n Dev	15
Calaveras	2
Calumet-Corbin.	01
Chief Con	2
Cortez	10
Crown Reserve.	26
Crystal Cop	.80
Eagle & Blue Bell.	2
Houghton Copper	.75
Intermountain	1
Iron Cap, Com	16
Iron Cap Cop., pf	16
Mexican Metals	.27
Mines of America	1
Mojave Tungsten	.40
Nat. Zinc & Lead	.40
Nevada-Douglas	1
New Baltic	1
New Cornelia	16
Oneco	.40
Pacific Mines	35
Rex Cons	.16

SALT LAKE*	Sept. 18
Bannack	53
Big Four	04
Cardiff	5 50
Colorado Mining	15
Daly	1 70
Daly-Judge	8 45
Empire Copper	1 30
Gold Chain	18
Grand Central	52
Iron Blossom	89
Lower Mammoth.	03
May Day	05
Moscow	.15
Prince Con	.98
Silver-King Coal'n	3 15
Silver King Con.	4 20
Sioux Con	07
So. Hecla	1 00
Tintic Standard.	1 57
Uncle Sam	04
Wilbert	30
Yankee	07

TORONTO*	Sept. 18
Bailey	05
Beaver Con	40
Buffalo Mines	†1 00
Chambers Ferland	15
Coniagas	3 80
Hargraves	14
La Rose	62
Peterson Lake	12
Right of Way	† 05
Temiskaming	32
Wettlaufer-Lor	07
Dome Exten	15
Dome Lake	14
Foley O'Brien	1 60
Hollinger	6 15
McIntyre	1 50
Newray	80
Porcu. Crown	41
Schumacher	‡ 42
Teck Hughes	40
Vipond	27
West Dome	17

STOCK QUOTATIONS—Continued

COLO. SPRINGS	Sept. 18
Cresson Con.	5 62
Doctor Jack Pot.	03
Elkton Con.	05
El Paso	20
Gold Sovereign.	04
Golden Cycle.	2 04
Granite.	44
Isabella	10
Mary McKinney	08
Portland	1 42
United Gold M.	.17
Vindicator	.60

LONDON	Sept. 3
Alaska Mexican	£0 10s 0d
Alaska Tre'dwell	1 2 6
Burma Corp.	4 3 9
Cam & Motor	0 11 9
Camp Bird	0 8 0
El Oro.	0 11 0
Esperanza.	0 10 6
Mexican Mines	6 2 6
Nechi, pfd.	0 13 3
Oroville	0 16 9
Santa Gert'dis.	0 12 3
Tomboy.	0 18 6

* Bid prices. † Closing prices. ‡ Last Quotations

MONTHLY AVERAGE PRICES OF METALS

Silver	New York			London		
	1915	1916	1917	1915	1916	1917
January	48.855	56.775	75.630	22.731	26.960	36.682
February	48.477	56.755	77.585	22.753	26.975	37.742
March	50.241	57.935	73.861	23.708	27.597	36.410
April	50.250	64.415	73.875	23.709	30.662	36.963
May	49.915	74.269	74.745	23.570	35.477	37.940
June	49.034	65.024	76.[illegible]	23.267	31.060	39.[illegible]
July	47.519	62.940	79.010	22.597	30.000	40.110
August	47.163	66.083	85.407	22.780	31.498	43.418
September	48.680	68.515		23.591	32.584	
October	49.385	67.855		23.925	32.361	
November	51.714	71.604		25.094	34.192	
December	54.971	75.765		26.373	36.410	
Year	49.684	65.661		23.675	31.315	

New York quotations cents per ounce troy, fine silver. London, pence per ounce, sterling silver, 0.925 fine.

Copper	New York		London			
	Electrolytic		Standard		Electrolytic	
	1916	1917	1916	1917	1916	1917
Jan.	24.008	28.673	88.083	131.921	116.167	142.895
Feb.	26.440	31.750	102.667	137.895	133.167	148.100
Mar.	26.310	31.481	107.714	136.750	136.000	51.000
April	27.895	27.935	124.319	133.842	137.389	47.158
May	28.625	28.788	135.457	130.000	152.522	142.000
June	26.601	29.962	112.432	130.000	137.455	142.000
July	23.865	26.620	95.119	128.409	125.500	140.409
Aug.	26.120	25.380	110.283	122.391	126.304	137.000
Sept.	26.855		113.905		134.071	
Oct.	27.193		122.750		142.523	
Nov.	30.625		134.659		155.432	
Dec.	31.890		145.316		162.842	
Year	27.202		116.059		138.281	

Tin	New York		London	
	1916	1917	1916	1917
January	41.825	44.175	175.548	185.813
February	42.717	51.420	181.107	198.974
March	50.741	54.388	193.609	207.443
April	51.230	55.910	199.736	220.171
May	49.125	63.173	196.511	245.114
June	42.231	62.053	179.466	242.083
July	38.510	62.570	168.357	242.181
August	38.565	62.681	169.870	243.978
September	38.830		171.345	
October	41.241		179.307	
November	44.109		186.932	
December	42.635		183.368	
Av. year	43.480		182.096	

Lead	New York		St. Louis		London	
	1916	1917	1916	1917	1916	1917
January	5.921	7.626	5.826	7.530	31.167	30.500
February	6.246	8.636	6.164	8.595	31.988	30.500
March	7.136	9.199	7.375	9.120	34.440	30.500
April	7.630	9.288	7.655	9.158	34.368	30.500
May	7.463	10.207	7.332	10.202	32.967	30.500
June	6.936	11.171	6.749	11.12[illegible]	31.011	30.500
July	6.352	10.710	6.185	10.644	28.137	30.500
August	6.244	10.594	6.088	10.518	29.734	30.500
September	6.810		6.699		30.786	
October	7.000		6.898		30.716	
November	7.042		6.945		30.500	
December	7.513		7.405		30.500	
Year	6.853		6.777		31.359	

Spelter	New York		St. Louis		London	
	1916	1917	1916	1917	1916	1917
Jan.	16.915	9.619	16.745	9.449	89.810	48.329
Feb.	18.420	10.045	18.260	9.875	97.762	47.000
Mar.	16.846	10.300	16.676	10.130	95.048	47.000
April	16.695	9.459	16.525	9.289	99.056	54.632
May	14.276	9.362	14.106	9.192	94.217	54.000
June	11.752	9.371	11.582	9.201	68.591	54.000
July	8.925	8.643	8.755	8.473	50.750	54.000
Aug.	8.730	8.360	8.560	8.190	51.587	54.000
Sept.	8.990		8.820		52.095	
Oct.	9.829		9.659		54.159	
Nov.	11.592		11.422		56.023	
Dec.	10.665		10.495		55.842	
Year	12.804		12.634		72.071	

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton.

Pig Iron, Pitts.	Bessemer‡		Basic‡		No. 2 Foundry	
	1916	1917	1916	1917	1916	1917
January	$21.60	$35.95	$18.78	$30.95	$19.70	$30.95
February	21.16	36.37	18.93	30.95	19.5[illegible]	30.95
March	21.81	37.37	19.20	33.49	19.4[illegible]	35.91
April	21.65	42.23	18.95	38.90	19.4[illegible]	40.06
May	21.78	46.94	19.11	42.84	19.58	43.60
June	21.95	54.22	18.95	50.05	19.34	50.14
July	21.95	57.45	18.95	53.80	19.20	53.95
August	21.95	51.17	18.95	50.37	19.22	53.95
September	22.88		19.58		19.63	
October	24.61		21.26		21.51	
November	30.07		28.18		26.55	
December	35.16		30.95		30.79	
Year	$23.88		$20.98		$21.15	

‡ As reported by W. P. Snyder & Co.

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Clarkdale, Arizona, United Verde's Million Dollar Town

By T. C. ROBERTS
Chief Engineer, United Verde Copper Co., Clarkdale, Ariz.

A modern company town, built according to the employees' tastes and up to date in sanitation and modern equipment. Floor-plan designs are given with photographs of the various standard houses; also some approximate cost data.

WHEN the United Verde Copper Co. decided to build its new smelting plant the company was confronted with the problem of providing dwellings for its employees. After considerable preliminary work had already been done the problem was placed in my hands. It was decided to build a town to take care ultimately of seven thousand inhabitants. The new town was to be named Clarkdale in honor of ex-Senator W. A. Clark, the principal owner of the United Verde mine. Jerome, the nearest town, was about six miles away, and there were no railroad connections between the two town sites. After considering the problem in all its phases President W. A. Clark decided that the company would build a model town; that it would be different in construction from the usual company-built towns in that all the buildings would not be of the same design; and that they would be built entirely of brick.

In order to get the individual's ideas on design, all employees who were to live in Clarkdale were requested to submit a rough sketch showing what they would desire if they were building their own homes. From these sketches a number of standard houses were planned containing from one to nine rooms. A number of special houses were also designed to meet the requirements of employees whose ideas could not be satisfied with the more modest constructions. Suitable clay beds having been found in the vicinity, a brick plant and a sand-and-gravel washery were first constructed.

VIEW OF THE UPPER TOWN, CLARKDALE, ARIZ.

The town is laid out in two districts, known, respectively, as the upper town and the lower town. In the upper town are all public and mercantile buildings and residences for merchants, professional men or any of the employees desiring that locality. In the lower town, which is nearer the smeltery, residences were built for all employees who preferred that section. The lots in the upper town are 32 x 120 ft. and in the lower town they are 30 x 90 ft. The streets are 40 ft. wide between curb lines and 60 ft. wide between building lines, allowing 10 ft. on each side for sidewalk, parking, etc. A 10-ft. lane or alley divides the block and gives access to the rear of all buildings.

The principal thoroughfare on which the business houses are situated is Main Street, which is 55 ft. between curbs and 75 ft. between buildings. The streets parallel to Main Street are designated as First, Second and Third North Streets, etc., and First, Second, Third and Fourth South Streets, etc. The cross streets are numbered from First Street to Seventeenth Street, inclusive. The residences, which will be described more or less in detail, are situated on alternate lots, thereby leaving greater space between them, avoiding a crowded effect and making it more pleasant. Ornamental iron fences were built around each house.

TWO-STORY SCHOOLHOUSE

RESTAURANT AND ROOMING HOUSE

A BUSINESS BLOCK IN THE CENTER OF CLARKDALE, ARIZ

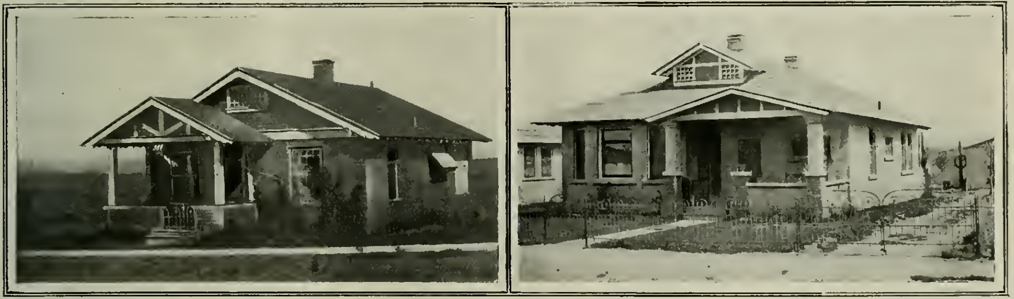
Due to the excessive heat in summer, a number of houses of the Mexican patio type were built. Each patio is 110 ft. long x 32 ft. wide, and contains five two-room apartments under one roof. The exterior walls, 8½ in. thick, are constructed of brick, the foundation and floor being of concrete. Each apartment has a living room 11 ft. 3½ in. by 12 ft. 5 in., and a combination dining room and kitchen of the same dimensions. There is also a sleeping porch with shower-bath and toilet accommodations. Separating each apartment is the yard, or patio, from which this style of house gets its name. The space between the apartments is 10 ft. wide and 32 ft. long, closed at each end with latticework and gates. These houses have a pleasing appearance and cost approximately $2300 each.

The residences built in the lower-town site consist of two-, three- and four-room single, and two-room double, cottages. To date, there have been erected twenty three-room houses costing $1600 each; forty-five four-room houses costing $1250; and eighteen double two-room houses costing $2225. These cottages are constructed with brick exterior walls 8½ in. thick, concrete foundations and timber joists and partitions. A number of these buildings have composition-roof coverings, some have asbestos roofs, and some stained cedar shingles. The walls inside received two coats of plaster and a sand finish.

The residences erected on the upper-town site consist of forty-six four-room cottages costing $1700 each and twenty five-room cottages costing $2600 each. They are of the same construction as the lower-town-site houses. The five-room cottages have hard-wood floors in living and dining rooms. These rooms are divided by large arches, supported on two columns. The upper-town-site houses have a front porch and at the rear a sleeping porch. The styles are bungalow, with gabled shingle roofs stained in red and green colors. The brick selected for the exterior walls are of different colors in different buildings, giving a harmonious tone throughout. In addition to these houses, as stated before, a number of special houses were built, costing from $3000 to $10,000 each.

The schoolhouse is two stories in height. The foundations are of concrete; the beams supporting the first-floor joists are of reinforced concrete; the frame consists of steel beams and columns, and the exterior curtain walls of brick. The brick walls are 13 in. thick on the first floor, the piers being carried up to the roof beams at a uniform thickness. The walls between the piers in the second story are 9 in. thick. This building is 111 ft. long x 61 ft. 3 in. wide and contains nine class rooms, a library, a room for the principal, a rest room for teachers, and an auditorium with stage for recitals, etc. The size of the class rooms is 24 x 30 ft., and the auditorium 36 x 48 ft. exclusive of the stage. The heating has been taken care of by a steam plant and the ventilating by a plenum system. This building cost approximately $60,000. The exterior is of light buff brick with dark mortar joints, and trimmings in cement. The blackboards are of slate. The building is equipped with electric clock and program signal systems. The furnishings are of latest type throughout. The natural light, in order to avoid cross lights, is admitted from one side only of each room.

The policy adopted in deciding upon the design for business houses was as follows: Notice was given to the public that applications would be accepted from those desiring to engage in business in Clarkdale. When the applications were all received each was carefully considered. It had been previously decided how many shops of the same class would be permitted, due consideration having been given to the effect of excessive competition. Each successful applicant was invited to present a rough sketch showing the size of the building that he would require. The buildings were then designed according to the individual's requirements and were grouped according to class of business but also with regard to scenic effect. By building lodge rooms and offices on top of what would otherwise be one-story shops, the buildings are made nearly uniform in height although varying in design. The construction consists of brick walls, steel beams and girders, and fire walls. All of the fronts are glazed with plate glass and equipped with ventilators. Clarkdale is not an incorporated town. It is not the desire of the company to receive any monetary profit from the town over the revenue required to cover insurance, maintenance, sanitary and policing expenses, therefore the rental both for business and residence buildings was based on a fixed percentage of the actual construction cost of the building. The class of business conducted in Clarkdale



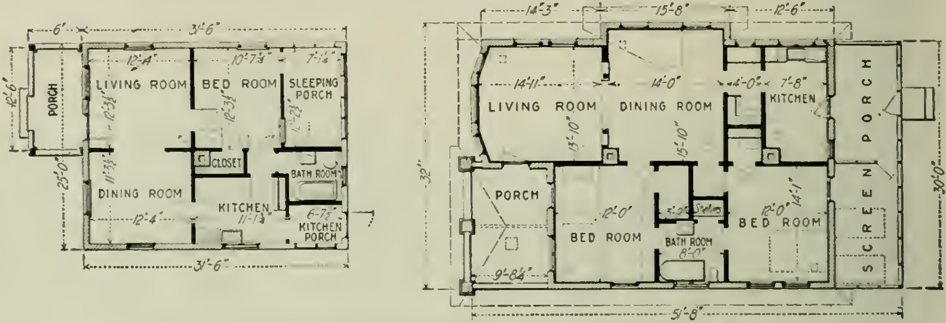
FOUR-ROOM AND FIVE-ROOM COTTAGES, UPPER TOWN, CLARKDALE, ARIZ.

ROW OF APARTMENTS, MEXICAN PATIO STYLE

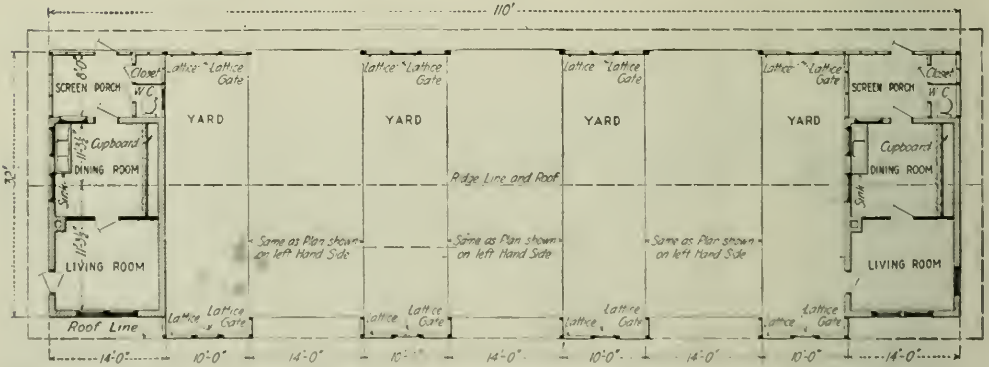
is the same as that in any other town, consisting of the same general stores, banks, post-office, drug stores, moving-picture theaters, bakeries, restaurants, lodge rooms, office buildings, etc. As stated before, due to the elimination of excessive competition, the merchants seem to be thriving, and conduct stores that would be a credit to many larger towns.

RESTAURANT AND ROOMING HOUSE IN LIEU OF HOTEL

Due to the fact that satisfactory arrangements could not be made for a tenant for the hotel, a rooming house with a restaurant attached was built. This house contains 30 rooms. Exterior walls are of brick over which is a composition roof. The building cost approximately $15,000 and has screened sleeping porches on three sides.



FLOOR PLAN FOUR-ROOM AND FIVE-ROOM COTTAGES, CLARKDALE, ARIZ.



FLOOR PLAN OF ROW OF MEXICAN PATIO APARTMENTS

The electric-lighting system was designed and constructed in accordance with the Arizona Corporation Commission's rulings, which are based almost entirely upon the National Electric Light Association's standards. The Mountain States Telephone and Telegraph Co. serves the town under a special permit. The water supply is obtained and piped in from springs in the mountains to a reservoir built of reinforced cement, and has a capacity of 500,000 gal. It is then distributed through the town system which was constructed in accordance with standard practice. The sewerage system[1] consists of approximately 30,000 ft. of 6-, 8-, 10- and 12-in. mains with flush tanks installed where necessary, and discharges into a septic tank consisting of 14 compartments, 9 x 9 x 12 ft., and divided into two sections of seven compartments each. The capacity of each tank up to the affluent outlet is 769 cu.ft. The sludge capacity of the 14 tanks is approximately 9000 ft. The operation of the tanks, which are of a modified Imhoff design, is according to the usual practice. The sewage from the 12-in. main enters one bay of the tanks and the flow is changed from one bay to the other approximately every 3 months. The usual sludge and sand filter beds are built in connection with the tanks. The tanks cost approximately $15,000, and the entire system cost approximately $60,000. All the water, sewerage, lighting and power systems are controlled by the United Verde Copper Co., while the town of Clarkdale is controlled by the United Verde Copper Co. through the Clarkdale Improvement Co. The Verde Valley branch of the Santa Fe, Prescott & Phœnix R. R. connects Clarkdale with the main line, and in a short time the Verde Tunnel and Smelter R.R. will be extended to Jerome, giving connection over the United Verde & Pacific R.R. with the main line at Jerome Junction The town cost approximately a million dollars.

Silver-Palladium-Cobalt Alloy has been patented by H. S. Hooper in U. S. Pat. 1,229,037. The alloy is described as consisting of 70% silver, 25% palladium and 5% cobalt. It is hard, heat-resisting, non-oxidizing and is a good conductor of electricity. These properties make such an alloy well adapted for use in electrical-contact points.

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[1] Eng. and Min. Journ., p. 581, Sept. 27, 1913.

Standard Reports for Accident Statistics[*]

Three thousand lives are lost every year in the mines of the United States. Standardization of accident records and the use of information to be gained from statistics would reduce this mortality. Kind of data required for complete records and what the mine operator can do in this connection.

THE magnitude of the mining industry may be grasped when one realizes that more than 6,000,000 men are engaged in the mines of the world. Of this number 3,800,000 are employed in the coal mines and 2,200,000 in the metal mines. In addition, millions more are engaged in allied industries dependent directly upon the mines for coal and metal.

Mining is one of the hazardous industries employing over 1,000,000 men in the United States, in which three out of every 1000 men employed are killed every year by reason of some accident. While complete data relating to non-fatal injuries are not available, reports to the U. S. Bureau of Mines for all metal mines in the United States show that about 200 men per thousand per year are injured sufficiently to cause a loss of time. A reduction of 50% in the number of mine accidents would mean a saving of 1500 lives in the United States every year, in addition to reducing the loss of time and suffering resulting from more than 200,000 non-fatal injuries.

WHY ACCIDENT STATISTICS ARE VALUABLE

Before offering any suggestions as to what the operator can do for accident statistics, it is well to point out some of the reasons why accident statistics are desirable. The reason is not merely to show a record of experience, discomfort, pain and suffering of the employees to be handed down to future generations or to statisticians in order that a set of figures may be juggled to suit any peculiar whim; nor to provide for the construction of fancy charts. These things are, however, necessary adjuncts to the main purpose, viz., to obtain information by which a diagnosis of industrial accidents may be made, the causes determined, and remedies provided. Statistical records are absolutely essential as a matter of evidence to prove the guilt of certain mechanical devices which assault with intent to maim or kill, and to determine with a reasonable degree of accuracy the extent of the personal element entering into the cause of accidents. As in every court of justice, it is necessary to have all the evidence available in order to find the guilty one, and to pass proper sentences.

There are a few operators who have not awakened to the need of statistics and therefore feel, when asked for certain information concerning accidents to their employees, that a sort of inquisition is being forced upon them to disclose their private business. Far from it. Such information is for the operators' benefit as well as for the welfare of their employees. Whatever expense is incurred to help human beings in their work by providing conditions conducive to good health and bodily comfort will be returned by increased dividends to the man who provides such essentials. Sick or crippled employees in the hospital or at home are a burden to themselves and their families, to the community and the state, and are of no benefit whatsoever to their employers. Even though a crippled man may be employed as a pensioner, he cannot render full service to his employer.

Statistical reports should embody all of the information available concerning each accident, if the best results are to be obtained. It is not enough to know that a man fell down a shaft and was killed. Why did he fall down? Who was to blame? Was the shaft properly guarded? Could the accident have been avoided? The answers to these questions are what should be recorded in accident statistics.

WHAT OPERATORS CAN DO

So long as accidents occur it is necessary for the operator to keep correct and detailed records. He should study intelligently every accident from all angles. If the accident was preventable, he should install a device that would prevent its reoccurrence. At the close of the year he should take an inventory of his accident records with the object of finding out what and who was to blame for each group. Having found out the principal causes, he should see that proper remedies are then applied. For example, should it be known that a certain type of machine has cut off a dozen fingers during the year, the remedy is not to supply additional fingers, but to devise a guard for the machine or install another type for this particular work.

If human beings were perfect and it were possible to devise perfect machinery, there would be no need for accident statistics. While someone has a lapse of memory for an instant, a machine that is under human control moves 3 in. too far and crushes a man to death. Another does not look where he is stepping and as a result falls down a shaft. The shaft should have been guarded to protect the thoughtless. Lead pencils have rubbers because people make mistakes. Industries have many accidents because of mistakes; many occur because of carelessness, and many because of inadequate mechanical safety devices. Mistakes are made by manager as well as by employee; both are often careless and both are responsible for mechanical equipment, the employer in providing it and the employee in keeping it in proper condition when installed and turned over to him to operate.

In all industries there are a certain number of accidents that are inherent and for which it is impossible to place the blame on anyone. Such accidents in the mining industry equal about 50% of the total. The responsibility for the remainder may be placed about equally on the operator and the employee as shown by the records of the mine inspectors of the Union of South Africa.

In order that the accident records of one company or one state may be comparable with those of others, they should be collected and tabulated on a uniform basis, care being taken to separate each branch of industry from all others. The number of men employed should be classified into underground and surface employees, and a corresponding grouping of fatal and nonfatal injuries should be made according to the principal causes. Uniformity may be brought about by the standardization of state laws relating to statistics. The Bureau of Mines is doing all in its power toward this end, a committee having drafted standard rules and regulations relating to metal mines. One relating to coal mines is under consideration. It is hoped that state legislatures will adopt, as nearly as conditions will permit, the rules and regulations proposed by the bureau. The operators can help in this.

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[*] A paper entitled, "What Can the Mine Operator Do To Aid Accident Statistics," presented by Albert H. Fay, mine statistician, U. S. Bureau of Mines, Washington, D. C., before the mining-section meeting of the sixth annual congress of the National Safety Council in New York, Sept. 13, 1917

Necessity for Exact Records

Exact records of labor are necessary and should include the number of men on the payroll; days and wages lost by reason of accidents, as well as days off duty for other causes. A classification of employees by occupation is desirable by reason of the varying occupational hazards. Inasmuch as all industrial plants do not have the same number of working hours per day or per year, it would assist very materially in the matter of comparing accident records and rates if the operators would keep record of the time actually worked by all employees. In other words, the plant which operates on the basis of a 10-hr. day should have a greater accident hazard than a similar one operating on an 8-hr. basis, and a comparison of the two without an adjustment is not fair to either the one or the other. The company's payroll in every case, except in contract labor, should show the number of hours for which wages are paid during the day, week, month or year. Taking the number of hours as a basis upon which to calculate the accident frequency, it is an easy matter to arrive at the number of 3000-hr. or 2000-hr. workers as the case may be.

Comparing accidents on the basis of the number of men on the payroll is not strictly correct, although it may answer for all comparative purposes. In most cases the number on the payroll is considerably higher than the number actually at work, thus having a tendency to show in reality a lower accident record than would otherwise appear.

Correct Records Lower Insurance Rates

If the operators are desirous of obtaining lower insurance rates than they are now paying, it can be obtained by keeping correct records of labor and all accidents, and having available sufficient proof to show that the accidents at certain plants are not as high as they are at other plants of a similar nature. The absence of records has a tendency to hold the rates higher than perhaps they should.

The campaign for education of employees in the various industries has also been extended to the mining industry, and many of the larger operators are in various ways making special efforts to educate their workmen. So far as accidents are concerned probably the principal thing that can be done by the operator along educational lines is to see that the employees are thoroughly instructed as to the various dangers to which they may be subject when they enter the mines, and to furnish them, through their superintendents and shift bosses, instructions as to how to avoid accidents, and take care of themselves. Much of this educational work may be done through safety committees, which should consist, in part, of members from the various occupations in and about the mines, each being given an opportunity to make suggestions which in his opinion will prevent accidents in his particular department. Many companies have such committees actively at work and report gratifying results.

Publicity for Successful Safety Methods

Another feature which might assist in accident reduction is the matter of publicity. Whenever a mine operator discovers a means of preventing accidents in certain branches of his work, it would be an inestimable service to his fellow operators if he would in some way let his discovery become known. Any exchange of ideas with reference to safety work among the operators of a district or community should result in much good being accomplished toward a reduction in number of accidents.

The following is submitted as a summary of what the operators may do to assist in this work:

1. Keep exact records of all accidents as to time, place, cause and result of accident similar to the reports required by the insurance companies.

2. Keep detailed records of men employed, days worked, as well as shifts and wages lost by reason of accident. It will assist materially in obtaining equitable insurance rates.

3. Urge the standardization of mining laws, rules and regulations so that all companies will be required to render to the state mine inspector the same type of report.

4. Coöperation with state and federal agencies. This will not be a difficult task when all the facts appear in the operator's records.

5. Spread the safety-first propaganda as much as possible in a manner whereby an interest may be created among the employees, and in this connection make public your methods of accident prevention.

6. Prevent accidents if possible to the point of elimination, and then there will be no need of accident statistics.

Corundum in the Transvaal

A considerable export business in corundum has sprung up in the Transvaal since the war, according to the *South African Mining Journal*. The commercial value of the mineral is, of course, chiefly due to its use as an abrasive, and Canada has hitherto been the chief producer. For various reasons the price has risen considerably since the beginning of the war; and the farmers and natives of the Louis Trichard, Leydsdorp and other districts of the Transvaal are finding the collection and sale of the ore a profitable industry. Several of the land companies of the Transvaal are now engaged in investigating the possibilities of the industry. During 1916 the value of the output was £7762. Previously the quantity had been trifling. It seems extremely doubtful, however, whether this output can continue to find an outside market under post-bellum conditions.

Washington Magnesite Industry

By Clough D. Hudson*

The magnesite quarries of northeastern Washington, opened late in 1916 after the steel industry was brought to the verge of a famine in refractory materials by the stopping of Austrian imports, soon will be in position to produce a large share of the magnesite required by consumers in this country. Today the industry is employing 500 men and represents an investment aggregating $1,000,000. If the present market holds these figures will be doubled in another year.

When the war cut off imports from central Europe, Austria-Hungary was meeting 93% of the annual consumption of 175,000 tons of calcined and crude magnesite in the United States. California was providing 4% of the supply and Greece 3%. Owing to the fact that most of the California deposits occur in small veins, many of which must be worked underground, that supply was inadequate to meet the tremendous demand that developed when the foreign tonnage was cut off. Discovery of the deposits in Stevens County, Washington, came when steel mills were bidding higher and higher for the small lots of magnesite on the Eastern markets. Shipments of the crude rock were started during the winter of 1916 in order to relieve the scarcity. Since the opening of development work this year, from 200 to 600 tons have been leaving the district daily.

The Washington deposits, so far as known at present, may be mined by opencut operations. Assays average 49% magnesia and 51% of carbon dioxide, compared with the commercial standard of 47.6% magnesia and 52.4% carbon dioxide established by the California product. The Washington deposits occur in giant ledges and are free from intrusions or pockets of foreign rock. The magnesite walls are abutted by dolomite or slate. Serpentine, closely related geologically to magnesite, is found in two of the larger quarries; but development has not proceeded far enough to state whether or not it accompanies magnesite throughout the district.

U. S. MARBLE QUARRY OF NORTHWEST MAGNESITE CO., NEAR CHEWELAH, WASH.

Brucite and white magnesite

Dump of shipping material

"RED MARBLE" MAGNESITE QUARRY NEAR VALLEY, WASH.

LOADING WORKS AT FINCH QUARRY NEAR CHEWELAH, WASH.

Development to date and that projected for the immediate future are as follows: Northwest Magnesite Co., headed by R. S. Talbot, of Spokane, is shipping 400 tons of crude magnesite daily from the Finch quarry. Construction of rotary kilns near Chewelah, Wash., is under way and contract is let for five-mile aërial tram connecting Finch quarry and kilns. Company owns U. S. Marble quarry, partly developed. Tunnel will be run this winter to test depth of deposits. Six-mile tram contemplated, connecting U. S. and Finch quarries. Company also owns Midnight claim as reserve. Present haulage charge from Finch quarry is

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*Spokane, Wash.

$2.50 a ton. American Minerals Production Co. has developed Red Marble, Allen and Woodbury quarries to shipping conditions. Has a battery of four upright burners at Allen and two uprights at Woodbury. Contract let for 13½ miles of railroad out of Valley, Wash., to tap Red Marble quarry, project to cost $300,000. Contract also let and work begun on one-mile tram connecting quarry and rail terminal. Erection of rotary kilns at Valley is part of company's plan. Double Eagle Magnesite Co. is developing two quarries on adjoining ledges and has started erection of battery of 10 upright kilns. Half-mile tramway is to be erected connecting quarries and kilns. United States Magnesite Co. has one quarry partly developed and is experimenting in manufacture of bricks. The present haulage from the Red Marble and Double Eagle properties is $4.50 per ton, but it is estimated that the rail rate will be 21.2c. per ton. Both quarries are awaiting burning facilities before beginning regular shipments.

The Northwest Magnesite Co. is controlled by San Francisco, Seattle and Spokane capital, W. H. Crocker of San Francisco being the most prominent stockholder. The company is preparing to fill contracts for all kinds of refractory brick and also plans to produce building blocks, its U. S. Marble quarry having large deposits of white magnesite or brucite especially suitable for facing blocks. The American Minerals Production Co. is controlled by Chicago capital and Thomas W. Cole is the present head of the company. California capital is interested in the Double Eagle Magnesite Co. and F. M. Handy, formerly professor of mining in the State College of Washington, is manager.

American Smelting and Refining Co.

The semi-annual report of the American Smelting and Refining Co. for the six months' period ended June 30, 1917, states that the combined income of the company and its subsidiaries from smelting, refining and mining properties, together with miscellaneous earnings, amounted to $18,757,900, after deducting various general expense items. This is an increase of $5,528,841 over similar earnings for the corresponding six months of the preceding year. Against the gross income, as given, various charges amounting to $8,555,780 reduce the net income to $10,202,120 as compared with $11,145,694 reported for the same period of last year.

The charge for depreciation and depletion of ore reserves is $2,396,174 as against $1,019,489 for the first half of last year, the new figure being obtained by a more scientific method of estimation, based on a percentage of appraised valuation of the property of the company. Administrative expenses were $529,027, a slight increase; research and examination expenses were $86,052, a small decrease. Interest on outstanding American Smelter Securities Co. debenture bonds amounted to $25,450 and that on the American Smelting and Refining Co. first-mortgage bonds was $377,483. Miscellaneous profit and loss charges were $752,033 and an appropriation of $500,000 was made for an employees' life-insurance fund, the plan of which insurance will be more fully outlined in the next annual report of the company. There was also a charge for corporate taxes, including accrued income tax and estimated excess profits tax, amounting to $3,889,561. Since the law fixing the amount had not been passed, the board of directors were unable to determine whether the estimate would prove too large or too small.

After the payment of the regular dividends and a special Red Cross dividend of 1% on the common stock, or a total dividend disbursement of $5,037,049 during the six months as compared with $4,502,734 for the same period of last year, there was carried to the credit of the surplus account a balance of $5,165,071. This gives a total profit-and-loss surplus of $28,607,366 on June 30, 1917, as compared with $26,203,398 on June 30, 1916, or a net increase of $2,403,968.

The expenditures for increasing the facilities and capacity of various properties, together with the purchase of new properties, amounted to $3,794,647, which amount has been charged to a reserve account of $6,000,000 established for the purpose from the earnings of the year 1916. The property account has been decreased by the amount charged to depreciation and depletion of ore reserves and by certain small miscellaneous credits, making a total decrease of $2,409,140 since Dec. 31, 1916, which leaves a total property account of $138,756,545 on June 30, 1917. The investments in securities of other companies amounted to $1,744,174, or an increase of $916,897 over the previous six months, representing investments in mining properties in the United States and also in Chile, as well as coal properties and plants for the manufacture of chemicals, details of which will be given in the next annual report of the company.

For the first time in three years or more the company is receiving a net income from its Mexican properties. All the mines and smelters in Mexico are now operating, except those at or near Chihuahua and those at Velardeña. Work is carried on under many difficulties and as yet only to a limited extent. The government of Mexico is anxious for the company to succeed and laborers are more than willing to work. However, on account of the high cost of living, they are suffering to even a greater extent, comparatively, than the inhabitants of the United States. It is estimated that in Mexico the price of necessities is at present six times greater than during the period preceding the revolution. To meet this situation the company is importing and selling such necessities to the laborers at cost, or lower, and has largely increased the wages paid. Transportation is the greatest difficulty, to overcome which the company has purchased the necessary cars and locomotives and, under the permission of the Mexican government, is managing its own railroad transportation. As the business of the company in Mexico promotes the general welfare of the country, by the payment of freight and taxes to the government and the employment of the people, the board of directors has felt that all difficulties should be overcome without regard to temporary profits. It is considered that, as long as the high prices of metals continue, the company will be amply repaid.

Colored Varieties of Quartz have been investigated by Thomas L. Watson and R. E. Beard and the results of experiments are published in *Proc. U. S. National Museum*, Vol. 53, No. 2220. The colors of amethyst, rose and blue quartz are considered to be due to the presence of varying amounts of metallic oxides such as titanium, manganese, iron and cobalt.

Necessity of Mechanical Ventilation for Metal Mines*

Ventilation produced by mechanical means, on a coal-mine scale, is needed in large metal mines to insure proper distribution of air currents to all working places. Reversible type of fan advisable to control direction of air current in case of underground fire. A scheme of ventilation should be planned when development of mines is undertaken. Health, efficiency and safety are found to be promoted by the adoption of an adequate system of ventilation underground.

LITTLE advance seems to have been made in the mechanical ventilation of metal mines for the three hundred years following the practice of the 16th Century, as described by Agricola, until the advent of compressed-air drills. The exhausted air from these then became, and ordinarily still is, regarded as supplying sufficient air to the working place in most metal mines. When the drill is not running, if the atmosphere is oppressive or is bad following blasting, compressed air is allowed to escape directly from the air pipe at the breast of the heading or stope. Undoubtedly this may be sufficient in small metal mines, or in those in which there is no considerable generation of noxious gas, or in which the workings are but a short distance from the drift mouth or shaft. In most metal mines, however, the ore formation generally has its greatest dimensions along the strike and in depth rather than in horizontal width, and, as a result, differences in temperature between the lower workings and the outside atmosphere readily create air currents after secondary connections have been made to the surface.

Inflammable Gases Rarely Occur in Metal Mines

Inflammable gases rarely occur in metal mines and generally there is little absorption of oxygen by the ore or inclosing walls. In mines where there is much timbering it has been found that there is considerable absorption of oxygen by the timbers due to bacteriological action. Nevertheless, from thousands of samples of air gathered from metal mines by the Bureau of Mines, it is rare that the air has a considerable amount of impurity except after blasting. Occasionally, as in the Cripple Creek district, Colorado, metal mines contain large amounts of pure nitrogen gas residual in the strata. Such mines can be worked only by using a plenum (pressure) system of ventilation. In general, however, the chief air impurities in metal mines result from blasting.

In the case of long drainage tunnels, the rule is to ventilate with fans and air pipes and it is obvious that it is an advantage of economic importance to ventilate the heading quickly after blasting so that the miners may get back to their work as soon as possible.

In great orebodies, such as found at Butte, in the Lake Superior iron and copper mines, in the copper mines of the southwest, and especially in the deep and extensive gold mines of South Africa, there has been a gradual introduction of ventilation by mechanical methods apart from the dependence upon compressed air at the faces.

Attempting to ventilate mines by means of compressed air when there is a considerable volume of noxious or poisonous gas present, as from blasting, is extremely ineffective in sweeping away the smoke and gases as this practice merely tends to stir them up; and from a mechanical standpoint it is not an economical use of air, which has usually been compressed inefficiently to a high pressure and is liberated at atmosphere pressure without doing much mechanical work. The only improvement possible in the use of compressed air for ventilation is to cause an air-circuit movement by the aid of "booster" fans.[1]

Two Exits from Every Mine Imperative

It is hardly necessary in this day to present an argument for necessity of having two means of exit from every mine; this is a requirement of the metal-mining laws of most states. Probably over 95% of the metal mines of the country that have reached a permanent basis of ore production possess two exits, and the remainder are probably putting in such secondary exits as rapidly as can be done. Where there are two exits one naturally becomes the channel of the upcast draft and the other that of the downcast. Unfortunately, however, direction of current sometimes becomes reversed with a change of season, and during such change, or approaching it, the current is neutral and natural ventilation underground is insufficient. In such mines there is a necessity for the use of fans. In deep mines, such as are in the Lake Superior copper district, normally the upcast and downcast conditions do not reverse and the natural main upcasting current is strong. It then becomes a problem in such a special case whether in the interest of safety it is not best to install a large fan—which may never be needed except for such fire protection—to prevent a reversal of current in the case of a mine fire in the downcast shaft.

However, in a great majority of metal mines a strong non-reversing current can not be obtained by the difference in temperature between the upcasting and downcasting shafts. Such being the case, it is therefore highly important, both for fire protection and for positive-circuit ventilation, that fans should be used.

The great variety in conditions found in metal mines of the United States, from typical fissure veins to the great irregular iron orebodies of the Lake Superior district, makes it impossible to standardize a method of ventilation for metal mines as for mines in coal seams. Nevertheless, it will be generally conceded that a great deal more might be done in the future development of a mine than has been done in the past if preliminary plans for a ventilating system be borne in mind. This is particularly true in the development of large low-grade deposits the extent of which has been more or less predetermined by prospecting.

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*Excerpt from a paper entitled "Necessity of Mechanically Produced Ventilation in Metal Mines," read by G. S. Rice before the mining-section meeting of the sixth annual safety congress of the National Safety Council in New York, Sept. 13, 1917.

[1] Small compressed-air jets set inside a ventilating pipe, and pointing away from the heading, create a suction draft that has proved effective for long tunnels or raises at a comparatively small expense.—Editor

Ventilation Usually of Haphazard Character

While metal-mining law requires and modern practice demands provision for two exits, and operators generally recognize the necessity for an air current downcasting in one shaft and upcasting through another shaft, adit or tunnel, the necessity for providing circulation through the workings of the body of the mine has not been well recognized, with the result that in some of the great mines of the United States the ventilation is of the most haphazard or badly arranged character. Often I have had occasion to observe that the main underground fan was ineffective because part of its air discharge had already been in circuit around the mine. Therefore, even when the percentage of impurity in the air might be low this condition does not fulfill one of the most important features of deep metal mine ventilation, i. e., keeping the air-current temperature below that of the mine walls. The temperature in a mine is not always a question of depth or natural heat of the strata, for where there are large masses of timber, as in the caving system using a timber mat, the temperature is frequently far greater immediately under the mat than it is in the deeper development levels.

It is believed that if the same degree of care were taken in laying out in advance a ventilating system, as is given to laying out the levels, drifts, crosscuts and raises for extracting the orebody, a great deal of the difficulty of a physiological nature now experienced by miners in certain districts would be prevented. Such troubles are not simply questions of the workers' temporary discomfort, but their health is likely to become affected and make them susceptible to diseases, thereby lessening their working efficiency and in consequence decreasing the net earnings of the mine. Ventilation, therefore, takes an aspect of economic importance. It is difficult to name specifically mines or districts without making unfortunate comparisons, but the problem is an acute one in many districts, as will be readily conceded by most authorities on mining.

Effect of Hot, Ill-ventilated Mines on Workers

Another phase of the physiological problem concerning workers in hot mines is whether or not the air is in motion—not the high temperature of the air alone. In the experiments conducted by Dr. Haldane, of Oxford, the celebrated physiologist demonstrated in a striking manner that in still, hot air the human body is enveloped in a film of air at or near blood heat and that in such stagnant air there is no evaporation of the sweat to produce a cooling effect on the skin; also that if the air is in motion, unless it be saturated, which is seldom the case, evaporation occurs and the skin is consequently cooled. I recall a case where in a certain stope there was no movement of air, the miners complained of heat and from time to time went to a nearby crosscut where there was a strong current of air, and although in the latter place the temperature was actually several degrees hotter than in the former, the effect was one of considerably greater bodily comfort.

The tremendous variety of mining conditions existing in the United States prevents the formulation of any exact specifications for a ventilating scheme adaptable to all conditions; but, in order to bring out discussion, which it is hoped will be elicited by the suggestions made herein, the following general principles are mentioned with a view to guidance in planning the ventilating system of a new mine, or in adapting the openings of old mines as insofar as it is possible to do so:

General Principles of Mechanical Ventilation

1. That there shall be a permanent upcast and a permanent downcast shaft or tunnel.

2. That the downcast shaft shall be as far as practicable that in which the men are hoisted and lowered—it may or may not be the main ore-hoisting shaft—the object being that in case of an underground fire the main hoisting equipment for men shall be available. If practicable, such shaft and its landing shall be concreted or otherwise fireproofed, and back of each landing there shall be a fire door for protection from fire in the workings beyond.

3. That the main downcast shaft shall be connected to the lowest working so that the fresh air may go to the bottom of the mine and then ascend through the workings to the upcast shaft. Sufficient air is to be diverted on the different levels from the downcast shaft to provide proper ventilation on each level, the returning current to be circuited around the downcast shaft by means of crosscuts or concreted air bridges.

4. That the main ventilating fan be of the reversible type, of fireproof construction and with fireproof housing, and be installed at the surface. Generally the most convenient arrangement would be to place it at or near the collar of that shaft which is not the main hoisting shaft—of course, a tunnel or incline portal would be equally good—so as to avoid an air lock; and therefore would normally be an exhaust fan, although, as stated previously, it should be reversible to provide for emergencies.

5. The fan should be of a size sufficiently large to take care of the greatest volume of air likely to be necessary for at least five or six years ahead. It should be able to deliver or draw air at a pressure in excess of that which could be produced by maximum natural causes; that is, the maximum "motive head" of the air column, due to the maximum difference which may obtain, between the temperature of the mine air and that of the outside air, on the coldest or the warmest day of the year. For mines, undeveloped, such figures have to be more or less conjectural, and so it is often necessary to make assumption based on past experience.

In general, the main fans at metal mines are entirely inadequate, and fans such as are in use at large coal mines should be installed where the workings are expected to be of great extent and many men are to be employed underground. By this is meant fans that will discharge from 100,000 to 300,000 cu.ft. of air per min. against pressures measured by 2 to 6 in. of water gage.

On account of the fire risk it is not good practice to place the main fan underground. There is usually a liability that the air will short-circuit, that is, go round and round and not be discharged at the surface. Of course, there are unusual conditions where the ground is badly cracked and creviced near the outcrop, and the leakage of air would be too great to place the fan at the surface, but it is an exceptional case where openings can not be sealed by surface covering or by using clay filling.

6. "Booster" fans are necessary in driving exploratory drifts, winzes and raises and also in working high stopes. A new device in the way of canvas tube and its supporting arrangements has been developed recently and makes an admirable auxiliary for reaching the face of drifts and winzes. In order to give adequate ventilation throughout the mine, and especially to provide for fire protection, plans should be made whenever possible, just as in coal mining, for a continuous circuit of air. This should be done as soon as it has been established that important bodies of ore exist.

A number of the greatest fire disasters in metal mines would have resulted in much less loss of life had there been a continuous circuit of air, that the miners could have followed out to the source of intake. The great merit in fireproofed downcast shafts and the landings adjacent thereto is that they enable the hoisting of the men after they have reached the shaft. On the other hand, if an unfireproofed downcast shaft takes fire, as at the Cherry coal mine or the North Butte copper mine, it nearly always spells disaster and the only possible hope then is prompt reversal of the fan, which, if accomplished in time, might save the men. If this cannot be done or if all the escape passages are already filled with smoke, the only thing left for the men is to "brattice" or "bulkhead" themselves in some heading free from smoke, marking with chalk where they have gone for the subsequent direction of the rescue parties.

NEED OF FAN INSTALLATION IN METAL MINES

While the cost of providing adequate ventilation is considerable, whether it be in metal mines or in coal mines, it must be regarded as an absolute necessity for deep mining. Any one who has visited deep or hot mines, such as in the Comstock Lode or at Butte, must realize that it is of vital importance to provide the best ventilation possible in order that deep mining may be at all possible. Where nitrogen gas occurs, or where there is spontaneous combustion of rich sulphide ores as in some Montana and Arizona mines, and where those mines cannot be filled with sand or slime, it is necessary to erect fire walls and put in a plenum system of ventilation so that the gases may be forced into the crevices in the strata or behind the fire walls.

The need and importance of mechanical ventilation in metal mines may be summarized as follows:

1. To provide air of good quality for the underground workers in all parts of the mine, including the working face. Exception would have to be made for conditions at the face immediately after blasting, and then only for a short time, during which the miner must be kept away from the face both for the sake of his health and the best interest of the mine operator.

2. To keep down the temperature of the mine air at the working place.

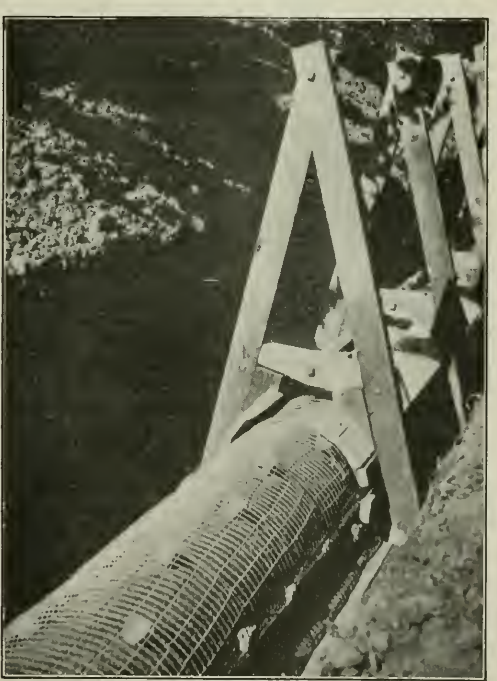
3. To provide a positive movement of the air in hot working places in order to keep down the bodily temperature of the worker and thus increase his efficiency.

4. To provide a positive circuit of air, so that in the event of fire the underground workers may escape by following back the fresh incoming air—provided, of course, that the fire has not started at the intake end. If it has, the only possible way of saving the men is by immediate reversal of the fan, unless they are able to bulkhead themselves in and await rescue later.

Steel Pipe Line Covered With Concrete*

Long stretches of old riveted-steel water pipe have been successfully incased in reinforced concrete by an economical method used by the Temescal Water Co., Corona, Calif., for the last four years. In the light of the present high price of steel plates the work may be of interest to others having pipe lines to replace.

These details were worked out more particularly for use in covering 10,000 ft. of 24-in. riveted-steel pipe line used as inverted siphons working up to 80 ft. head. This line was laid 30 years ago and is beginning to give way near the ends of the siphons, and where light weight steel was used on account of low heads. Possibly 95% of the iron is still in the pipe, but it has rusted badly and pitted particularly at the seams, so that it has been necessary to make repairs during the irrigation season. The system not only protects the outside of the pipe and prolongs its life by the jacket of reinforced concrete, but when the old pipe has disintegrated it leaves a reinforced-concrete pipe without joints, sufficiently strong to carry the pressure.



FORMS BLOCKED FROM GROUND, PIPE HUNG FROM TRIPOD

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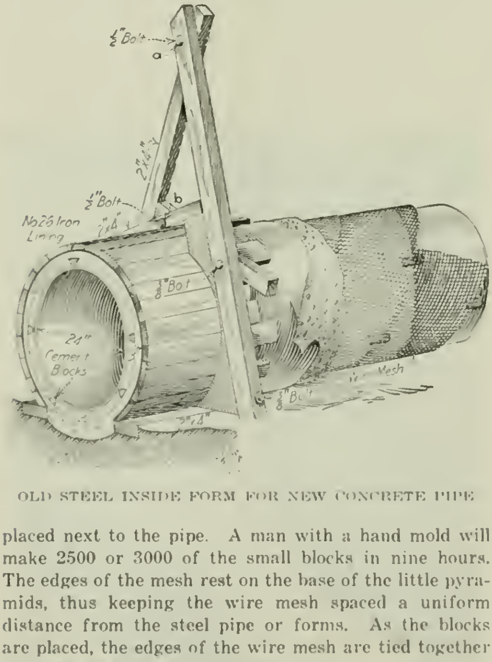
*An article by H. R. Case in "Eng. News-Record," Sept. 20, 1917.

The drawing shows the details of the wood form used in covering the 24-in. pipe. The forms are constructed of Oregon pine and lined with No. 26 black iron, which saves not only the forms but much material, making a smooth outside surface to the finished pipe. Forms for 24-in. and larger pipe are made in 8-ft. lengths, while the smaller sizes are made up in 12-ft. lengths.

After the steel pipe is uncovered it is thoroughly scraped and cleaned with steel brushes. The ground under the pipe is then shaped to the required depth, the pipe being supported on wood blocks until the forms are set. Bedplates of 2 x 4s are then spaced with a template, similar to the end section of the form, on each side of the pipe to support the forms when in place The wire-mesh reinforcement cut to 50- or 75-ft. lengths is then wound spirally around the pipe and supported where the edges unite by small cement-mortar blocks made in the form of truncated pyramids, 1½ in. high. 2 in. square at the base and ¾ in. at the apex, which is placed next to the pipe. A man with a hand mold will make 2500 or 3000 of the small blocks in nine hours. The edges of the mesh rest on the base of the little pyramids, thus keeping the wire mesh spaced a uniform distance from the steel pipe or forms. As the blocks are placed, the edges of the wire mesh are tied together with No. 24 soft stovepipe wire.



OLD STEEL INSIDE FORM FOR NEW CONCRETE PIPE

The forms are then placed on the 2 x 4s and held rigid by the two ½-in. bolts as shown. The wood blocks supporting the pipe are removed, and the pipe is held in place by a strand of wire and a turnbuckle clamp until the form is filled to a point where the concrete will support the pipe. The concrete is a 1:2½:1 mixture of cement, sand and crushed rock or screened gravel of ¾-in. maximum size. It is mixed by hand and poured rather wet, being worked to place with a light rod and by tapping the forms with a hammer. In laying the pipe up hill the top openings, as the forms are filled, are closed with covers clamped to place until the concrete sets slightly, when the covers are removed and the surface is well troweled and smoothed. The next morning the forms are removed, and the pipe is painted with neat cement. The pipe is then covered with soil and kept wet for two weeks.

Twelve men will easily build and backfill 140 ft. of 18-in. pipe, 100 ft. of 24-in. or 80 ft. of 30-in. pipe in a day of nine hours. The company is replacing 30-in. steel pipe under 40-ft. head, placed on bridges, with concrete siphons of the same size, at a cost of $2.50 per foot, including the ditching, using collapsible inside forms. Covering 24-in. pipe, including the digging, costs $1.70 per ft., and 18-in. pipe $1.40 per ft. Cement is $2.30 per barrel and labor from $2.25 to $2.50 per day. The mesh used is selected from the stock of the United States Steel Products Co. and varies with the size of pipe and head.

A. I. M. E. Meeting at St. Louis

The American Institute of Mining Engineers will hold their 115th meeting from Monday, Oct. 8, to Saturday, Oct. 13, inclusive, 1917. A special train will leave New York Saturday, Oct. 6, at 2:04 p.m. from the Pennsylvania station, and is scheduled to arrive at St. Louis, Mo., at 5:25 p.m. on Oct. 7. Eastern members can join the party at any of the following points: Philadelphia, Baltimore, Washington, Harrisburg, Pittsburgh, Columbus and Indianapolis. Application should be made to W. V. Kibbe, district passenger solicitor, Pennsylvania R.R. Co., 487 Fifth Ave., New York.

The committee on arrangements consists of H. A. Buehler, chairman; W. E. McCourt, secretary; C. J. Adami, J. A. Caselton, F. W. DeWolf, E. F. Goltra, L. L. Hutchison, Eugene McAuliffe, P. N. Moore, Victor Rakowsky, J. D. Robertson, A. Thacher, H. A. Wheeler and Mrs. P. N. Moore. Registration on the first day of the meeting will be in St. Louis at the Planters' Hotel and thereafter as follows: at Webb City, Mo., Thursday, Oct. 11, at 10:30 a.m.; Miami, Okla., on Oct. 12, at 7:30 a.m.; Tulsa, Okla., on same day, 3:30 p.m. The meeting will disband at Depew, Okla., on Saturday evening in time for visitors to connect with trains for Tulsa, Joplin, Kansas City and St. Louis.

The technical program has been scheduled as follows: Monday, 10 a.m., simultaneous sessions on milling and on coal; Tuesday, 10 a.m., simultaneous sessions on lead and on petroleum; 8 p.m., session on miscellaneous subjects; Wednesday, 2 p.m., simultaneous sessions on ore deposits and on iron and steel; Thursday, 4 p.m., session on zinc; and Friday, 8 p.m., session on petroleum.

Trips have been scheduled as follows: Tuesday, Herculaneum smeltery, St. Joseph Lead Co.; Wednesday, optional all day trip to Illinois coal mine or morning visit to steel works, lead and zinc smelteries and other industries; afternoon trip to Diesel engine plant; Thursday, visit to steam-shovel operations in southeastern Kansas coal field, automobile trip through sheet-ground district, underground visits to Joplin mines; Friday morning, visits to mines and mills of the Miami district; Friday afternoon, Cosden Refinery, Tulsa, Okla.

A special session of the War Minerals Committee on Oct. 9, at 2 p.m., will take place at the Planters' Hotel in St. Louis to secure and condense information as to the relative importance of different properties from the standpoint of domestic mineral production. Committee consists of W. Y. Westervelt, chairman; A. G. White, secretary; W. O. Hotchkiss and David White.

Cost Reduction on the Rand*

Mining and milling practice on the Rand has changed little in the last 20 years. Apparent lowering of costs, G. A. Denny claims, has been effected by mining large tonnages of low-grade rock that does not pay for itself. Profits have therefore suffered. Ore reserves are not properly calculated, sampling methods are illogical, and insufficient or no interest or redemption charges are made. It is suggested that the reduction of an entire district's output be centralized in one large plant.

MINING costs on the Rand have been reduced by 8s. 4d. ($2.03) since 1902 but, in the face of lowered efficiency of white labor, new avenues of expenditure and increased cost of supplies, how could this have been accomplished? Is the reduction a genuine saving or the result of increasing the divisor by ore of unprofitable grade, cheaply obtained but containing less gold than the cost to handle it? Has the reduction, capital and all charges considered, been achieved without serious loss in profit? In the discussion of the mining practice on the Rand, G. A. Denny remarks:

"It is depressing that the practice and system on these fields is becoming more stereotyped. Individuality seems helpless against the inertia of a settled universal opinion that, for the special conditions present, existing practice represents the ultimate possible degree of efficiency."

Unskilled laborers are taught by example and all in one school; methods remain unchanged despite the immensely different problems presented by mining near the outcrop and at incline depths of over a mile below. To direct the conservative tendencies of the natives into new channels is almost out of the question. The tendency of the labor organization is to pattern every mine on its neighbor. Broad characteristics of all mines are identical, there are no particular problems and practice settles into the dead level of conventionality.

"Of all the great precious metal mining fields, this is the only one that in two generations of experience has found it unnecessary to alter the fundamental type of its reduction plant." This is attributable to absence of any difficulty in treating the ore and to centralization of control, which implies standardization; moreover, by no means least, it is the result of the want of a proper charge for capital cost in the operations. Recognition of capital charges in working cost would have been ample incentive for change. Remove the atmosphere of self-satisfaction by impartial inquiry into what the rest of the world is doing; let Rand engineers show their ability to lower capital cost and achieve similar or better economic results.

Methods of calculating tonnage and values of ore reserves, Mr. Denny suggests, that gave approximately accurate results when applied to the average-sized block of 15,000 or 20,000 tons common 10 years ago, may not be invariably used in computing tonnages and values of present-day blocks, which may reach half a million tons. The principle which underlies all mine valuation is the assumed projection into the solid interior of marginal values of the drives. Projection from levels gives a more accurate forecast of interior values than those from winze connections, as the lenses or shoots of higher grade ore are usually disposed with their longest axes toward the dip. Mr. Denny shows that the general formula adopted can only apply in cases in which the width and value are regular. He gives several examples of the danger of throwing into the pot, as it were, highly payable ore and unpayable ore, and extracting from it an "average" payable value. Immense errors may be introduced into the calculations of ore reserves, which justify the suggestion that the area method (delimiting the areas of profitable and unprofitable ore) should be adopted in mines showing sectional and zonal fluctuation in value.

SAMPLING STOPES EVERY FIVE FEET NEEDLESS

Sampling stope faces at five-foot intervals monthly Mr. Denny thinks unnecessary. "It is a refinement of practice which gives no adequate return for the expense. Of what use is it to calculate value and tonnage to several places of decimals when the standards by which they are measured are the truck-and-skip tallies of primitive character." The whole system is approximate. For narrow rich reefs a 10-ft. interval is sufficient; for wide low-grade reefs, 20 ft. Doubtful stopes should be sampled at wide intervals fortnightly. Valuations must be much more detailed in low-grade mines, as a drop of half a pennyweight may mean the difference between profit and loss. Assays tend to indicate an average value that is too high. To check this an average is frequently substituted for assays above the average. Mr. Denny believes that a high assay must be taken to represent an area smaller than the one represented by a low assay.

POOR METHOD OF EVALUATION OF ORE RESERVES

The existing method of expressing the value of ore reserves leaves much room for improvement. Without specific knowledge of the actual gold recovered from a certain assay value and the cost of recovering it, not even an approximate idea of intrinsic value nor of relative values of different mines can be gained. One mine may work on a large scale, mining big widths; another may adopt the small-scale policy, mining narrow widths and clean ore. It is clearly unsatisfactory to be unable to interpret from a symbol of value what its real meaning is. The logical symbol is one which directly states the value of this asset, namely, the profit, expressed in currency. An authoritative statement that a mine had 1,000,000 tons developed and fully valued, estimated to yield a profit of £250,000, would mislead no one. It is now quite impossible for anyone correctly to arrive at the profit represented by ore reserves.

Mr. Denny declares that it will cost "in our very extravagant Rand practice about £7 capital outlay per ton milled per month for a 40,000-ton plant." If we estimate that £1,000,000 is required to launch a present-day gold-mining venture, about £800,000 would be for capital account. If the mine had a life of 20 years and milled 500,000 tons a year, each ton should be charged with approximately 3s. ($0.73) interest at 6% and redemption at 4%. Mr. Kotze[1] demands, in his calculations respecting the Eastern Rand, 15% interest as a fair risk. That would bring the interest and redemption charge to nearly 6s. per ton. No ore should be regarded as profitable which does not clear full capital charges. The procedure advocated would play havoc with ore-reserve estimates as now presented, but in the long run would be beneficial.

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*Excerpts from a review, by A. Cooper Key, of a paper, entitled "Rand Economics: Some Salient Unappreciated Issues," written by G. A. Denny for the South African Institution of Engineers.

The profit per ton can be ascertained only for each block on its own merits and to be payable, a block must meet all legitimate charges. The Rand practice of including in payable ore rock of an assay value equivalent to the estimated working cost is quite indefensible. To begin with, the mine-assay value is generally higher than the value recovered. Further, ore is only payable when it yields an amount which includes a fair rate of interest on the investment. The practice of establishing the working cost as the pay limit should be abolished. We should not think of ore reserves in terms of tons but in terms of profit. Working on the principle that tonnage of seemingly payable value is the most important thing in statements of ore reserves, encourages the habit of mining low-grade ore to increase tonnage. Nothing could be more diametrically opposed to the sound conduct of mines as financial ventures than this.

PROFIT SACRIFICED TO LOW COST PER TON

Stopes yielding perhaps 12s. ($2.92) per ton are worked continually though the average cost is 18s. ($4.38) as part of a deliberate policy. Inquiries as to the wisdom of this policy are met by the reply that the increased tonnage (a) reduces cost and (b) provides a larger appropriation for mine-development redemption account. The answer to the puzzle as to how ore of lower yield than the average working cost can be profitable lies in the fact that the individual profit made on ores of differing grade must be regarded as a contribution to a general-profit fund, out of which fixed charges must be met. On doubling tonnage, the fixed charges are halved when expressed on a tonnage-milled basis. The application of an average cost leads to most erroneous conclusions.

The treatment of waste rock resolves itself into the following: (1) Does it yield sufficient gold to pay for all legitimate charges it must bear? (2) Is there no more profitable material available? It is surprising that after nearly 30 years the question of rejection and treatment of waste rock is so debatable that even among the largest mines no uniform practice has been adopted. Milling of waste rock may accomplish the reduction in cost per ton but it also lowers the profit. It creates an impression of improved work by a spurious lowering of working cost per ton. This is responsible for lowering the efficiency of mining, since it proclaims "tons" to be the objective, and not profit. The mainspring of all action, all ambition, is tons. The inevitable result is that a premium is put on bad mining.

The increased cost of labor and supplies which the war has imposed on mines working at low margins of profit, burdens them most seriously. It is a question whether such companies should deplete their ore reserves for nominal profits or should conserve them until normal times and add to the development, thus making a greater profit. In the meantime a large part of the native labor such companies employ unprofitably could be transferred to more profitable mines. Many men would also be freed for service at the front.

It may be assumed that eventually at least 25 new companies will be established in the far-eastern Rand. Separate equipment will involve £15,000,000 to £20,000,000 expenditure, incurring a charge to each company of £70,000 per annum for interest and redemption. To prevent duplication and waste, it would be advisable to concentrate the whole of the milling requirements of the Virgin district in one plant, financed independently of the mines, either privately or by government. It should embody most modern practice and economy of expenditure for installment and operation. It would mill from 500 million to 700 million tons during its period of activity, but its growth would be gradual. The tariff charge, to be regulated by the state, should be less than individual companies could hope to attain in their own practice. Mines would deliver their daily quota to the central sampling plant, and there would be no necessity to mill mere tons. There is no practical difficulty whatever, according to Mr. Denny's contention, in carrying out such a scheme.

American Cyanamid Co.

The report of the American Cyanamid Co. operating at Niagara Falls and in New York harbor, shows a great increase in its business for the year ended June 30, 1917. Sales were $2,705,054; cost of sales, $1,767,667; general expenses, $253,754; reserve for depreciation, $189,625; leaving net profits of $494,008 as compared with $351,218 for 1915-1916. Other income was $144,641, an increase of $119,468, giving a total profit of $638,649. During the year the company began manufacturing a low-grade cyanide from cyanamid in addition to placing in operation a new liquid-air plant and a sulphuric-acid factory in New York harbor, which will later be supplemented by a factory for the production of ammonium phosphate as a fertilizer. The capitalization has been increased to $7,895,200 of 6% cumulative preferred—on which $439,837.80 of dividends remain unpaid—and $6,514,000 of common.

Tonopah Extension Mining Co., of Tonopah, Nev., reports that for the fiscal year ended Mar. 31, 1917, there was mined 109,402 tons of ore, which yielded in milling 2,068,650 oz. Ag and 19,622 oz. Au, an average of 18.908 oz. Ag and 0.171 oz. Au per ton. This is 6.0222 oz. Ag and 0.061 oz. Au per ton under the average of the previous year. The average price per ounce for silver for the year was $0.70867 and for gold $20.6718, making an average gross value of $17.107 per ton. Milling losses amounted to $1.503, leaving a net recovery of $15.604 per ton. Receipts from sales of products amounted to $1,707,174; cost of mining, $536,097; cost of milling, $396,363; cost of freight, express and refining, $32,430; net operating profit, $746,469. Sundry receipts amounted to $4185, and "Damages," exploration and depreciation were charged off at $14,859, leaving a net realization of $701,610. On the tonnage basis, costs were: Mining, $1.900; milling, $3.623; freight, $0.071; refining, $0.225; losses, $1.530. Profit, $6.785 per ton. Dividends amounting to $702,491 were paid during the year.

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[1] Government Mining Engineer.

Rôle of Vanadium in Alloy Steels*

The presence of a few tenths of a per cent. of vanadium remarkably increases the elastic limit and tensile strength of steel without seriously impairing the ductility or presenting any difficulty in hot or cold working. The prevalent notion that it acts simply as a scavenger is wrong. It has improved high-speed steels greatly and is of value for both castings and forgings.

THERE is a somewhat prevalent popular idea that vanadium is a powerful scavenger, and that the beneficial effects of its use in steel are principally due to its removal of minute, residual amounts of oxygen and nitrogen from the steel. It has even been advanced that when all the vanadium added has been completely used up in scavenging, and none remains in the steel, all the improvement or beneficial effects possible have been accomplished despite the fact that there is an increase in the mechanical properties of the steel with increasing amounts of vanadium present, and that vanadium has equally as great beneficial effects in steels made under reducing conditions, such as crucible and electric furnace steels, as it has in steels made under oxidizing conditions like openhearth and bessemer steels. While it is true that vanadium oxidizes readily and will combine with nitrogen, its value as a scavenger is negligible, as there are much cheaper metals that are as effective, or perhaps more so.

The following discussion will be confined almost entirely to the consideration of pearlitic-vanadium-ternary steel, or simple carbon-vanadium steel, and will not more than briefly touch on the quaternary-vanadium steels.

The remarkable effects of vanadium on steel are due entirely to its presence in the steel as an alloying element and to its influence on the other constituents. When added to steel it is found in both the main constituents, ferrite and pearlite, but principally in the latter. Only a few hundredths of one per cent. of the vanadium combines with the ferrite. This minute amount, however, appears to increase the strength, toughness, hardness and resistance to abrasion of the ferrite. Nearly all the vanadium, however, is found in the pearlite, in chemical combination with the cementite, as a compound carbide of vanadium and iron in the case of ternary steel, and as more complex carbides in the case of quaternary steels.

VANADIUM TENDS TO FORM SORBITE IN STEEL

Vanadium replaces the iron in the cementite or the carbide by increasing amounts until finally when the percentage of vanadium is about five per cent. all the iron has been replaced by the vanadium. The vanadium-containing cementite is not as mobile as ordinary cementite and consequently does not segregate into as large masses but occurs in relatively minute particles and, therefore, is more uniformly distributed. It does not, consequently, readily occur as thin plates in the pearlite but in a granular or sorbitic condition. This strong tendency of vanadium to form sorbitic and even troöstitic pearlite is doubtless one of the reasons for the mechanical superiority of steels containing vanadium.

Vanadium carbide is not as readily soluble on heating as iron carbide, and consequently vanadium steel requires a higher temperature to dissolve the cementite and put the steel in the austenitic condition for quenching. The presence of vanadium does not raise the Ac1 and Ar1 points more than about 10° C., and repeated heatings do not seem to lower the Ar1 point. The Ac2-3 and Ar2-3 points are raised somewhat more and continue to rise with increase in percentage of vanadium.

The effect of vanadium on the physical or mechanical properties of steel increases with the percentage of vanadium until about 1% is present, after which there is a decrease, even in the case of quenched steels. With 3% or more of vanadium the steel is actually softened on quenching until unusually high temperatures are reached, say about 1300° to 1400° C.

HIGH-SPEED STEELS IMPROVED BY VANADIUM

Vanadium-steel hardenite has greater power to withstand elevated temperatures without softening or breaking down or separation of cementite. This property is responsible for the ability of high-speed steels, through the addition of vanadium, to stand up longer under the high temperatures developed at the point of the tool in taking heavy cuts at high speed. Percentages of vanadium as high as 3.50 have been successfully used in high-speed steel, and 1.50 to 2.50% are not uncommon, although only a few years ago the percentage ranged from 0.30 to 0.75 and it was thought that more than 1% gave little additional advantage. The improvement in high-speed steel through the use of vanadium has borne an almost direct relation to the percentage of vanadium present and is considered to be from 60 to 100 per cent.

In the case of carbon-vanadium tool-steel the use of vanadium has proved almost equally beneficial, although at present only about 0.2% of vanadium is used in such steel. It has a wider quenching range—that is, can be heated higher without injury—hardens deeper, retains cutting edge longer, and is very much tougher and stronger. A bar of 1% carbon tool-steel containing 0.25% vanadium, quenched and drawn back at 400° C., will bend 90° without failure whereas a similar steel without vanadium will bend only about 20° or possibly 30°. Comparative compression tests of such tool steels with like tempering or draw-back gave on 1¼-in. cubes, 490,000 lb. for the vanadium steel and 278,000 lb. for the steel without vanadium. For battering tools, such as pneumatic chisels, rock drills, etc., vanadium tool-steel possesses marked superiority on account of its combination of hardness, strength and toughness.

EFFECT OF VANADIUM IN STEEL CASTINGS

One of the principal applications of vanadium steel has been for steel castings, particularly for locomotive frames. The composition of the steel is the same as usual for such castings, except for 0.15% or more vanadium. This addition increases the elastic limit of the annealed castings 25-30% without lowering the ductility. The tensile strength is not increased proportionately in the case of thoroughly annealed castings, but is usually 10-15% greater. Vanadium-steel castings require a somewhat higher annealing temperature than ordinary steel castings. They are also more susceptible to hardening, and therefore should be cooled slowly in the annealing furnace until they have cooled below the Ar1 point. The annealing temperature should be about 875° C.

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*Excerpts from a paper by G. L. Norris, presented at th annual meeting of the American Society for Testing Materials a Atlantic City, N. J., on June 26-29, 1917.

There is a growing tendency to heat-treat, and quench and temper steel castings for many purposes. Vanadium steel is much more suitable for heat treatment than ordinary steel, as it hardens more on quenching and consequently much higher physical properties can be obtained. Even air cooling from the annealing temperature, followed by an annealing at a low temperature, greatly increases the elastic limit without affecting the ductility.

There is also doubtless a great future for vanadium-quaternary-steel castings, both annealed and heat-treated—particularly the latter—for, as in the case of forged or rolled quarternary-steels, the improvement in the mechanical properties from the presence of vanadium would be much greater even than in the case of simple carbon-vanadium steel. The value of vanadium in simple carbon forging steels has been over-shadowed by the greater mechanical properties of the vanadium-quaternary steels, such as chrome-vanadium, yet they have mechanical properties equal to those of ordinary 3-per cent. nickel steel under like conditions. Excepting where the very high physical properties obtainable from quaternary steels are desired, carbon-vanadium steel can be used to advantage, especially for large forgings.

This steel presents fewer manufacturing difficulties than quaternary steels. It is less liable to losses from shrinkage cracks and checks in the ingot, and to heating and cooling strains in forging and heat-treatment. It requires no more special care in handling than ordinary carbon steel and is worked with equal facility.

ANNEALED CARBON-VANADIUM STEEL EQUALS HEAT-TREATED CARBON STEEL

Carbon-vanadium forging steel in the normalized condition, which may be described as annealed for grain refinement, has physical properties superior to those specified for heat-treated carbon-steel forgings. This simple treatment alone, therefore, gives physical properties sufficiently high for a great number of forgings that would otherwise have to be quenched and tempered.

A large field for annealed or normalized carbon-vanadium steel is its use for locomotive forgings. It is generally conceded that there is need of a steel of greater strength not only to meet present conditions but also to permit of reducing sections of reciprocating parts to obtain better counterbalancing. To meet this requirement the railroads several years ago turned to heat-treated carbon and heat-treated alloy steels, notably chrome-vanadium.

The use of heat-treated locomotive forgings has not proved altogether satisfactory for a number of reasons. One objection to the use of these forgings is the lack of heat-treating equipment in most railroad shops. This operates particularly in repair work where for any reason the forging has to be locally heated to straighten, stretch or shorten, destroying thereby the effect of the original heat treatment and producing inequalities which may result in failure. Probably no other class of forgings is subject to such abuse as locomotive forgings, and under such conditions ordinary heat-treated forgings have not been found reliable. For these and other reasons annealed forgings are preferred. Consequently a steel that could give in an annealed condition physical properties equal to or even better than those specified for heat-treated carbon-steel forgings, would prove very desirable. Carbon-vanadium forging steel responds to heat treatment in a very superior manner and in this condition will meet the requirements specified by the American Society for Testing Materials for quenched-and-tempered nickel-steel forgings.

Petroleum in Russia

The production of mineral oil in the Russian oilfields in 1916 showed an increase of about 27,000,000 poods (1 pood = 36 lb.), as compared with the average total production of the three previous years, according to a British consular report from Baku. This increase is accounted for by the production of the Grozni fields, where new lands have been opened up, and the production of the Surachani field, where several large spouters were brought under control. The actual production of the Baku fields (Balachani, Romani, Sabounchi, and Bibie Eybat) showed a decrease, having fallen from 419,000,000 poods in 1913 to 330,000,000 poods in the year under review. This falling-off in productiveness is undoubtedly attributable to the fact that much less drilling has been done. This is accounted for by the difficulty in obtaining the requisite materials and the high prices asked for them when they are obtainable. Owing to the cessation of exports of the more valuable products to foreign markets, and to the increased demand in the interior of Russia for liquid fuel for factories, railway and river transport, the percentage of residuum for liquid fuel has been considerably increased. An average of over 70% of this product is now being taken off, as compared with less than 60% in normal times, while the percentage of lubricating oils produced is now under 4 as compared with 7, and the percentage of lighting oils obtained has decreased from 26 to less than 23 per cent.

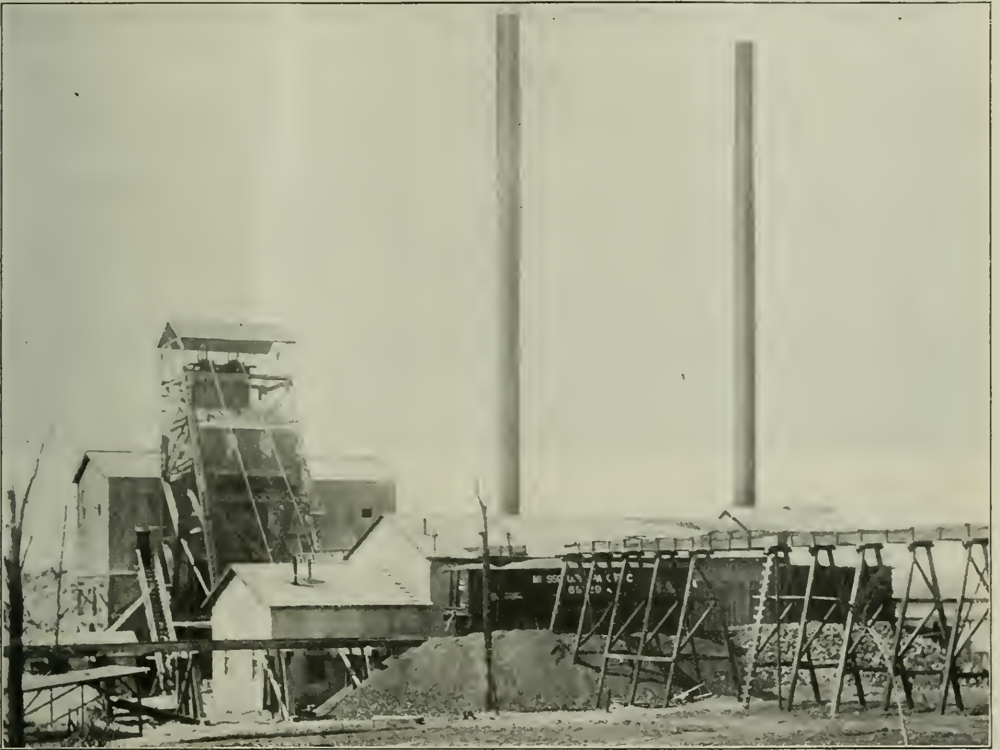
Prior to the war about 45,000,000 poods of lighting and lubricating oils were annually exported abroad, chiefly to Egypt, Turkey and Germany. The cessation of these exports, which were highly profitable to the refiners, has tended to drive the price of oils for home consumption to a higher level than is warranted by the increased price of production.

Mineral Production of Peru

Official revised figures of the mineral production of Peru for 1915 have recently been published. The principal items are as follows, the quantities being given in metric tons unless otherwise stated:

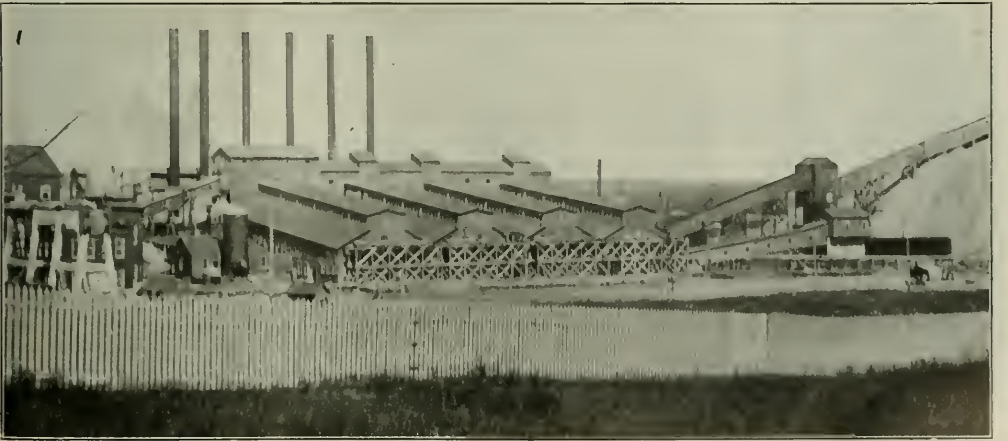
Coal, 290,743; petroleum, 363,162; gold, 1690 kg.; silver, 294,425 kg.; copper, 34,727; lead, 2696; zinc ore, 47; vanadium ore, 3145; tungsten ore, 375; antimony ore, 522; molybdenum ore, 2740 kg.; quicksilver, 920 kg.; borates, 510; salt, 25,729 tons.

The Southeast Missouri Lead District



SHAFT NO. 3 OF THE DESLOGE CONSOLIDATED LEAD CO., DESLOGE, MISSOURI

This company, during the last year, operated at full capacity from three shafts. The mill was enlarged and improved and the tailings are now stacked close to the mill by an endless-belt conveyor instead of being hauled away by railroad trains to be dumped in the valleys



ST. LOUIS SMELTING AND REFINING CO.'S MILL, ST. FRANCOIS, MISSOURI

NEW 300-TON STEEL-AND-CONCRETE MILL NO. 4 OF T

The Federal Lead Co. made a new high record of production in 1916. A new shaft, No. 12 (shown at the right), was sunk
that was blocked out with diamond drills. It is equipped with a steel headframe and automatic skips that are operated by
feature of the mill is the large number of windows provided. The ore from No. 12 shaft is conveyed by endless belts, after pass
with Hancock jigs, trommels, drag classifiers, dewaterers, regrinding mills, 40 Wilfley tables equipped with Butchart riffles, l
conveyor to a nearby valley. The mill is of the gravity type, being distinctive in the district as the only one having a natu
The mines and mills of the Federal Lead, Boston-Elvins, National, Desloge, Doe Run and St. Joseph Lead companies are work
Jefferson, Madison and St. Francois Counties, of which the last named in 1916 produced 90% of the total production from
was the case in St. Francois County during the early history of that district and the relationship between the shallow and d
of such unprecedented prosperity, the district has been most active and buoyant, although somewhat handicapped by labor scar
result in greater economies, larger tonnages and more efficient work. With the higher prices prevailing for lead, it has b
Although the district is in a hilly country, being on the flanks of the Ozark uplift, the most striking and obtrusive features of
silent, huge monuments that attest tremendous activity, but they are also eloquent warnings that the diamond drill must be n

MILL NO 3, FEDERAL LEAD CO., FLAT RIVER, MO

The central power plant at No. 3 mill was enlarged last year by the addition of two [illegible]-kw turbines equipped with jet condensers. Two water tube boilers, of 600 hp each, were added and a water softening plant was installed

RAL LEAD CO. AT ELVINS, ST. FRANCOIS COUNTY, MISSOURI

th of 459 ft. on the old Central tract about $\frac{1}{4}$ mile east of Elvins and is now an important producer from the large orebody
ic hoist with current from the central power plant at No. 3 mill, about $\frac{1}{2}$ mile distant. The new mill started last March. One
gh an independent rockhouse equipped with two large gyratory crushers that feed to disk crushers. The mill is equipped
ners, a flotation unit, Oliver filter and steam drying plant for flotation concentrate. The tailing will be moved by belt
g base. Southeastern Missouri produced about 184,000 tons of pig lead in 1916, which approximated $25,000,000 in value.
rews, trying to make another high record for 1917. The district embraces the area included in Washington, Franklin,
ines in deep disseminated deposits. Shallow lead deposits are for the most part being worked in the other counties, but this
its in this county it is believed will be repeated in the others as can only be proved by deep drilling. With the stimulus
oal shortage last winter. All the operators have increased their plants and are making important improvements that will
le to work ores carrying only 2% of lead with profit, although the average for the past year was slightly over 3% of lead.
t are the enormous piles of tailing that now loom up as the most impressive feature of the landscape. They are not only
in the future to replace the orebodies that are being rapidly exhausted by the modern large mills

ONE OF THE MILLS OF ST. JOSEPH LEAD CO., ST. FRANCOIS COUNTY, MISSOURI

This company, the most important lead producer in the state, was the pioneer in the development of the disseminated deposits. It operates three mills: A 2100-ton plant at Bonne Terre, a 1750-ton mill at Leadwood and the 4000-ton mill at Rivermines

Monazite Found in Mysore, India

It is reported by the Geological Department in Mysore that monazite has been discovered in the state, according to United States Consul Lucien Memminger, at Madras, India. The discovery was made quite by accident, by Sambasiva Iyer, who in the course of his geological excursion work happened to come across a few pieces of the mineral in the metal heaps stacked near the roadside in the precincts of the village of Yedur, south of the Vasavangudi Extension, Bangalore City. It was then traced to the quarry for road metal close at hand, and the identity of the mineral itself was subsequently verified by chemical analysis. A requisition was afterward made to the Industries and Commerce Committee for funds to have the place opened up, with a view to ascertain the mode of occurrence of the mineral and the probable quantity available for commercial purposes.

MONAZITE FOUND IN SITU

Work was soon commenced, with the result that mineral monazite was discovered *in situ*. Dr. Hayden, the director of the Geological Survey of India, and three other Geological officers, with H. M. A. Cooke, of the Kolar gold field, who manifested a keen interest in the discovery, visited the quarry and remarked that this was the second place in India where the mineral was found *in situ*. The large size of the crystals was especially remarked upon as being unique. The question of ascertaining the commercial possibilities is being worked out and Dr. Hayden agreed that some further work should be done, since the results of operations so far was not conclusive either way.

Another rare mineral allied to samarskite has also been discovered in this quarry. It occurs in the quartz of a pegmatite "run" in gneiss, which is the country rock. Samples of this have been sent to Calcutta for analysis in the geological laboratory there. The two minerals, monazite and samarskite, occur in the same pit and within about a yard of each other. The trend of the veins bearing these minerals is the same as that of the country rock, and occurrence of both in the form of small lenticular pockets in parallel runs, suggests a common mode of origin. The commercial value of the latter deposit will be ascertained when that of monazite has been determined.

The mineral survey now being conducted in Ceylon in coöperation with the Imperial Institute has led to the discovery of beach deposits of monazite sand, which will usefully supplement the commercial supplies of thoria required for the manufacture of incandescent gas mantles. Samples of the sand have been investigated by the Imperial Institute, and the results are so promising, says the *London Economist*, that the government of Ceylon has arranged to work the deposits. Suitable British concentrating machinery has been selected by the institute for the purpose, after experimental trials, and will shortly be shipped to the colony. This is the latest chapter in the story of the long struggle to rescue the gas-mantle industry from German domination. Formerly the monazite deposits in Brazil were the only commercial source of supply of thoria, and these were controlled by the German Thorium Syndicate. The Brazilian monopoly enjoyed by this syndicate was broken by the discovery of extensive deposits of monazite in the state of Travancore in India, so rich that samples examined by the Imperial Institute were found to contain nearly twice as much thoria as the Brazilian monazite. The German syndicate, however, obtained control of the company formed to work the Indian deposits, and they continued to exercise a dominating influence over the industry till the outbreak of the war. Since then the company has been reconstructed and given a British character, and it is understood that another portion of the deposits in Travancore has been taken up, and will be worked by a second British company. The work of the Mineral Survey has shown that Ceylon can furnish several other thoria minerals besides monazite. Among these is thorianite, the richest known source of thoria. This new mineral at first was sold in England at as high a rate as £1600 per ton, but the deposits have proved to be limited.

Copper at 23½ Cents

This is the official statement from the Committee on Public Information, under date of Sept. 20, 1917, released for morning newspapers of Friday Sept. 21, 1917:

> After investigation by the Federal Trade Commission as to the cost of producing copper the President has approved an agreement made by the War Industries Board with the copper producers, fixing a price of 23½c. per lb., f.o.b. New York, subject to revision after four months. Three important conditions were imposed by the board: (1) That the producers would not reduce the wages now being paid; (2) that the operators would sell to the Allies, and to the public, copper at the same price paid by the Government, and take the necessary measures, under the direction of the War Industries Board, for the distribution of the copper to prevent it from falling into the hands of speculators who would increase the price to the public; and (3) that the operators pledge themselves to exert every effort necessary to keep up the production of copper to the maximum of the past as long as the war lasts.
>
> The War Industries Board felt that the maintenance of the largest production should be assured and that a reduction in wages should be avoided. The stipulation that present wages shall not be reduced compels the maintenance of the highest wages ever paid in the industry, which without such stipulation would, with the reduction made in the price of copper, be reduced under the sliding scale so long in effect in the copper mines. Within this year copper has sold as high as 36c. per lb., and the market price would now be higher than it is had it not been well known for some weeks that the Government would fix the price.
>
> The principal copper producers throughout the country have evinced an admirable spirit and for weeks have promptly supplied every request of the Government for copper, without awaiting decision as to price, agreeing to accept the price which the Board should ultimately fix. The proper departments of the Government will be asked to take over the mines and plants of any producers who fail to conform to the arrangement and price, if any such there should be.

Mine Pumping Contract

BY A. L. H. STREET*

When a contract to pump a mine contemplates performance of such work for an indefinite period, the agreement is terminable at the will of either party according to the view taken by court of appeals at Kansas City in the late case of Latshaw vs. Stoddard, 194 Southwestern Reporter, 727, in a controversy which arose in the Joplin district.

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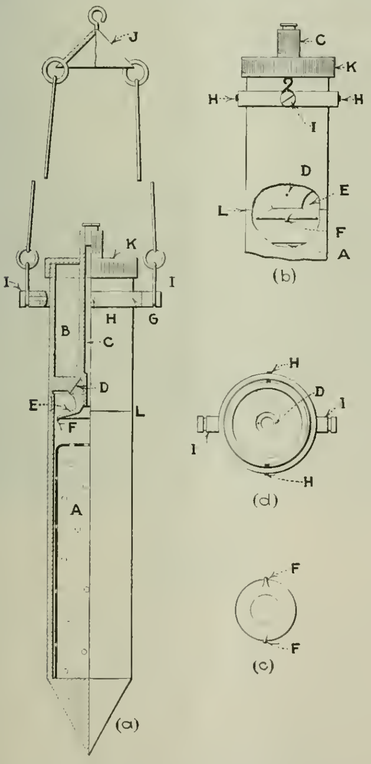
Details of Practical Mining

The McKay Back-Sight Lamp

By Guy R. McKay[*]

Every engineer who has "swung a transit" in a long tunnel in operation has wished for an adequate, dependable, self-illuminated back sight. When the tunnel is straight and dry, and less than 3000 ft. long, a large plumb bob hung just inside the portal with the daylight as a background furnishes an ideal back sight; but when, through curves, mist, or distance, the portal is obscured or invisible, the difficulties of tunnel surveying are greatly multiplied.

At the Snake Creek tunnel, in the Park City district, Utah, an acetaline back-sight lamp has been developed which answers the purpose very well. The lamp consists of a cylindrical metal casing made in two parts which screw together at *L*. The lower portion contains a metal carbide container *A* which fits loosely into the casing. It is closed at the top and open at the bottom, and perforated to permit access of the water and escape of the gas. This container permits the lamp to be filled and emptied easily and, by forcing the water to run down the sides of the casing, gives it a better opportunity to attack the carbide at the bottom first, thus preventing the formation of a layer of spent carbide at the top which would protect the fresh carbide below and hinder the escape of the gas.



DETAILS OF McKAY BACKSIGHT LAMP

The upper portion of the lamp consists of a water chamber *B* with a screw cap *K*. Through this cap the gas tube *C* projects. This tube has a cone-shaped portion near the bottom, which seats tightly into the bottom of the water chamber when the tube is screwed down, closing the water ducts *D*. When the lamp is in use the gas tube is unscrewed sufficiently to open these two water ducts and permit the water to run down on the apron *E* and drip from the wires *F*, shown in plan at (*c*). The function of the apron *E* and wires *F* is to prevent the water from running under the bottom of the gas tube and stopping the free passage of the gas.

The lamp is suspended in a gimbal ring *G* at the points *H*, shown in plan (*d*). The ring is suspended by two hooks *I* which fasten through brass chains into a hood *J* which prevents water from dropping on the flame. The hood has a swivel hook in the top by which the lamp can be suspended. The upper end of the gas tube *C* is made to receive an ordinary gas burner such as those used in miners' cap lamps of the Baldwin or Justrite type. In practice it was found that these frequently dropped out and were lost or broken, so an ordinary 0.22 short rifle cartridge was substituted. A fine needle hole was punched accurately in the center of the empty cartridge and was driven down into the gas tube, which happened to be just the right size. Since then there have been no burner troubles. The lamp is constructed symmetrically and balanced so that it hangs in a vertical position with the flame exactly under the spad. The flame can be readily bisected with the vertical cross wire of the transit at almost any distance.

Speeding Up the Drill

Considerable discussion and effort has taken place in an attempt to get more work from machine drills. There are many ways in which this may be accomplished but also many obstacles when it comes to active practice. It is the object of this article briefly to outline some of these methods and to describe one in particular.

In analyzing the cost of breaking rock it has been found that the greatest item of expense is miners' labor, and the labor situation of today is such that it is poor policy to try to get any more work out of a man. The only way out of the difficulty is to make it possible for a man to do more work without expending any more energy. In view of such considerations methods of speeding up the drill seem to offer the best solution and group themselves under the following heads: (1) Increasing the actual drilling time of the machine. (2) Increasing the reciprocating speed of the machine.

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[*] Park City, Utah

The importance of the first factor is realized by few. A little time spent with the stop watch will show that machines are actually operated from 25% to 50% of the total shifts' time, or from two to four hours of the customary eight. Personally, I have never known one to run as high as four hours out of eight. The rest of the time is spent in various other operations, such as "mucking back," mounting, changing drills, moving the machine, tearing down, loading and firing the holes, etc. All these things have to be done by the miner and take up a large part of his shift.

The diminution of such delays in drilling must be made according to the conditions in various places. In a general way only a careful study of delays will suggest remedies. In many cases lighter machines and mountings can be used to advantage. In drifting the miner's greatest delay is mucking out a place for his post. Where there are two 6- to 8-ft. wide drifts not too far distant on the same level, the following is a good time-saving method:

Instead of using one machine per shift in each drift, work both machines in one drift on the day shift and move them to the other on the night shift. In the mean time the first drift is mucked out and ready for a clean start on the following day shift. This adds from one to two hours to the available drilling time. Needless to say, the miners are glad to be relieved of the strenuous mucking at the start of the shift. There is no additional labor involved in this arrangement and it is only impracticable where the ground is so soft that there is not enough drilling in a round of holes to keep two machines busy for a shift. Careful attention to the supply and quality of drill steel will also help to increase the machine's running time. These are merely suggestions and may not apply in all cases. Some day the rock-drill manufacturers will devote more time and study to the designing of a machine that will facilitate the changing of drills and other operations that mean lost motion to the miner.

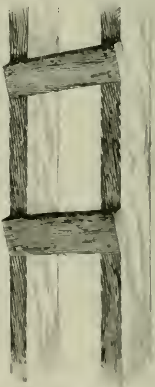
In the second method of speeding up the drill it is evident that, if a machine is only reciprocating from two to four hours in a shift, everything should be done to get a maximum amount of hole drilled in that time. This means a close study of different types and makes of both machines and drills to determine what is best suited to the ground. There are several makes of machines on the market as well as a diversity of opinion as to which are best. That is a question that can only be decided by experiment in each case. The same applies to various types of drill bits. Of course, a small hole can be drilled faster than a large one and here we have the big advantage of the Carr bit with its small gage changes. On the other hand, a small hole will not hold so much powder. In the latter case the solution is either to use stronger powder or place a smaller burden on each hole. The powder solution is preferable, of course, but there are mines where the ventilation is too poor to care for the larger volume of fumes that come from powder of greater strength.

There is one thing that will increase drilling speed in all cases and that is getting every available pound of air pressure behind the hammer. Pressure-drop through pipes, hose, inlet ports, etc., has been carefully measured and recorded, but there are still a surprisingly large number of mines where no attention is given to such matters. To put the loss in drilling speed into something more tangible than merely the pounds drop in pressure, an interesting test was conducted.

A place was selected where there were two machines in good condition, supplied with air through oversize pipes to insure a maximum pressure. A globe valve was inserted in the pipe line near the machines, and a pressure gage attached between the valve and the machines. For an entire shift the pressure was kept down to 55 lb. by manipulating the valve, and the drilling speed of the machines recorded in the usual manner. The next day the test was repeated with a constant pressure of 70 lbs. This 15-pound increase in air pressure increased the drilling speed by 37 per cent. By drilling speed is meant inches drilled per minute of actual reciprocating time. The result obtained was almost startling although the test was simple and easily performed. A 15-lb. drop in pressure is quite common in conducting compressed air through pipes, but a difference of 37% in drilling speed is enough to make anyone "sit up and take notice." In this particular case it led to a careful investigation and to the adoption of certain standards in regard to minimum size pipes, hose, inlet ports and connections. The air-pipe equipment of each level was carefully worked out so as to comply with a fixed maximum permissible drop in pressure.

Design for Stope Ladder

Where it is necessary to haul timbers up into a stope through the manway, the nuisance of timbers catching on the ladder rungs can be eliminated by setting in the rungs as shown in the drawing. Rungs set in this manner are not weakened for man climbing but care must be exercised in sending the ladders into the mine so that they will not be put into place upside down. With such ladders, timbers may be easily hauled over inclined as well as vertical ladderways.



CONVENIENT MINE LADDER

A Drifting Record at the Old Dominion mine, Globe, Ariz. was made this year when 197 ft. of drifting was accomplished in 14 days.

Mining and Metallurgical Machinery

Hollow-Steel Hole Puncher for Drill Sharpener

The accompanying illustration shows a device recently adapted for attachment to the Sullivan drill-sharpening machine, to permit rapid and convenient punching out of the hole in hollow drill bits and drill shanks. Blacksmiths know that the action of upsetting hollow drill steel and of forging it tends to close the hole, so that some means is necessary for opening it again to its full size. Various appliances have been developed for this purpose in order to save the time required to use a hand punch. The dolly pin operates satisfactorily in some cases, particularly on the larger sizes of steel, or when the work to be done is not of a kind that will close the hole seriously. A special pneumatic punch has been used with good effect; but this is rather an expensive and elaborate apparatus to install for this little job. As shown by the accompanying illustration, a Sullivan DB-13 air-hammer drill, such as is used frequently for hitch cutting and trimming, is the tool employed in the present device. This tool weighs 14 lb. Its two essential features are a push-throttle handle and a nose chuck with a knurled or milled cap, which is screwed to the end of the cylinder to hold the drilling tool in position. The tool is supplied with a collar forged on the shank to prevent it from being pulled out of the chuck.

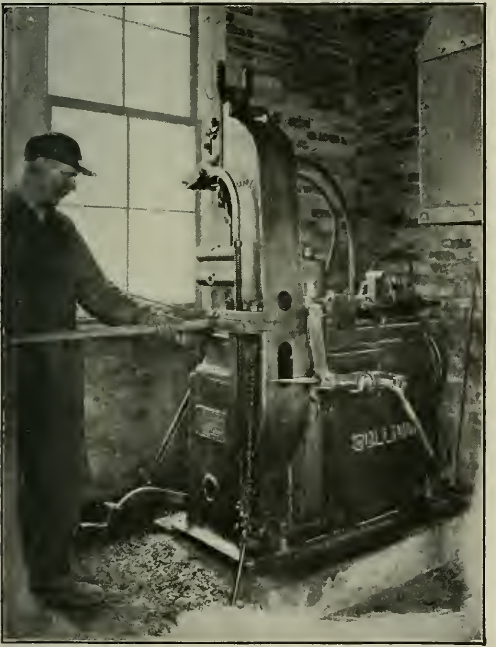


FIG. 1. FORGING BIT AND SHANK ON HOLLOW DRILL STEEL

As will be noted from the illustration, the drill is placed at the back of the sharpener on a special clamp or brace bolted to the frame for this purpose, and so arranged that the handle of the tool is permanently held while the cylinder is left free to slide back and forth on a support. The method of using the tool is as follows:

The bit is forged and sharpened first in the usual manner. The operator then places the bit end of the steel over the end of the punch, which is inserted in the chuck of the DB-13 tool. A slight thrust by the operator opens the throttle and starts the tool reciprocating so that the hole is quickly opened to full size. When the punch has advanced far enough into the steel, a quick pull releases it. Some punches have been made up with a blunt end with the size of the punch reduced just back of the point. This is said to give better results in removing the steel from the punch. In some cases operators have elaborated the bracket for

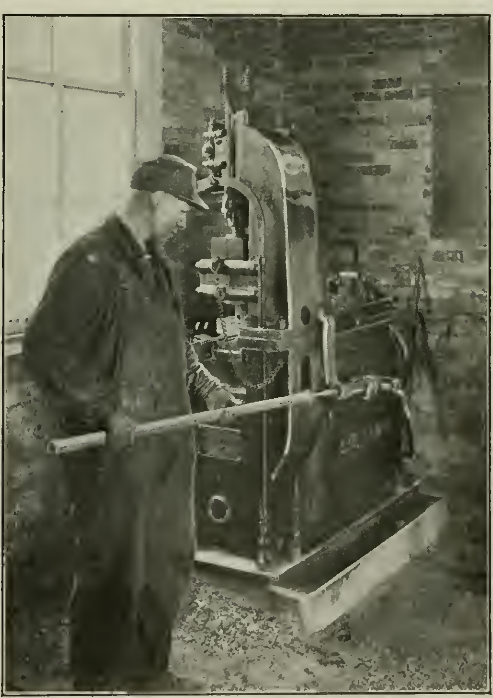


FIG. 2. CLEARING CENTRAL HOLE BY MEANS OF SPECIALLY ATTACHED DEVICE

holding the DB-13 tool by adding a guide arm in front on which the steel can be rested when thrusting it onto the punch. This is said to save time in handling.

This special attachment will be regularly furnished on any Sullivan drill-sharpening machine and, when so furnished, the tool is equipped with a special handle and is permanently placed in an opening cut in the vertical frame. The cut, however, shows a homemade form of bracket, which can be adapted for attachment to any sharpener in the field. The economy of time and labor involved in the use of this tool has proved important in blacksmith shops where a large amount of hollow steel has to be handled.

There are no economic advantages in wet machines unless drills and steel are kept in condition. The introduction of refined machinery demands refined care and it is not enough to give a miner a perfect machine. It must be kept tuned up for him. Hollow steel must be kept hollow.

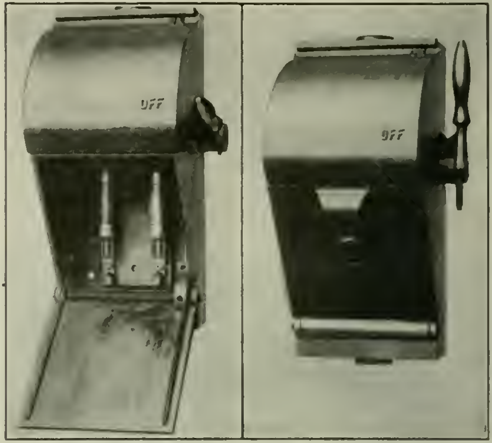
Gilbert & Barker Portable Oil Tank Outfit

For the purpose of providing a convenient method of handling oil around the shop, the Gilbert & Barker Manufacturing Co., Springfield, Mass., is now manufacturing the portable pump and tank outfit shown in the illustration. The tank is made of steel plate with oxy-acetylene-welded seams. The frame and axle are of wrought iron, welded into one piece, and are mounted on 6-in. malleable-iron wheels. The pump can be set to fill any small-size container without overflow and has a lock to prevent unauthorized use. A pan is placed on top of the tank for holding oilers, funnels, etc. The capacity of the tank is 30 gal., but the space occupied is considerably less than that taken by an ordinary barrel. While the tank is not intended to be large enough for general storage purposes, it forms a convenient means for transporting oil from the main storage to the point where it is to be consumed.

PORTABLE OIL-TANK OUTFIT

Westinghouse Safety Switch

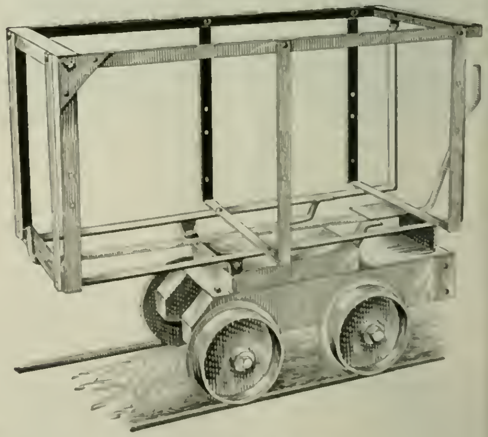
The knife switch illustrated, which is so constructed that all live parts are totally inclosed and inaccessible except in case of real need, is the product of the Westinghouse Electric and Manufacturing Co., East Pittsburgh, Penn. The device consists of an ordinary single-throw knife switch and fuse holders inclosed in a cast-iron box with an operating handle outside of the housing. The box is designed for conduit connection and has a partition separating the switch blades from the fuses. The upper, or switch, compartment can only be opened by removing two machine screws, while the door to the fuse compartment may only be opened while the operating handle is in the off position. When the door of the fuse compartment is open, it is impossible to close the switch. Means are also provided for locking the switch handle in position to prevent tampering by unauthorized persons.



WESTINGHOUSE SAFETY SWITCH

Skeleton Mine Car

The skeleton mine car shown in the illustration is a development due to the high freight rates and high cost of materials. As noted, the frame is ready for either wood or old sheet-steel lining which may be salvaged from around the plant. The "skeleton" comes from the closet of the Truax Manufacturing Co., Denver, Colo.



SKELETON MINE CAR

Events and Economics of the War

The deceit of Bernstorff while ambassador to the United States and the pro-German activity of certain citizens have been revealed during the week by the Government; letters seized show that the embassy had been spending money in attempts to influence Congress and that writers in this country were paid to distort the truth to favor Germany. A nationwide plot of the I. W. W. against the Government has been disclosed at the trial of draft resisters in Oklahoma. The price of copper has been set at 23½c. per lb. and prices have been fixed for pig iron, steel, iron ore and coke. The House has passed the $7,000,000,000 war credit bill and the Senate the $11,538,000,000 bond bill; the war-revenue bill is deadlocked in conference and the war-insurance measure is being considered.

In France, the British broke the German lines near Ypres on an eight-mile front and advanced a mile. The Italian campaign is apparently over; Turks are aiding the Austrians on this front. Korniloff is on trial for treason in Russia. In replying to the Pope's proposals Germany failed to state her peace terms; an apology to Sweden has been made for the embarrassment caused by the Luxburg incident. The Argentine Congress has voted to break with Germany and has mobilized its navy; many strikes in the country are said to be due to German influence. Costa Rica has severed relations with Germany.

Hoover Discusses War Economics at Business Convention

The delegates to the war convention of American business men, held at Atlantic City, Sept. 17-21, by the Chamber of Commerce of the United States, were addressed by many prominent men, including Secretary Franklin K. Lane, Frank A. Scott, chairman of the War Industries Board, Judge Robert S. Lovett, A. C. Bedford, president of the Standard Oil Co., and Food Administrator Herbert C. Hoover. In part, Mr. Hoover said:

> One looming shadow of this war is its drift toward socialism. For the gigantic sacrifice of life the world is demanding a sacrifice of property. We will surely drift to that rocky coast unless we can prove the economic soundness and willingness for public service of our commercial institutions. The alternative to failure of our commercial system to maintain its place and serve public interest is rigid autocratic governmental organization of industry of the German type.
>
> The large question of the hour is price fixing, for the suspension of the law of demand and supply as an equitable, economic law is forcing our hand in every direction. We will find as we go on with the war and its increasing economic disruption that first one commodity after another will need to be taken into control. We will, however, profit by experience if we deal with every situation on its own merits. So long as demand and supply have free play in a commodity, we had best leave it alone. One point in the mind of the public I am anxious to get clear. The Food Administration is limited absolutely to that area of commerce between the producer and the retailer. We can only use influence on both the retailer and producer, and depend upon their patriotism. In this area we can only regulate the flow of trade and hold it to moderate profits and excise speculation.
>
> High prices reduce consumption, but through the methods of famine. There is no national conservation in robbing our working classes of the ability to buy food. Real conservation lies in the equitable distribution of the least necessary amount, and in this country we can only hope to obtain it as a voluntary service. If we are to have ascending prices we must have ascending wages. But as the wage level rises with inequality, it is the door leading to strikes, disorder, riots and defeat of national efficiency. The verdict of the world's experience is in favor of price control as the lesser evil.
>
> The total experience of Europe has demonstrated that many methods of price control such as maxima and minima are a fallacy, but one formula has remained, and that is the fixed, specified price for every stage of a given commodity based, as nearly as may be, on the cost of production and a reasonable return for capital. The constant dominant thought in price fixing must be the stimulation of production. The result of price fixing in wheat and flour has reduced speculation and distribution charges so that there is a $3 per bbl. increase to the farmers and $3 decrease to the consumer. It appears to us that no right-minded man wants extra profit from the war. If he does he should be branded with the brand of Judas for selling the blood of our sons for profit.

American Committee of Engineers in London

The "American Committee of Engineers in London" was formed a few months ago by American engineers and business men in London for the purpose of suggesting to the Government of the United States plans that might be useful in carrying on the war; also to offer their services for consultation and advice to the Government's representatives, should this be desired. The complete list of members is as follows:

Col. J. W. Boyle, mining engineer; A. O. Cautley, mining engineer; H. Stokes Waite, consulting engineer; S. C. Magennis, mining engineer; H. A. Titcomb, mining engineer; W. B. Poland, railway engineer; Millard Shaler, mining engineer; D. P. Mitchell, mining engineer; R. Gilman Brown, mining engineer; C. W. Purington, mining engineer; Col. Millard Hunsiker, representing American metal industries; Reginald Gillmor, consulting engineer attached to United States Navy Department; George I. Gay, civil engineer, statistician; Robinson Smith, publicist, Department of Food and Publications; Louis P. Sheldon, banker; Pierre Humbert, engineer; Joseph A. Nash, shipping department, Commission for Relief in Belgium; C. W. Hough, engineer, electrical director of J. G. White & Co.; I. N. Dessau, director of Sir John Jackson & Co. (Russia), railway construction; G. Lawson, merchant; Henry S. Mackay, mining engineer; A. J. J. Fifer, consulting engineer; George H. Short, merchant; R. McClellan, merchant; W. C. Burton, engineer, general manager, London Underground Ry.; A. F. Kuehn, mining engineer; J. T. Clarke, architect; H. D. Hunter, railway engineer; E. Sengier, engineer, Commission for Relief in Belgium; G. I. Benenson, financier; R. Grant, Jr., banker; E. A. Brayley Hodgetts, secretary Nobel Dynamite Trust; F. W. Baker, financier; Edward Hooper, mining engineer; G. H. Thurston, mechanical engineer; Thomas Plunkett, financier; L. L. Tweedy, financier; Edward Walker, editor, *Mining Magazine;* H. R. Keene, manager, Allis-Chalmers Manufacturing Co.; A. F. Martin, airplane engineer, Conrad Hall & Co.; A. Holm, timber merchant; R. Peacock; C. Titcomb; R. Martens; D. P. Campbell; M. de Witt Mackenzie, Associated Press (of America); Leslie Urquhart. The Executive Committee consists of W. B. Poland, Millard Shaler, L. P. Sheldon, D. P. Mitchell, H. S. Waite, A. O. Cautley, C. W. Purington, Col. J. W. Boyle, Col. Millard Hunsicker.

The following list comprises those engineers, resident outside of Great Britain, who are members of the committee in a consulting capacity:

In the United States: Herbert C. Hoover, W. L. Honnold, Edgar Rickard, T. J. Hoover, T. A. Rickard, W. R. Ingalls, H. H. Knox, Philip Argall. In Russia: J. P. Hutchins, Petrograd; W. E. Thorne, Bodaibo, Siberia; Norman C. Stines, Ekaterinburg; R. Chartran, Bodaibo, Siberia; R. E. Smith, Vladivostok, Siberia. In Spain: N. B. Knox, Noya, Coruna.

Engineer Services Organized

The extent to which the services of engineers will be utilized in the war is emphasized in the Army general orders recently issued. They are, in effect, as follows:

Each army, consisting of three corps, will have a special engineer regiment of one colonel, one lieutenant colonel, three captains and 38 enlisted men in the headquarters division, and six companies, with six officers and 250 men each, whose business it will be to handle the "gas and flame service." In addition each army will have regiments for the following services: A mining service of six companies, a water-supply service of six companies, a general construction service, an engineer-supply service of three companies, three workshop companies and one service battalion; also a battalion of topographical engineers to provide a surveying and printing service; a road service detachment with three road engineer companies and six service battalions of four companies each; 10 motor truck companies of 31 trucks each and five wagon companies with 61 wagons each.

On the line of communications of each army will be a pontoon park with six construction battalions and six service battalions of engineer troops, two supply battalions, two workshop battalions and three supply-service battalions, 10 battalions of forestry engineers supplemented by nine service battalions for this work; two battalions of special quarry service troops with three supplemental work battalions; five battalions of railway engineers for light railway service, supplemented by three work battalions; four battalions of railway engineers for the operation and mechanical department, supplemented by three service battalions.

A standard-gage railway service is to be maintained by five regiments of special railway engineers, with eight supplemental work battalions. For line of communications work there will be a separate standard-gage railway contingent. Six battalions of railway engineer troops will be detailed for operations with three service battalions and one regiment, and one supplemental engineer battalion and one service battalion in the mechanical and supply department.

Only 10% of the railway operating and shop troops, forestry troops and service battalions will be armed except during their training period.

Arsenals Used Free-Sulphur Formula Against Expert Advice

Testimony before the House Investigating Committee, in reference to defective ammunition sent to Gen. Pershing, disclosed that although ammunition experts had advised against using a free sulphur formula for the Government's ammunition primer, the opinion of the War Department was set in favor of such a formula. "The technical opinion of the world was against us. All our people believed in it, though," said Col. George Montgomery, U. S. A., commandant of the Frankford Arsenal. It is said, moreover, that Col. Montgomery went so far, upon one occasion at least, as to request of Brig. Gen. William Crozier, the chief of ordnance at Washington, that a fulminate of mercury primer be adopted in place of the sulphur primer. Gen. Crozier claimed that, while he knew of this recommendation, it had never been brought to him officially for action, intimating that a subordinate had shelved the report.

"Evidence that the sulphur primer was not accomplishing its function first appeared in January," says the New York *Sun*. "The percentage of hangfires and misfires, however, was not so great as to cause alarm, and, although investigation was commenced, it was not until May that Col. Montgomery, in the light of his previous experience, felt justified in recommending the suspension of sulphur primer manufacture. This was after it had been discovered that 10% of the small arms ammunition made and issued since January either hung fire or missed fire." Testimony showed that 8,000,000 sulphur primers had been condemned since the defect was discovered. The old free-sulphur formula is being used in artillery ammunition with perfect results because it ignites a quick-burning black powder, whereas in small arms ammunation the bullet is shot from the gun by a slow-burning powder.

Chemists Solve War Problems

When war was declared with Germany, this country was practically destitute of optical glass, needed especially for periscopes, range finders, field glasses and other instruments. This was stated by Director Arthur L. Day, of the Geophysical Laboratory at Washington, D. C., in presenting a paper on "American-Made Optical Glass" at the recent meeting of the American Chemical Society in Boston. The manufacture of this material was largely confined to France and Germany, in which countries it was a secret process. France could spare none, and no one here knew how to make it. The Geophysical Laboratory and the glass men of the country attacked the problem three months ago; today they are in a position to state that a sufficient supply of the six varieties needed for all branches of the service will be provided. It is promised that 45,000 lb. of it will be produced next month.

Two other problems were solved, said Prof. Julius Stieglitz, president of the Society, in "the invention of devices for safeguarding submarines against internal explosions of storage batteries and in the discovery of antidotes to the poison gases used by the Germans. We must never again be dependent on foreign countries for the manufacture of the basic elements of our chemistry."

Improvement of Waterways

While it will take long to improve all inland waterways that could be made navigable in connection with development of water power, yet every 100 miles helps, says H. J. Pierce, of Seattle, Wash., and the construction of river-power dams will be begun in many sections of the country when Congress passes laws permitting safe investment of capital in water-power developments.

The inland waterways of the warring countries of Europe are being used to their utmost limit, and hundreds of miles of new canals have been built since the war began. A new waterway 182 miles long, connecting the Oder and the Vistula Rivers, has recently been opened to traffic, and 500-ton boats go direct from Berlin to Warsaw and to the seaport of Dantzig. Germany has thousands of miles of canals and rivers that have been made navigable, and are being used for carrying heavy freight, leaving the railroads free to be used for the rapid transportation of troops and food supplies. Were it not for her freight-carrying inland waterways, Germany would have found the rapid movement of her troops from one front to another seriously impeded with the railroads occupied with heavy freight shipments.

During the time when railroads were extended more rapidly than traffic warranted, they naturally opposed river improvements, fearing water competition. But the roads can no longer handle the traffic offered them and welcome the passage of heavy freight by water. River steamers now act in most cases as feeders to them, gathering freight from points which they often do not reach and delivering it to them at terminals to be taken by rail to final destination. Transportation facilities are the very foundation of industrial prosperity, and the advantages of a complete system of internal land and water transportation is of incalculable advantage to any country.

Commission for Strike Problem

A commission to study labor unrest in the Far West has been appointed by President Wilson and has already taken up its work. The members composing it are: William B. Wilson, Secretary of Labor, who is chairman; Col. J. L. Spangler, of Pennsylvania; Verner Z. Reed, of Colorado; John H. Walker, of Illinois, and E. P. Marsh, of Washington. Felix Frankfurter will act as secretary to the commission. Col. Spangler and Mr. Reed are business men, while Mr. Walker and Mr. Marsh are labor men. Mr. Frankfurter is a special assistant to Secretary of War Baker, and has been acting in a confidential capacity in a number of labor disputes in which the War Department was involved.

This commission is to aid the state governments in developing a better understanding between employers and employees; to learn the real causes for discontent, to allay misunderstandings, and to show the active interest of the National Government in furthering arrangements just to both sides.

Government Control of Business

The control of business by the Government as provided for in the Food bill, may be presented under four heads, according to a bulletin of the Chamber of Commerce of the United States:

(1) Practices prohibited by the statute, and now illegal, such as (a) destruction of supplies for the purpose of enhancing price or restricting supply, (b) wilful waste, or wilfully permitting preventable deterioration, (c) hoarding, that is, holding or contracting for quantities in excess of reasonable requirements for use or consumption within reasonable time.

(2) Control by license to become operative upon order of the President and to the effect that no man may engage or carry on any such business as specified above without a license from the President.

(3) The third means of control exists with respect to wheat, flour, meal, beans and potatoes; the President is authorized to purchase, store and sell.

(4) The fourth method exists in the President's powers of requisition, to secure an adequate supply of the commodities specified in the law, for the army or navy or for any other public use connected with the common defense.

This statement of some of the provisions of the law has been sent to members for their information.

To Avoid Export Congestion

To prevent congestion of export traffic at ports and in yards of seaport lines, a committee has been formed to coördinate the activities of the railroads and of various Government departments concerned. It is known as the "Coördinating Committee on Exportation" and has been created at the instigation of the Railroads' War Board. The committee will consist of a representative from each of the following: General Staff, U. S. A., the traffic executive of the Allied governments, the Shipping Board, the Food Administration, the Red Cross and the Car Service Commission as well as of the Railroads' War Board. Charles M. Sheaffer, of the Car Service Commission, is chairman.

First Standarized Ship Launched

The first standardized ship built to the order of the British Government recently completed her tests and has been put into commission. The keel was laid in February of this year. Hull, machinery and boilers are all standardized to secure quickest results at least expense. A special feature is the large hatchways, making the ship almost self-trimming, and greatly facilitating loading and unloading. Handling of cargo is further simplified by the large number of winches provided. In British shipyards two types of these vessels are being constructed, each of 8000 tons deadweight carrying capacity. These are the "A" type, single deck, and the "B" type, two deck. Two smaller types, C and D, are contemplated, of 5000 and 3000 tons dead-weight respectively.

Tractors to Defeat U-Boats

Nine thousand motor tractors have been ordered by the British Food Production Department to carry through the scheme to add 2,000,000 acres to the arable land of the country in time for the harvest of next year. Up to the present nearly 1000 have been received from the manufacturers. Delivery of the others is expected at a rate which should place at the disposal of the Department 2500 by the end of October, 4500 at the end of the year, 7000 early in February, and the completed total of 9000 before the end of March. In placing orders for so many a generous margin for possible delay or loss in transit has been allowed. With 5000 tractors actually at work it is estimated that the desired new acreage can be broken up and cultivated in time to yield a crop.

President Appoints Joseph P. Guffey Petroleum Administrator

Joseph P. Guffey, of Pittsburgh, has been appointed Petroleum Administrator for the Government to cover the purchasing and obtaining of petroleum and petroleum products for the United States and the Allies both in this country and abroad. Mr. Guffey is general manager of the Philadelphia Co., controlling the Philadelphia Oil Co. He is also state chairman of the Democratic party. He will be associated with Dr. Harry A. Garfield, Fuel Administrator, and is expected to open offices in the Munsey Building in Washington.

Industrial News from Washington

By Our Special Correspondent

Potash Bill Passes the House

The potash bill passed the House on Sept. 21 with the committee amendments. There was little objection to the measure. A digest of the bill prepared by Representative Ferris, the chairman of the Committee on Public Lands, is, in part, as follows:

Sec. 1 of the bill authorizes the Secretary of the Interior to issue prospecting permits to citizens of the United States covering areas of not to exceed 2560 acres in any one case for the purpose of exploring for potash on public lands. The life of such a permit is not exceeding two years. Land in and adjacent to Searles Lake, Calif., is excepted from the provisions of this section because it is well known and is ready for development and requires no prospecting work to be done.

Sec. 2 authorizes the prospector, under the permit described in Sect. 1, upon discovering a valuable deposit of potash, to obtain a patent for not exceeding one-fourth of the land in the permit. This provision is designed to induce exploration for this valuable substance which might otherwise not be had, as these deposits, if found, are likely to be in arid desert basins, the prospecting of which is an arduous and expensive matter. Sect. 2 also provides that all the lands in any prospecting permit not so patented shall be subject to lease by the Secretary of the Interior in areas not exceeding 2560 acres, conditioned upon the payment of moderate royalty. The leases are to be indeterminate, but the Secretary of the Interior is authorized to readjust the terms and conditions at the end of each 20-year period.

Specific reference is made to the known deposits of potash in and adjacent to Searles Lake, and it is provided that they may be operated by the United States or may be leased by the Secretary under the terms and provisions of the act. There are now two small plants for the manufacture of potash located on the shores of this lake, and several other persons or corporations have indicated a willingness to take leases should this bill become a law. Railroad facilities are already provided, and early development of this deposit seems assured if the bill should become a law. Provision is also made in this section for the leasing of certain known potash deposits in rock in Sweetwater County, Wyoming. These lands also contain valuable deposits of coal, and the bill provides that the potash may be leased under the provisions of the act on condition that the coal be reserved to the United States.

Sec. 3 authorizes the Secretary to permit the use by any permittee or lessee of not exceeding 40 acres of unoccupied non-mineral public lands for camp sites or refining works in connection with any permit or lease.

Sec. 5 is designed to prevent monopoly or interlocking stockholding interests; limits any lessee from holding more than one-tenth interest in any other agency engaged in the sale or resale of potash products, and provides for appropriate forfeiture proceedings in the United States court for violation of the provisions of the section.

Sec. 10 provides for the disposition of royalties and rentals under the act. They are to constitute a part of the reclamation fund for the irrigation of arid lands in the Western States, and, upon return to the reclamation fund after such use, 50% is to go to the Treasury of the United States, the other 50% to be paid to the state within the boundaries of which the deposits are or were located, the money to be used by the state for the construction and maintenance of public roads and schools.

Sec. 13 directs the Secretary of the Interior to incorporate in every lease issued a provision reserving to the President the right to regulate the price of all minerals extracted or sold from the leased premises, the price to be fixed so as to yield a fair and reasonable return to the lessee and to secure to the consumer any of the products at the lowest reasonable consistent price. A proviso to the section also vests in the President authority to regulate the disposal of the potassium products so as to secure their distribution and use wholly within the limits of the United States or its possessions.

Comments on the Copper Price

Difficulties occasioned by having fixed too low a price on coal are thought to be responsible for the fixing of the price of copper at 23.5c. per lb. One higher than 22c. is said to have surprised the Federal Trade Commission, which had been charged with the task of ascertaining the production costs. That the President should have fixed the price 7c. higher than that at which 32 contributors voluntarily supplied the Government with 48,000,000 lb. of copper is deemed to bring out with great clearness the generosity of the producers. It also substantiates the assertion that the price of 16⅔c. was set without considering economic facts and was simply the manifestation of patriotic desire to be the first industry to come forward directly to help the Government and thereby set an example that others might follow. It also served to notify the speculator that any effort to accumulate copper supplies would be made at his risk. It had the further advantage of enabling the Chief of Ordnance to utilize the services of all manufacturers who could not bid unless the Government furnished the copper.

This coöperation of the copper men in such an open, altruistic manner has won the favorable comment of members of the Federal Trade Commission, the War Industries Board and the Council of National Defense. Particular credit is given to John D. Ryan, Murry Guggenheim, James McLean and Rodolphe L. Agassiz. Praise has also been given T. Wolfson, who, as secretary of the Defense Council's copper committee, bore the brunt of the hard work occasioned by the lengthy negotiations. It is said that the copper interests have taken no offense at any demand that has been made upon them. All requirements have been filled promptly on memoranda, pending the fixing of price. The Trade Commission, in particular, is gratified at the reception given its agents who investigated cost figures. In most cases the companies furnished all the clerical assistance that the examiners could utilize. In no office visited was there any tendency to hamper the work of the Commission's representatives. In fact the spirit of coöperation was so generally manifest and so little selfishness was apparent, that an official declared that an equivalent amount of patriotism on the part of the public in general would add mightly to the strength of the nation.

More Platinum from Colombia

Platinum production in Colombia is expected to increase materially during the coming year. Prospecting has shown that the metal occurs in the stream gravels and in the high gravels for long distances on the Atrato and San Juan Rivers in the Department of Choco. The most important operations are those of the South American Gold and Platinum Co. along the Condoto River, and the numerous native washings in the vicinity of Istmina.

Editorials

Copper to Everybody at 23½ Cents?

THE morning papers of Sept. 21 contained the announcement that the War Industries Board, with the sanction of the President, had determined upon a price of 23½c. per lb., f.o.b. New York, for copper after agreement with the producers, that price to be subject to revision after four months. It was said further that as conditions with respect to this price the producers had agreed not to reduce wages, to supply the Government, the Allies and the public at the same price, to maintain production at the maximum and to keep copper out of the hands of speculators. Incidentally the W. I. B. brandished the big stick and said that if the producers fail to do those things the Government will take over their mines and plants.

Several things stand out in this statement. In the first place there has been another surrender to labor. Capital is directed to be self-sacrificing. Labor is protected. (Is there an implied obligation on the part of the W. I. B. to see to it that labor does not make unjust demands during the four months in question? If so, we fail to notice any such guarantee.) In the next place the President had no direct authority in this matter although he had implied powers that would have enabled the same ends to be accomplished, but anyway his sanction had to be obtained in order to quiet the several discordant and controversial elements in the Government.

As for the price itself, 23½c. is not unreasonable. Previous to the war we had taught ourselves to regard 14½@15c. as an average price reasonably to be expected. The general inflation—the increased cost of production, or however the inflation may be expressed—is probably about 60%. If that figure be correct, a present price of 23¼@24c. would correspond to 14½@15c. before the war. When Washington talks about the market price having been 36c. a few months ago, about the producers having been willing to sell to the Government at 16⅔c., and about the cleverness of the W. I. B. in cutting the price from 36c. on the one hand, and its generosity in raising it from 16⅔c. on the other, it is the cheapest kind of buncombe and claptrap. The major market for copper was never as high as 36c. The producers made their big sale to the Allies last October at 25c. The average realized by them for all their sales in 1916 was about 25c. The quotational average for the year was 27.2c. When, last spring, negotiations were opened between them and our Government they asked 27c., and were willing to take 25c. Now, after all the delay, uncertainty, controversy and upsetting of business, the outcome is a price of 23½c. Was the difference of 1½c. worth the while? The difference becomes even narrower when it is considered that from one-fourth to one-half the net profit of the producers is to be taken by the Government in its excess profits tax.

But the matter of price, as between 23½ and 25c., is the least important thing in Washington's program. The vital matter is the reiteration of the theory of one price for all and the threat of force unless it be granted. It is said that the producers agreed to this. We may imagine their assent as being given while they were under duress. They could readily agree to keep copper out of the hands of speculators, for they do that anyway, it having been an ancient policy of the leading producers to sell to none but consumers. But how can they give copper at the same price to everybody if they have not the copper to give? What is the manufacturer of electrical apparatus, of lamps, of pins, of tacks, of rivets, etc., going to do if he asks for copper at 23½c. and is told that there is none for him? Suppose he says that he will give 24, 25, 26 or even 30c. if some can be diverted to him and the producer replies that it cannot be done else his mines will be seized? But suppose the consumer goes to a seller of copper from mines in Cuba, Peru, Chile or Spain, what will Washington do about seizing those mines? Or suppose he goes to a seller of copper reclaimed from scrap and there are no mines to be seized? How are consumers, who happen to be oversupplied, going to be prevented from reselling at their own price? Fortunate will be those manufacturers who have provided for their requirements by average-price contracts. Unfortunate will be those who have contracted to deliver finished goods at prices based on the quoted price for copper and have not provided for their raw material.

There will be two prices for copper, viz., the official price to the Government, the Allies, and such consumers as are favored or lucky, and a competitive price established by the bidding of the unlucky consumers for the uncontrolled copper. Their competitors in Great Britain will have the advantage over them, for they will get their copper through their governments at the cut price. Of course this is on the assumption that the supply of copper is going to be short. If the supply be in excess, something different will happen. We are of the opinion, however, that unless demand experiences a sharp contraction the supply of copper during the next four months is going to be short. In this connection it may be remarked that everybody is apparently going to be in the dark respecting the Government and Allied requirements, i.e., everybody except those buyers and the producers who are supplying them. However, perhaps the producers will continue in the darkness wherein they stand at present and will never know how much they may safely release to consumers.

How is priority in the industries to be determined? The trade has heretofore attended to that automatically through a system of premiums for early delivery, but hereafter there will be but one price. The continued existence of such premiums up to last week, in spite of the absence of general buying for a long time past, is in itself an indication that the copper supply is short. When the supply is abundant there is no premium.

The Government did not need any promise from the producers that they will maintain maximum production. They would not be so unpatriotic as to curtail production out of pique and they would naturally produce all they could so long as they did not incur loss. Let it be noted, however, that the negotiations, studies of cost, etc., have been confined to the large producers and have taken no account of the position of the scores or hundreds of small producers whose copper, considerable in the aggregate, passes through many hands. They are supposed to follow the lead of the big fellows. The question is: Can they? And if they cannot, their men will not necessarily become available to the more economical producers, for the latter may not have the plant in which to use them. The wiseacres who figure the margin between market price and bookkeeping cost of production overlook that what seem like stupendous profits have gone to a large extent into plants to supply the increasing production that is required and that such outlay may have to be amortized at 100% or 50%, which makes the real cost of production a very different thing from what it appears on books kept in the ordinary way. This is why many industrial companies that are supposed to have made enormous war profits are now in financial difficulties, and why many more are contemplating the necessity of borrowing money in order to pay their taxes for 1917. Manifestly the theory of Washington is not going to encourage the risking of money in new plants.

Until more is known respecting the notions of the War Industries Board about the copper business we cannot discuss the situation very well. We doubt if the W. I. B. itself knows what it has done or is going to do. On the face of things the W. I. B. has commandeered for the Government an option on copper at 23½c. for the next four months. The producers are threatened if they do not obey. The Government has the first call on copper for its own requirements; then for the Allies, including their consumers; if any remains it is for the American consumer. If none remains the American consumer must go without unless he can buy it abroad. Suppose, however, there should be a surplus. Is the producer to charge for it at 23½c. although he might be willing to sell it for less?

Then there is the contract system on which the copper business is based. The manufacturer takes a contract to deliver an order of sheet copper during the next three months and covers himself by an order for cakes from the refiner for the same period. What is going to be done about such business while the Government has an unlimited option? What is going to be done by the buyer of copper in raw material, often from remote countries, which may not be deliverable as refined copper for many months after its purchase? Is not there great danger that our important supply of imported copper will be seriously curtailed?

The Government's edict abolishes the trade custom of selling to consumers on the basis of "delivered, 30 days," the seller paying the freight to the buyers' works and waiting 30 days after delivery for payment. The buyer will now have to pay his own freight and presumably will have to pay cash, but as to the latter nothing has been said officially.

Contracts for the delivery of copper in the first quarter of 1918 have already been made. Are we to have an open market on such business? When is the Government going to consider its next quarter's business, which even now is not very far ahead?

In a natural market these things take care of themselves. With a price-fixed market nobody can foresee what is going to happen. It is as if a giant had suddenly deposited snags in a smoothly flowing river.

The attitude of Washington with respect to price fixing appears to be that the experts in the several industries are wrong, even if they are not swayed by selfish and unpatriotic motives, and that the only way that it can be satisfied that water cannot be made to run uphill is to try to make it do so. The attitude of the copper producers is that they do not believe it can be done, but they are going to try loyally to help Washington in what Washington wants. No difference of opinion, no injury to individuals, is going to stand in the way of working unitedly for the country.

The Iron and Steel Prices

ON SEPT. 24 the War Industries Board announced its fixing of the prices for coke, iron ore, pig iron and certain steel products. These prices were arranged by agreement with the producers on conditions similar to those that were imposed on the copper producers. As in the case of copper, the iron and steel producers also express satisfaction with the prices. The parallel is further extended by there being the same absence of consideration of the organization of the business and the same leaving to the producers the matter of working things out. The War Industries Board is apparently imbued with the amateurish idea that the price for a commodity is all there is about it, and is ignorant of the delicate organization of any complicated business and the fact that a natural price is the final expression of many intricate pieces of mechanism. Let a computing machine be set in one way, it produces a certain number. Change the setting, and all the cogs and levers, working together, produce a different number. The War Industries Board pitches a crowbar into the copper machinery and another one into the iron and steel.

Again, as in the case of copper, the reductions in the prices for iron and steel were not so much as is represented. The iron and steel market, as quoted for several months past, has been virtually a fictitious one, in that quotations did not represent large transactions. Belated consumers and those who needed some supplies in emergencies did indeed have to pay fancy prices, but such did not represent what consumers were paying or producers were getting for the bulk of the supply. Yet the Committee on Public Information (Mr. Creel's Committee), which issued the official statement, published therein a table showing the enormous cuts that the Government had made in the interest of the public by comparing the new prices with the non-representative prices that have been made on small and emergency business. This is precisely analogous to the misleading representation that might be made if the Government had reduced the price of theater tickets in New York to $1.75. The market price is $2 and the bulk of the transactions are at that figure, though not a day passes when a few are not sold to belated and insistent buyers at $3. The War Industries Board would herald such a maneuver as a cut—not from $2 to $1.75, which would be the truth—but as a cut from $3 to $1.75 and would point out how cleverly and ably it had looked out for the public welfare, which would be buncombe passed out to the people in the hope that they would swallow it. Most of them would not in the matter of theater tickets but would in the cases of copper and steel, whereof they are not well informed. It is unhealthy when Government bureaus indulge in such deliberate misrepresentation.

Quotation of the Copper Market

LARGE business in copper is done on the basis of the market as quoted by the *Engineering and Mining Journal*. Ores and bullion are so bought from miners and smelters. Refined copper is so sold by refiners to manufacturers and by manufacturers to ultimate consumers. In some states the taxes on mines are computed on our average.

On Sept. 21 the Government announced an arbitrary price by which producers agreed to abide, and said, furthermore, that if it did not do so their mines might be commandeered.

We believe there will continue to be a free but circumscribed market in which the quotations may be higher or lower than the Government price. We see nothing for us to do, however, but to adopt the Government price as our quotation, and assist the Government's purpose. If the producers who sell directly are required to supply consumers at 23½c., those consumers who have contracts on the basis of our quotation cannot equitably be expected to pay anything different. Nor can those smelters and refiners who buy copper in ores and crude form be expected to pay more or less than the price at which the Government requires them to sell. Nor can states expect to collect taxes on any different basis.

As to the extensive labor contracts between copper companies and their workmen, they have been abrogated. Not so, however, the contracts between zinc-mining companies, gold- and silver-mining and others that are based on the price for copper. This is a matter that they will have to settle as best they can.

There may be some injustice done in the relations between foreigners and Americans and in the relations among foreigners alone, but if so we do not see how we can help it.

If there develop a competitive market, circumscribed though it may be, we shall naturally report it, but until further notice our official quotation will be the Government price.

New mining and milling machinery, electrical equipment, structural steel, etc., is at present extremely difficult to obtain, especially by the smaller buyers. The purchase and use of second-hand machinery and equipment has, as a consequence, been given greater attention than heretofore and small plants are now using discarded and renovated grinding mills, concentration tables, engines and machines of all sorts successfully when purchased and remodeled by competent engineers. The market in second-hand mining and metallurgical supplies is therefore of considerable interest; and a cataloging of such material available, giving the necessary details, would prove of great value.

BY THE WAY

Matthias Erzberger, who came recently into prominence by his advocacy of peace in the German Reichstag, has been dropped from his office as director of the Deutscher Kaiser Mining Co., which is controlled by August Thyssen, the well known steel millionaire. Herr Erzberger's program of "peace without annexation" was extremely distasteful to Thyssen and the other Rhenish steel operators, who want to see Germany retain control of the Belgian iron mines and of the minette-ore deposits of Lorraine and the Briey Basin in France. The loss of this office, it is said, will deprive Erzberger of a large part of his income, which will, perhaps, put him into a warlike mood.

The recommendations of Mr. Thomas, the labor representative on the British Mission to the United States, to the committee on labor of the advisory commission of the Council of National Defense are worthy of serious consideration both by employer and employee. Predicated upon his British experience, he suggests: "Let the employer say: 'I am not desirous of taking advantage of the war to break down something that I never believed in.' On the other hand, let the employees say: 'While anxious to maintain the law, we are not anxious to take advantage of the war to enforce something during the war that we could not obtain in peace times.' With both sides recognizing that, I repeat, I believe they will find a solution."

Washington evidently dropped a stitch in the recent price fixing. The selling price of coal, copper, iron, coke, wheat, etc., was fixed at various points, and notwithstanding the fact that these prices were not entirely satisfactory to producers, "big business" has loyally stood behind the Government, even to the point of protesting that the prices were "fair" and "pleasant to take." But fixing the price of a product without fixing the cost of the elements entering into its production gets us back to the same old system—raising the price as the cost of production rises. Now the bituminous-coal miners are demanding a 20 to 70% increase in wages, while the price of the product remains fixed at a $2 base, which has already curtailed production.

How are the mighty fallen! East Rand Proprietary—one of the biggest and formerly one of the best mines on the Witwatersrand—announces but a three-figure profit for August—namely, the ridiculous figure of £100, says the London *Financial Times*. No farther back than January the company netted £30,000 in a month, while seven or eight years ago, in the early days of the combined undertaking, the monthly profits almost always ran into six figures. The official cable palliates last month's "catastrophe" by explaining that there is at present an acute shortage of native labor; the mine has only 68% of its complement of underground "boys." But the root cause of the trouble is, of course, the disastrous falling off in development results in the upper half of the property in recent years. The future depends mainly on the chance of a fresh payable mine being opened up in the lower (southern) half of the company's large area, but this at best will take six or seven years and a large expenditure of money to bring to the producing stage. It is probable that the interests of all would be better served by suspending production now until after the war, when the labor supply and working expenses become more normal. By the way, the East Rand Proprietary does not, of course, belong to the Far East Rand group of properties which has recently been so popular, there being a big break geologically between them.

The central span of the great cantilever bridge at Quebec was successfully bolted into place at 3:28 p.m., on Sept. 20, thereby closing the gap across the St. Lawrence and practically completing the largest bridge of its kind in the world. This span weighed 5400 tons and the structure was lifted 150 ft. into place by hydraulic jacks from pontons after having been floated down the river for a distance of 3½ miles. Recalling the disaster of 1907, when a hundred men were dragged into the river with the collapsing south end of the original structure, and again the catastrophe of last year when the slipping of a link caused a span similar to that just lifted into place to fall into the river a complete wreck, sacrificing 14 more lives, the final success must be hailed as a victory for the builders who out of a two-fold failure have justified their prediction that the bridge could be completed as planned.

Enticed by an advertisement reading "Mining machinery for sale, apply to manager of Sonapet Zemindary, via Amda Ry. Station," a mining engineer in India writes: "Just at that time, I was on the lookout for some machinery, so decided to have a look at the things. Accordingly, with the master-mechanic of the mines went by rail to Amda, arriving there only a few hours or so late, at 11 p.m. On making inquiry at the station, nobody seemed to know just where this Sonapet lay, though three or four men agreed that it was some sixteen miles in the jungle, and the only way to get there was by bullock cart. This began to look interesting to one new to Indian ways, so a driver and cart with two buffaloes were obtained and the station officials were asked to explain in the local dialect just where we wished to go. It was a magnificent moonlight night so we did not anticipate any difficulty; accordingly, we made our beds in the cart, which was so short that our feet stuck out of the back (one always takes one's bedding when traveling in India) and lay down to sleep. These carts have no springs of any kind, and the drivers are not particular whether they keep to the road or not, so it may be imagined how much sleep was obtained. All proceeded well until it began to get daylight and we asked the driver in Hindustani where we were. As his replies did not appear too satisfactory, we asked him where he was taking us, and he replied, 'Into the jungle.' After much crossquestioning, he admitted that he did not know where he was going! At that, our remarks to him were . . . (deleted by censor would not be understood by the mining profession anyway) and one could imagine the blush which must have come under his black skin. A village was near, so it was decided to get down and ask the villagers our route. On alighting, the buffaloes took a look around and must have been alarmed at the sight of white faces and European clothing, for they bolted, turning over the cart and sending lunch basket, foodstuffs, bedding, etc., flying in all directions. Finally a large tree brought them to a standstill, but not for long, as they soon broke away from the cart, and the last we saw of them, they were well on the home trail, with a *Bail-Gharry-Wallah* yelling anathemas after them in some strange dialect. It took much persuasion to get the villagers to lend us two bulls to take us back to the station, but finally this was done and we returned too late to start out again, so we spent the day in making arrangements for two good bulls and a man who really knew the way and at 11 p.m. we started again. This driver persisted in walking the bulls on the level, and making them run helter-skelter down rocky hills. To make the bulls run, the driver usually takes a tail in each hand, and gives it a good twist; this has the desired effect. On one of these little expeditions he drove the cart over the side of a steep bank, which would have smashed any ordinary cart, but we got nothing more than a shaking, while the driver trilled happily to the bulls, and we went merrily on our way. At 4 a.m., after five hours of steady travel, we asked how far we had to go and were told, 'One mile.' This mile took until 6:30 a.m., and long before that we were not on speaking terms with the driver. Arrived at the mines, there was nothing suitable for our works, so the return journey was made, and Amda was reached at 5:30 p.m., after 18½ hours' steady travel. I trust that the expeditions of engineers in the States are more fruitful."

There is one bit of unpublished history, says John Hays Hammond, in the *American Magazine*, that will show how near Cecil Rhodes came to controlling the copper output of the world. The near coup was scheduled for 1895. By this time the new gold mines of Rhodes in South Africa were pouring out millions and millions of dollars' worth of their precious product, and we could have raised $200,000,000 or $300,000,000 of capital without trouble. The memorable Secretan Copper Syndicate, which aimed at buying up the bulk of the world's stock of copper and boosting the price, had collapsed ignominiously some time before this. The brilliant but erratic Frenchman had gone about things the wrong way. Now that Rhodes had managed to establish control of the international diamond business, he became interested in the idea of acquiring control, not of finished copper, but of all the principal copper mines of the world, so as to be able to regulate output and price. Rhodes succeeded in interesting the Rothschilds, who controlled the great Rio Tinto mine as well as another large mine in Mexico. Alfred Beit was also behind us, as were all the resources of the DeBeers and the Consolidated Gold Fields—the whole representing hundreds of millions of dollars. I laid out plans at Mr. Rhodes' request, for control of Anaconda and other American properties, and the scheme was so far advanced that I was to leave for the United States early in 1895 to complete the American end of the deal. Unfortunately, the Jameson Raid came on. I was in prison for six months, and then Rhodes went to Matabeleland to quell a serious uprising of natives in that territory. So the whole gigantic plan fell through.

Butte & Superior Flotation Case

When asked regarding the policy of the company in connection with the judgment recently entered against it by Minerals Separation, Bruce MacKelvie, president of the Butte & Superior Mining Co., informed a representative of the *Boston News Bureau* substantially as follows: "We did not really expect any other outcome of the case in the district court, as we had always expected that the real contest would be made before the circuit court of appeals. We were, of course, surprised that the judge went as far as he did in view of what our attorneys had advised us was the effect of the Supreme Court decision and the decision of the circuit court of appeals in Wilmington in the Miami case. If the judgments of those courts construed by the best legal advice we can obtain has been followed, we are and for many months have been operating entirely outside the terms of the Minerals Separation patent, but this matter will now be submitted by appeal to the United States circuit court in San Francisco at the eariest date it is possible to obtain a hearing there. The appeal is now being perfected.

"As a condition of continuing operations Judge Bourquin requires the company to file a bond of two and one-half million dollars and to deposit all future earnings in court. Surety companies that have been approached in the matter and made familiar with the nature of the company's assets will not issue a bond, as it is evident that current assets of any mining corporation are largely represented by inventory and metals in process and in transit; so that Judge Bourquin has imposed upon this company the closing down of its mine at a time when the country is at war and requires the maximum production of metal. The same protection could be granted the Minerals Separation Co. by the court through a modified order providing that in addition to having all future earnings paid into the court the assets should not be disbursed. Under such a plan the assets of the company will be held intact pending a final accounting."

Assessment Bill Passes House

Washington Correspondence

But three votes were cast against the Annual Assessment bill when it came up for passage in the House on Sept. 21. The bill has already passed the Senate and, though important substantial amendments were made by the House, it is believed that the conferees can easily reach an agreement. Representative Mondell, of Wyoming, introduced an amendment exempting oil-placer locations from the act. Representative Taylor, of Colorado, justifies the passage of the bill on the following grounds:

1. On account of scarcity of labor and the actual inability to procure men to do this year's assessment work.
2. Because a great many prospectors and miners have enlisted in the army and navy and many others are being drafted.
3. Because mining development, especially in the way of prospecting and new discoveries, is practically at a standstill at the present time, and the exceeding high cost of powder, steel and other materials makes assessment work almost prohibitive.
4. Because approximately 90% of all the assessment work done is virtually dead work; that assessment work does not bring about practical development; and during these times it is looked upon as unreasonable and wrong to require any useless or unproductive expenditure of either labor, money or materials, and that wasted energy in any direction should not be required in these war times.

While the opposition was small, a determined fight was made by Representative Walsh, of Massachusetts, who did not consider it a war measure. He expressed the belief that corporations holding a large percentage of mining claims could secure the labor to do the assessment work if they would pay a proper wage. He maintained that the precedent of exempting claim holders from the 1917 assessment work would be made an excuse for similar exceptions in future years and perhaps indefinitely, thus retarding the mining industry greatly.

Government Fixes Prices for the Steel Industry

Washington Correspondence

By fixing the price of steel plates at $3.25 per cwt. and that of iron ore at $5.05 per ton, the Administration has dealt more liberally with the steel industry than had been anticipated. Steel men who had closely followed the trend of the negotiations with the War Industries Board did not expect the price to exceed $68 per ton. The price of coke is $2 higher than had been expected by the coke men themselves. With coke at $6 an incentive is offered to use coal at present prices in its manufacture. The official statement follows:

> The President has approved an agreement between the War Industries Board and the steel men, fixing the following prices, which become effective immediately and are subject to revision Jan. 1, 1918, namely: Iron ore, lower Lake ports basis, $5.05 per ton; coke, Connellsville basis, $6 per ton; pig iron, $33 per ton; steel bars, $2.90 per cwt.; shapes, $3 per cwt.; plates, $3.25 per cwt. The prices of bars, shapes and plates are on a Pittsburgh-Chicago basis.
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> It was stipulated, (1) that there should be no reduction in the present rate of wages; (2) that the prices above named should be made to the public and to the Allies, as well as to the Government; and (3) that the steel men pledge themselves to exert every effort necessary to keep up the production to the maximum of the past so long as the war lasts.
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> Measures will be taken by the War Industries Board for placing orders and supervising the output of the steel mills in such manner as to facilitate and expedite the requirements of the Government and its Allies for war purposes, and to supply the needs of the public according to their public importance and in the best interest of all, as far as practicable. A spirit of coöperation was manifested by the steel men, and no doubt is entertained that every effort will be made to bring the production as nearly as possible up to the extraordinary demands resulting from the war.

Negotiations to the end of fixing the prices have been in progress since May. More than 60 prominent men of the steel industry took part in the concluding discussion with the War Industries Board.

Nitrate Plant Site Not Selected

Washington Correspondence

Delay in selecting a site for the Government nitrate plant is causing concern to those closely in touch with the nitrate situation. The Secretary of War has approved southwestern Virginia as the general region in which the plant is to be built, but difference of opinion exists as to the exact locality. The spot that seems most likely to be chosen will require the construction of some heavy bridges which, it is thought, will delay the operation of the plant for several months.

Personals

Henry F. A. Riebling is examining gold properties in Mohave County, Arizona, in Gold Basin.

William Wraith, general manager of the International Smelting Co., of Tooele, Utah, is visiting New York.

Edward O. Acker, metallurgist for the Bethlehem Steel Co. for the last 29 years, has resigned and retired from active work.

Dyke V. Keedy sailed from New York on Sept. 19 for South America, where he will spend several months in the Guianas.

Austin W. Hoy, recently European manager for the Sullivan Machinery Co., has been commissioned an officer in the British Artillery.

Edel Moldenke is now on his way to Burma, where he will do geological work for Burma Mines, Ltd., in the Northern Shan States.

J. R. Harbottle, general manager of Batopilas Mining Co., and **Walter M. Brodie** have been in Joplin, Mo., examining properties for the Batopilas company.

J. H. Devereux has become a member of the firm of Wilkens & Devereux, 120 Broadway, New York. The other members are H. A. J. Wilkens and W. B. Devereux, Jr.

James Nelson, in charge of the duplex department of the Bethlehem Steel Co., at Bethlehem, Penn., has resigned to return to the Algoma Steel Co. at Sault Ste. Marie, Ontario.

A. S. Howie, who has been connected with the Backus & Johnston copper properties at Morococha, Peru, is on his way to Scotland, via Panama and New York, to join the colors.

William Wearne, general manager of the Inland Steel Co., at Duluth, Minn., has been commissioned a captain in the Engineer Officers Reserve Corps and is now at Fort Leavenworth.

H. T. Harrison, for some years chief engineer for Corrigan & McKinney, of Cleveland, Ohio, has been appointed general manager for the firm. **J. Y. Blackwood** succeeds him as chief engineer.

Norman R. McLure, for three years chief engineer of the Phoenix Iron Co., Phoenixville, Penn., has resigned and formed a connection with the Taylor-Wharton Iron and Steel Co., High Bridge, New Jersey.

John R. Stanton, president of the Wolverine, Mohawk, Michigan and White Pine Extension companies, has left for Illinois after an extended visit to the properties. He was accompanied by Theodore Dengler, general manager of the mines.

Herbert Schmidt, formerly assistant engineer of the Mahoning Ore and Steel Co., of Hibbing, Minn., has been commissioned first lieutenant in the Engineer Officers Reserve Corps and is at the Fort Leavenworth training camp.

S. S. Freeman has resigned as general manager of the Carbon Iron and Steel Co., Parryville, Penn. He has been elected secretary and treasurer of the Port Henry Iron Ore Co. and the Lake Champlain & Moriah Railroad Company.

Prof. H. E. T. Haultain of the University of Toronto, has been appointed a vocational training officer in connection with the Military Hospitals Commission for educating returned soldiers for such work as they are capable of undertaking.

P. J. Moran, general superintendent of the Detroit Iron and Steel Co., Detroit, has been appointed general manager of the blast furnaces of the M. A. Hanna & Co., succeeding **Max McMurray**, who has resigned to become president of the Cromwell Steel Co. of Cleveland.

Kenneth Ross, superintendent of the Bonner lumber mill of the Anaconda Copper Mining Co., has been appointed a member of a committee of lumber experts who will name 21 commissioned officers of the second forestry regiment, to be known as the Twentieth United States Engineers' regiment.

A. D. Shankland has been appointed chief chemist of the Lehigh and Saucon plants of the Bethlehem Steel Co., succeeding **F. O. Kichline**, recently transferred to Lebanon, Penn. **Samuel Lewis** has been appointed chemist of the Saucon laboratory, succeeding **A. R. Hartzell**, resigned.

Ralph Stokes, who is well known in this country as a former employee of the Canadian Exploration Co. and also as a contributor to the "Journal," has been serving with the British forces since the beginning of the war. He was lately promoted to a lieutenant-colonelcy and is now Controller of Mines, First Army, British Expeditionary Forces.

Edwin F. Gray has resigned as general manager of the Consolidated Coppermines Co., Kimberly, Nev., but will remain with the company as a director and consulting engineer. **Robert A. Linton** has been appointed general manager, and **H. S. Munroe** is general superintendent. Mr. Linton retains the general direction of the North Butte Mining Co. in Montana.

Capt. George Dey, of the metallurgical staff of Broken Hill Associated Smelters of Port Pirie, N. S. W., is in New York, en route to Port Pirie. He left Australia in May, 1915, as company commander of Company B in the 27th Australian infantry battalion, 7th brigade. He participated in the Dardanelles campaign and later in the Somme drive. He was awarded the Italian silver medal for his brilliant work at Pozières, where he was wounded, losing his right arm.

Whitney Lewis, of the firm of Hager, Bates & Lewis, oil geologists and engineers of Tulsa, Okla., has been forced to withdraw temporarily from the firm on account of his enlistment in the U. S. Engineers. Messrs. Hager and Bates have invited **Prof. James F. Kemp** to join them during Mr. Lewis' absence and Professor Kemp has accepted. Professor Kemp is compelled to forego for some time sedentary work, and is happy in receiving the invitation of two of his old students and friends to be associated with them in the Mid-continental oil field on or soon after Oct. 1.

Obituary

George W. King, president of the Marion Steam Shovel Co., Marion, Ohio, died Sept. 9, aged 63 years. He had been connected with the company since its formation in 1884, and had been its president since 1904.

Elwood B. Blandy, secretary of the Alaska Mines Corporation, died in New York, Sept. 16, aged 63 years. He was well known in the iron trade, having been associated for a number of years with the late George H. Hull, and having represented M. A. Hanna & Co., Pilling & Crane and other prominent concerns.

Societies

Coming Meetings

American Institute of Mining Engineers	St. Louis	Oct. 8-13
American Electrochemical Society	Pittsburgh	Oct. 3- 6
American Iron and Steel Association	Cincinnati	Oct. 26-27
National Association of Purchasing Agents	Pittsburgh	Oct. 9-11

Arizona State Bureau of Mines is planning to give a series of demonstrations or illustrated lectures throughout the state during the coming year, that are intended to bring the bureau's work directly to the people of the state and stimulate mineral production and create greater interest in safety of workers. Three lecture tours have been mapped out, one through the southern and eastern parts of the state, one through the western and one through the northern section.

Exposition of Chemical Industries—The production and uses of ferro-alloy metals, especially in relation to the war, is to be the subject of discussion at a joint meeting of the New York sections of the American Electrochemical Society and the American Institute of Mining Engineers, on Sept. 27 at the Grand Central Palace, New York, where the exposition is taking place. Among the speakers scheduled are C. S. Newcomb, who will talk on "Chrome Mining and Concentration"; W. B. Driver, on "Nichrome," and Sydney H. Ball, on "Ferromolybdenum." Dr. Colin G. Fink and Philip N. Moore, the presidents of the respective societies, are to give short talks; also, Dr. George K. Burgess, of the United States Bureau of Standards, who has recently been in France.

Institute of Metals (British) held its annual autumn meeting in London on Sept. 19. The following papers were presented: "Experiments on the Fatigue of Brasses," B. Parker Haigh; "Hardness and Hardening," Prof. T. Turner; "The Effects of Heat at Various Temperatures on the Rate of Softening of Cold-rolled Aluminum Sheet," Prof. H. C. H. Carpenter and L. Taverner; "A Comparison Screen for Brass," O. W. Ellis; "Further Notes on a High Temperature Thermostat," J. L. Haughton and D. Hanson; "Principles and Methods of a New System of Gas-Firing," A. C. Ionides; "Fuel Economy Possibilities in Brass Melting Furnaces," L. C. Harvey; "The Effect of Great Hydrostatic Pressure on the Physical Properties of Metals," Prof. Zay Jeffries; "The Use of Chromic Acid and Hydrogen Peroxide as an Etching Agent," S. W. Miller.

Industrial News

Mark R. Lamb has received orders from South America covering transmission machinery, conveyor-belt equipment, electrical transmission, pipe-line equipment and electric motors, amounting to $24,000.

J. L. T. Waltz, treasurer of the Bremer Waltz Corporation, 30 Church St., New York, is in St. Louis for a week or two, to be present at the starting up of the company's new aluminum-sheet rolling mill. The mill has a capacity of 5000 lb. of sheets per day.

Powdered Coal Engineering and Equipment Co., of Chicago, announces that Norman L. Warford, engineer in charge of construction for the company, sailed from New York on Aug. 31 to take charge of the coal-pulverizing and copper-smelting department of the Société des Mines de Cuivre de Catemou, at Catémou, Chile. Mr. Warford was the designer and first operating superintendent of the installation of the Anaconda Copper Mining Co., at Anaconda, Mont., where about 1000 tons of powdered coal per day is used in reverberatory furnaces. He was with the Anaconda company from Dec. 1, 1913, until Nov. 1, 1916, when he went with the Powdered Coal Engineering and Equipment Co. He has been using powdered coal since 1897, principally in cement manufacture.

New Patents

United States patent specifications listed below may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

Alkalies—Process of Recovering Alkalies from Cement Materials. Spencer B. Newberry, Baybridge, Ohio. (U. S. No. 1,239,616; Sept. 11, 1917.)

Alumina — Manufacture of Crystalline Fused Alumina. Frank J. Tone, Niagara Falls, N. Y., assignor to Carborundum Co. Niagara Falls, N. Y. (U. S. No. 1,239,984; Sept. 11, 1917.)

Alunite—Method of Treating Alunite. Frank K. Cameron and John A. Cullen, Washington, D. C. (U. S. No. 1,239,768; Sept. 11, 1917.)

Basic Brick. Harry A. Kennedy, Clearfield, Penn. (U. S. No. 1,240,148; Sept. 11, 1917.)

Boreholes—Apparatus for Ascertaining the Direction of Boreholes. Carl Lorens Carlson and Gunnar Bergström, Stockholm, Sweden, assignors to Svenska Diamantbergborrningsaktiebolaget, Stockholm, Sweden. (U. S. No. 1,239,351; Sept. 1, 1917.)

Electrolytic Apparatus. Harry T. Shriver, West Orange, N. J. (U. S. No. 1,239,530; Sept. 11, 1917.)

Electrolytic Deposition, Apparatus for. Frank L. Antisell, Perth Amboy, N. J. (U. S. No. 1,239,113; Sept. 11, 1917.)

Feldspar—Process for Treating Feldspar, Feldspathic Rock and Similar Material. Walter Glaeser, Brooklyn, N. Y., assignor to George T. Bishop, Macedonia, Ohio. (U. S. No. 1,239,787; Sept. 11, 1917.)

Ferrouranium Alloy. Robert M. Keeney and Louis F. Vogt, Washington, Penn., assignors to Standard Chemical Co., Pittsburgh, Penn. (U. S. Nos. 1,240,054 and 1,240,055; Sept. 11, 1917.)

Graphite—Method of Recovering Graphitic Carbon from Graphite Scale. Frederick W. Weissmann, Cincinnati, Ohio, assignor to The Hill & Griffith Co., Cincinnati, Ohio. (U. S. No. 1,239,992; Sept. 11, 1917.)

Lamp—Acetylene Miner's Lamp. Allen F. Adams, Madrid, Iowa. (U. S. No. 1,238,729; Sept. 4, 1917.)

Retort. Pierre Plantinga, Cleveland, Ohio. (U. S. No. 1,239,517; Sept. 11, 1917.)

Sintering—Machinery for Agglomerating Ore. Philip O. Hardlee, Rancagua, Chile. (U. S. No. 1,239,179; Sept. 4, 1917.)

Tamping Device. Vendel Sramcik, Senecaville, Ohio. (U. S. No. 1,239,631; Sept. 11, 1917.)

Editorial Correspondence

SAN FRANCISCO—Sept. 21

Snow in Siskiyou County for the first time this present season fell on Sept. 9. Mt. Shasta received a visible supply and a large amount of snow fell on the same day at and above an elevation of 11,000 ft. There has been a smaller amount of snow on Mt. Shasta during the past summer than for several years. It is estimated that about 10 in. was added during the recent snowfall.

Shasta County Copper Strike and strikers are being ignored and the mines are gradually resuming normal operations with miners willing to work under guarantee of protection from violence. The only way in which the companies could guarantee them protection was to employ armed guards which they did as soon as a sufficient number could be obtained. An effort was made by W. G. Mathewson, representative of the State Industrial Welfare Commission, to bring about some agreement between the mine managers and the strikers. The strikers said they would not return to work pending arbitration unless the guards were removed. Mr. Mathewson was asked if he would guarantee there would be no violence, in case the guards were removed. He replied in the negative. The strikers were asked if they would guarantee no further interruption of mine operation in case they were granted the $1 a day increase in wage. They replied that they would guarantee nothing; that if they wanted to strike five minutes after an agreement was made they would do so; they would do precisely as they pleased. There was other similar talk and, finally, at a consultation of Mr. Metcalfe, Mr. Anderson, Mr. Holman and Mr. Kett, representing the copper companies, it was agreed that they would resume work with as many men as possible and ignore the strikers completely. During the controversy between the strikers and the managers, Mr. Lubin, representing the State Housing and Immigration Commission, stated that under the recent act he had the power to call a public hearing when the whole question of wages and conditions affecting the industry can be gone into in detail. The final arrangement was to get the strikers together in mass meeting and explain to them that there is to be a public hearing and request them to return to work, pending a report of the investigation. The fact stands out plainly that if they return to work they will return upon the same terms which govern the men now working. A large number of men have quit work, some of them voluntarily and some of them through coercion on the part of the leaders. So long as enough miners are willing to work and to keep the mines open, there is no occasion for further discussion. The way the matter now stands there is nothing to arbitrate. Of course, the mines are not operating full handed, but they will be as soon as this band of agitators and disorganizers get tired of their jobs and move off to some other district to start new trouble. It is interesting to note that men who have returned to work are Americans. The strikers are chiefly foreigners. It is to the credit of some of them that they would willingly return to work if they were not afraid of violence at the hands of the men who have stirred up the trouble, in case they should be caught beyond the protection of the guards. So far as the Americans are concerned, they are capable of taking care of themselves when they are off shift.

BUTTE—Sept. 22

Anaconda is making another effort to operate its mines and smelteries without making a settlement with the striking miners and without recognizing them or dealing with them. The striking miners in Butte received important support, when the smeltermen at the Washoe smeltery at Anaconda joined in the strike and forced the closing of the company's mines in Butte, the smeltery in Great Falls, and other properties of the company in the state. This complete shutdown lasted about two weeks, and then the smeltermen decided to go back to work at the terms offered by the company, leaving the striking miners alone again. A majority of the miners also agreed to return to work but with all the company has less than 50% of its normal working force. This shortage, however, is largely due to the fact that thousands of miners have left the district, many going to other states and large numbers going east to engage in other labor. The back of the strike seems broken, but it will be many months before actual normal conditions are restored in the mines. The striking miners are holding out in their demands for a flat wage of $6 per day, regardless of the price of copper, and abolition of the "rustling card."

Raising the Cost of Living every time wages are increased is another great injustice under which the miners of Butte have suffered for years. Usually the increase is maintained thereafter, regardless of the fact that wages decrease again with the fall in the price of copper. Every time miners are granted an increase in wages, every restaurant, boarding-house keeper, lodging house, grocer, barber, laundry, and even saloons, advance their prices correspondingly, some going the raise in wages a little better. As soon as the companies announced, a few weeks ago, that an advance in miners' wages would be granted, every item that enters into the expense of living in Butte was advanced, and so the miners are always worse off than before, when they get an advance in wages based on a sliding scale and price of copper. For that reason, they are demanding a flat rate of pay. Should the price of copper drop to 15c. a lb. again, and miners have to accept $3.50 a day, they could not live in Butte, at present cost of living. Nearly every person responsible for the outrageous cost of everything in Butte is represented in the membership of the Employers' Association. The miners claim that the mining companies, if they had the interest of their employees at heart, could prevent this graft on the miners.

DENVER—Sept. 21

Colorado School of Mines receives an additional mill levy for maintenance, by an act of the last general assembly. The new act states that in addition to the levy now authorized by law, there shall be levied annually, beginning with the year 1917, upon all taxable property in the State of Colorado, for the use of the Colorado School of Mines, two-hundredths of one mill on each dollar of the assessed valuation of the taxable property.

State Mineral Department was authorized by act of the last general assembly. The State Board of Land Commissioners is directed to establish this department, to be under the direct supervision of the head of the department of mining in the Colorado School of Mines, who shall also be state mining engineer of Colorado. The board, with the advice of the state mining engineer, shall appoint an assistant state mining engineer. It shall be the duty of the state mining engineer to inspect in person, or through his assistant, all mines and other works operated under leases from the State of Colorado for the production of precious metals, coal, iron, oil, or other mineral products upon which rentals are due to the state, as often from time to time as he shall deem it necessary for the purpose of estimating and checking royalties therefrom, and keep such maps of the workings of all mines as will give the land department full information. Lessees of all lands, including coal lands, shall be required to furnish the state mining engineer with copies of blueprints of all maps of underground surveys of leased land made or authorized by the lessee, including engineer's field notes certified to by the engineer who made the survey. The state mining engineer shall supervise all mining and require the same to be done in accordance with the best methods of mining. Every mine and other works upon a public domain of the State of Colorado held under lease therefrom shall be at all times subject to the inspection of the state mining engineer.

SALT LAKE CITY—Sept. 22

Second Embargo on Ore Shipments—found necessary on the part of Salt Lake Valley smelters to relieve the congestion of ores—is being lifted in some cases and in others further extended. However, increasing shipments from the Tintic district—always a heavy sufferer in an embargo—are an indication that the situation is clearing somewhat. It is unfortunate that, with production at the present high rate, the situation should be further complicated by the difficulty of procuring adequate transportation.

Coal Supply of Salt Lake Valley remains a problem, as the Denver & Rio Grande railroad has found itself unable to meet the requirements of the coal mines of Carbon County. For one week the railroad was able to approach the number of cars promised—1800—but thereafter there was a falling off and in the week ended Sept. 8 only 1063 cars were available. Officials of the railroad in question lay the blame to the failure of connecting lines to supply an adequate number of return cars, and it is stated that weekly reports to the utilities commission by coal-carrying roads show more loaded cars received from the Denver & Rio Grande than empties returned. On the other hand, officials of connecting roads, refusing to assume the responsibility for the failure to return empty coal cars, allege Government demands upon transportation as being in the way of better service to Utah coal mines; and there the matter appears to rest at the present moment. In the meantime the coal mines are finding it practically impossible to operate at capacity, as well as difficult to keep their forces at normal, when not working full time.

WALLACE, IDAHO—Sept. 21

Mine Managers Conference was held and decision was unanimously reached to make no reply to the request of the miners' union made some time ago for a conference between the union officials and mine managers. This information was obtained from one who was present at the conference of managers. Labor conditions were regarded as satisfactory and there was no disposition to unionize the district, or even to recognize the union to the extent of making a formal reply to its request. One manager thought a reply should be made rejecting the invitation to confer, but he found no support in the meeting, and in fact was not disposed to press it himself. Decidedly the most interesting development in the conference of managers was the radical attitude of the Days in opposing any recognition whatever of the union. They were more vigorous in their opposition than any others, a position quite in contrast with that of former years when they were closely affiliated with the union during all the troublesome days, and their mine, the Hercules, was the haven of refuge for the old gang who found themselves shut out of other mines through the operation of the employment office. And this is not all. As a further safeguard against the encroachment of the union crowd, the Days are understood to have gone so far as to propose the restoration of the employment office. And Ed Boyce, founder of the Western Federation and for several terms its president, is a member of the Day family. Truly the world do move.

PHOENIX, ARIZ.—Sept. 20

Bureau of Mines Rescue Car No. 2 will be in attendance during the week of Nov 7 at the State Fair. This car is fully equipped for mine rescue service and first-aid training and is in charge of C. A. Herbert. This will be an added attraction to the important mineral department. The new building for the mineral department is well under way, and it is hoped that it will be ready in time for the opening of the Fair.

Arizona State Bureau of Mines is planning to carry on extension work during the year. Charles F. Willis, director, is making a tour of the state to arrange for the work. It is intended that every member of the staff will be out on lecture work during some part of the year, the work being carried on continuously by one or another of the men. The state has been divided into three districts for the lecture courses. The southern and eastern districts will include Nogales, Patagonia, Tombstone, Bisbee, Douglas, Globe, Miami, Safford, Clifton, Morenci, Duncan and Wilcox. The western district includes Casa Grande, Ajo and Yuma. The northern district will take in Hayden, Ray, Phoenix, Wickenburg, Prescott, Mayer, Humboldt, Clarkdale, Jerome, Kingman, Oatman, Winslow, Flagstaff and Williams. The courses to be given in the places mentioned will cover three days. Safety Engineer S. C. Dickinson will give courses in first aid in towns, cities and the larger mining camps. The field work of M. A. Allen, mineral technologist, will be to stimulate production of rare metals needed for war purposes and instruction in technology of the metals and minerals. G. R. Fansett, rock analyst, will instruct in mineral and rock identification. The lecture courses will be supplemented by demonstrations and illustrations. Moving-picture exhibitions will also be given. Members of the staff will talk before high schools, boy scouts, women's clubs or other organizations.

DULUTH, MINN.—Sept. 22

Iron Range Gardens were provided for at the beginning of the season when the Oliver Iron Mining Co. prepared the ground on large tracts on all of their locations and platted the same in small tracts, which were allotted by the "squatter" department to the employees free of charge. Large potato crops have been raised on these despite the fact that the season was so unfavorable. In order to take care of the product during the coming winter the company is building roothouses at central points.

Banner Season in Itasca County mining industry was shown when shipments for the year ended June 30, 1917, amounted to 5,684,556 tons as compared with 5,337,000 tons in 1916, and 5,464,000 tons for the year ended June 30, 1913. This year there were 19 properties shipping and the largest number in the former years was 13. During the last year 10,981,000 yd. of overburden was removed, which was the largest amount ever removed in one year before. Four new stripping projects were started: The Majorca, by Picands Mather Co., at Calumet; the Patrick and Ann properties by Butler Bros. at Nashwauk; and the York mine by A. B. Coates at Keewatin, all of which have been shipping ore this summer. The Bray and Pearson mines, which have been closed down the last few years, have been reopened. Three new washing plants have been built—the Patrick, which will treat the ores from the Patrick, Ann and Kevin mines; the Pearson for the Pearson mine; and the York at the York mine. In addition two concrete shafts were sunk, one at the Holman and one at the Hill mine of the Oliver company in the Canisteo district.

HOUGHTON, MICH.—Sept. 21

Copper Price of 23½c. per lb., fixed by the Government as the price for domestic consumers, for the Allies and for our own Government requirements, is looked upon here in the copper country as reasonably fair, but not to be compared with the Government price of $2.20 on wheat. The impression here was that 25c. would be a fair price, looking at the situation from a local labor standpoint as well as from the standpoint of the Government. But even at 23½c. a lb. it is not likely that there will be any of the mines shutting down. A few years ago any such price as 23c. for copper would have been considered as exceptionally advantageous to the copper-mining districts of the country. But the cost of production of copper has gone up in the last six or eight months to figures which seem all out of reason. The average cost of production here a few years ago was 12c., and this year the costs sheets of the mines of this district are running above 15c. at the best mines and above 20c. at the greater number of mines of the Michigan copper district. In fact, the average cost price of copper for the Lake Superior district this year will be greater than the average selling price of copper over any reasonably long period. "The best mine in this camp today is finding its mining costs alone to be over 10c." said one good authority yesterday. The increased cost of production largely goes to labor and labor is entitled to it, for the increased wages and the bonuses are needed to take care of the increased cost of living. However, the impression among the people of the Michigan district is that the Government price on copper is not unreasonable. It will mean an end to big profits for copper-mining companies, but it will provide for continuous operation of practically every mine here. It will mean that wages will at least be kept at their present figure. Further than that it will mean a reasonable profit for the shareholder. The greatest need of this district at present is more workingmen for the mines. The army has taken a large number of the best men, as copper mines did not ask for exemption for any of their employees.

JOPLIN, MO.—Sept. 22

Safety and Sanitation organization headquarters removal to a point west of Baxter Springs is being discussed by local operators, and is indicative of the waning importance of the Webb City-Carterville section of the field. The organization, which in reality is a mine operators' club, was formed about 2½ years ago, and has been the strongest organization of the sort the district has ever known. Of late attendance at the weekly Thursday meetings has been rather light, and it is believed removal to the Kansas-Oklahoma part of the field would mean renewed life and activity. There is talk of building a bungalow on the slope of what is known as the Blue Mound, a hill west of Baxter, and operating a buffet lunch for the operators at all times.

American Metal Co. has definitely entered this field by closing its option on a second lease of an 80-acre tract of the Ebbenstein land, immediately west of Baxter Springs, Kan. It has paid over $16,000 in cash, the last of the $35,000 bonus that was received by E. J. Pratt, George Moore and associates, of Webb City. First lease on the land is owned by Pratt and M. E. Grantham, of Baxter. Intensive drilling has been done on the tract for some time, and the American Metal Co. now has eight drills at work on one acre. Shaft sinking and full development, including mill building, is to be started at once. The principal orebody is found at 211 ft. and may mean heavy water. The decision of the company, after its careful investigation, has resulted in a new boom for the Baxter section of the field.

TORONTO—Sept. 22

High Price of Silver has occasioned renewed activity in prospecting in Portage Bay and Maple Mountain districts, and a number of good surface showings have been encountered. There are many promising prospects in these districts which have never been tested, and it is expected that under the stimulus of the present market conditions, the necessary capital for this purpose will shortly be forthcoming.

Cobalt Is Without Telephone Service, as are also the silver mines of the camp, because on Sept. 20 the wires were cut by order of the town council. The franchise of the company has expired and the company received three months' notice to cease doing business, as the municipality desires to construct its own telephone line. The courts issued an injunction prohibiting further interference with the equipment, and at last accounts the line was being repaired. The company offered to sell the system to the town but the price was considered too high. The case will shortly come before the court.

MELBOURNE—Aug. 5

Copper Producers' Association to be formed on the same lines as the Australian Zinc Producers' Association is being discussed. The object is to control the whole Australian output of copper, but seeing that copper does not represent the same proportion of the world's output as zinc it is difficult to understand what object is going to be attained, except that it will still further centralize the marketing of Australia's mineral production through one channel.

Tungsten and Molybdenum Ores have been advanced in price through agreement with the Imperial Munitions Department as a result of pressure from various quarters. Under the new scale, which is to operate as from July 1, 50s ($11.89 at present exchange) per unit will be paid for wolframite and scheelite of at least 65% trioxide, and 100s ($23.77) per unit for molybdenite of at least 85% molybdenum sulphide. The rates quoted are those being paid at the producing centers and compare with $10.74 and $21.59 under the old tariff. The rates at a port are higher in proportion.

The Mining News

ALASKA

MOTHER LODE COPPER MINES CO. (McCarthy)—Report for seven months ended Aug. 1 shows mine operated extracting shipping ore while sleigh road to railway at McCarthy remained good, except from Apr. 10, when 12-day labor strike occurred, also temporary shutdown on account of installing compressor chamber underground, 23 ft. from portal of Pittsburg tunnel. Additional 212 ft. of development since Jan. 1 making total of 8018 ft. Copper-silver ore reserves "in sight and estimated" amount to 113,930 tons. Commenced driving new tunnel to develop upper ore zone at estimated cost of $17.66 per ft.; total length to be 930 ft. Two-compartment shaft sunk 51 ft. by hand drilling. Additional buildings and machinery, including tramway being installed.

ARKANSAS

Marion County

E. O. OWENS, N. L. Wood and John Nanny, of Yellville, closed deal for new lead property 8 mi. north of Flippin. Ore high grade, no milling necessary.

GOODLUCK (Rush)—Development carried on at four different places. Good bodies of blende encountered. Contemplate constructing mill.

LOST JACK (Yellville)—Elmer Owens and N. L. Wood, sold lease on Lost Jack zinc mine to Liberty Lead and Zinc Co., which is erecting mill on Willet mine adjoining.

NORTH STAR (Yellville) — Shipped first car zinc ore this week. Mill operating.

ARIZONA

Cochise County

AT BISBEE, Sheriff Wheeler and deputies, assisted by citizens, arrested as vagrants returning I. W. W. men, upon arrival from detention camp at Columbus, N. M. One hundred have been arrested so far.

CALUMET & ARIZONA (Warren)—Produced in August 4,296,000 lb. copper, compared with 3,5[illegible]1,205 lb. in July.

SHATTUCK-ARIZONA (Bisbee)—Having obtained satisfactory license from Minerals Separation for use of flotation process, will let contracts for erection of 100-ton mill to treat lead ores. Expect mill to be ready for operation by Mar. 1, 1918. Estimated to have 10-year supply of lead ore, over 1,000,000 tons being blocked on three sides. Labor conditions improved. Arthur Houle, superintendent.

Mohave County

BULLION HILL MINING CO. (Chloride)—Shaft down 80 ft. Crosscutting started at 300 ft.; should enter vein within 30 days. Jesse Knight, of Utah, principal owner. H. M. Eakin, superintendent.

NEW TENNESSEE MINING COMPANY (Chloride)—Drifting on 240-ft. level in gold-lead-zinc ore. Sinking soon to be resumed. G. J. Ridenour, superintendent.

DIANA (Chloride)—South crosscut on 200-ft. level entered vein 13 ft. from shaft; just entering oreshoot. Resembles high-grade silver-lead ore in upper workings. George F. Beveridge, superintendent.

Pinal County

GILA DEVELOPMENT (Kelvin)—Considering construction of a mill to be buil early next year.

PINAL DEVELOPMENT (Kelvin)—Winze down 90 ft. and still in good ore. Shipments will be begun this month.

ARIZONA HERCULES (Kelvin)—Power plant equipment beginning to arrive. The ball mills and three Hardinge mills received. Erection of steel work on the mill proper begun.

Yavapai County

ARIZONA BINGHAMTON (Stoddard)—Treating 50 tons copper ore in flotatio mill per day. Development work on 600 ft. level shows some ore. G. W. Johnson, general manager.

COPPER QUEEN (Stoddard)—Ore shipments to Arizona Binghamton mill discontinued. Two shafts unwatered. Will sink 300 ft. shaft at Adit No. 1, 200 ft. deeper. Claude Ferguson, superintendent.

CALUMET & JEROME (Jerome)—Total footage of 132 ft. is reported by G. W. Avery, general manager, as advance for last week in various headings on 600-ft. level. No. 1 drift being run southerly to cut under formation shown in tunnel above, now in 200 ft. Winze in No. 1-A discontinued on account of water. No work in No. 1-A. No. 2 has advanced 160 ft.; No. 2-R, new drift run southerly from No. 2-A, advanced 32 ft. to cut formation encountered in No. 2.

CALIFORNIA

Amador County

BRIDGE REPAIRS on Rancheria Creek, near Amador City, made by Fremont, Bunker Hill and other mines to prevent tailings from interfering with road traffic. Bridge raised and approaches filled in.

SOUTH KEYSTONE (Sutter Creek)—Since reopening through North Star shaft to depth of 1000 ft. north drift from crosscut, 300 ft. west of the 1000-ft. level, station has been cleaned out and extended to length of 813 ft.; crosscuts also being run at 800- and 600-ft. levels.

Butte County

HOLTON DREDGE NO. 4 (Oroville)—New ground dredged by American Gold Dredging Co. started in August. Probably last piece of virgin placer ground in this field.

Calaveras County

RAILROAD SURVEY nearing completion from Copperopolis to Valley Springs, connecting Calaveras Copper mines with Southern Pacific running to Sacramento. Projected road is 25 mi. long, or 8 mi. longer than that to Milton, but more direct to Sacramento.

CALAVERAS (Murphys) — Unwatering started by Latchford & [illegible]stead, of Los Angeles. Pumps operated by electric power from Utica Mining Co. plant. Producer in past.

Eldorado County

CHROME DEPOSIT on Williamson ranch, near Webber Creek bridge, yielded a carload in one week with two men working. Estimated 18 to 20 carloads still to be extracted.

Kern County

BALTIC (Johannesburg) — Leased to Robert Nicoll to develop tungsten and gold. Good gold producer a few years ago but litigation and insufficient capital closed it down.

Mono County

NEW MINING DISTRICT, near Queen, being prospected on edge of California-Nevada state line, about 10 mi. north of Benton. Samples at Bishop show silver contents.

Nevada County

SUMMIT (Grass Valley)—Recently optioned along with Mohegan and New England, by J. H. Batcher, of San Francisco. Sampling and tests by J. C. Campbell, of Nevada City, satisfactory and three properties will be jointly operated. New hoisting plant on New England contemplated for old deep shaft and provide means of developing all three properties. Each was producer in past.

GRASS VALLEY CONSOLIDATED (Grass Valley)—Charles A. Brockington resigned as manager of Allison Ranch mine, succeeded by Robert Hathaway. Brockington will resume development of Golden Center mine. He reopened both these properties and installed Allison Ranch mill and cyanide plant. Golden Center incline shaft will be deepened.

Plumas County

DROGE (Greenville)—Reported property optioned by Eastern men; John W. Dailey, in charge of development.

PHILADELPHIA EXPLORATION CO. (San Francisco)—Developing Crescent and Green Mountain gold properties at Crescent Mills. Albert Burch, manager.

QUIGLEY (Laporte)—Reported that gravel property purchased by J. T. Buell, of Marin County, and electric power plant will be installed on south fork of Feather River, along with modern machinery at mine.

Trinity County

SCOTT MOUNTAIN ROAD from Siskiyou into Trinity County is to be built by popular subscription and board of supervisors. Will open up a large amount of mining and agricultural land that has been generally inaccessible. The Trinity end of the road will extend from the Siskiyou County line to Weaverville.

COLORADO

Lake County

GRAY EAGLE (Leadville)—Work resumed in shaft below 500-ft. level; development work to be continued on bottom level. Arranging to handle output on surface from stopes opened on 500-ft. level.

Park County

COMMONWEALTH (Alma)—Operating Magnolia mine and Eddy mill, has completed installation of cyanide process and operating tramway.

LONDON (Alma)—Crosscut tunnel, now in 400 ft., being driven to 1200 ft. to cut vein at depth. New boarding house being built at mine, and mill and cyanide plant will be built at tunnel portal. C. P. Aicher, manager.

San Juan County

SHIPMENTS FROM SILVERTON of concentrates and crude ore during August were: To outside smelteries, 200 carloads; to Silver Lake custom mill, 98 carloads; to North Star custom mill, 37 carloads.

COMING WONDER (Silverton)—Ore developed during past few months. Wire-rope tramway erected.

HIGHLAND MARY (Silverton)—Three shifts employed at property, situated at head of Cunningham Gulch. Mill operating; shipping. J. H. Slattery, manager.

San Miguel County

SHIPMENTS FROM TELLURIDE of ore and concentrates during August were: Tomboy, six cars concentrates to Durango and 41 to Blende; Smuggler-Union and Black Bear, eight cars to Durango and 53 to Blende; Liberty Bell, 12 cars to Durango; Carruthers Lease, two cars to Durango; Modena Mining Co., one car crude ore to Durango; total, 123 cars. During August, 1916, 117 cars were shipped.

BLACK BEAR (Telluride)—New compressor installed.

LIBERTY BELL (Telluride)—Two 3-ton electric locomotives for Stillwell tunnel transported to mine in wagons, each with six horses pulling and four pushing behind, hitched to large pole.

SMUGGLER-UNION (Telluride) — One-bucket aërial tramway, 2000 ft. in length, to Bridal Veil Falls power plant, completed. Tramway will be used for sending down timber, and transporting men and supplies to and from power plant. Tramway crosses dangerous snow-slide area. New barge and larger pump installed on Blue Lake, source of company's two hydro-electrical power plants.

Summit County

FARNCOMB HILL DREDGING CO. (Breckenridge)—First dividend of 4% on capital stock of $300,000 declared. Ground belonging to company being worked by two dredges of Tonopah Placers Co. under lease. All expenses of company have been paid, so that practically all future earnings can be paid out in dividends.

Teller County

LAST DOLLAR (Cripple Creek)—New fireproof buildings being erected by Catherine Gold Mining Co. will be ready for machinery and other equipment within 10 days.

CRESSON (Cripple Creek)—Ore developed on 14th level, 30 ft. high at west end, 15 ft. at east end of main stope. Drift on 15th level recently opened orebody 15 ft. long. Attempts made to find downward continuation of oreshoot on 14th level by inclined diamond-drill holes, but unsuccessful.

IDAHO

Shoshone County

INTERSTATE-CALLAHAN (Wallace)—Official statement for August gives total amount of ore mined and milled as 15,005 tons, averaging 21.5% zinc, 7.2% lead and 3 oz. silver per ton. Crude ore and concentrates shipped amounted to 5226 tons of zinc and 951 tons of lead. Assay of shipments showed about 47% zinc, 46% lead and 18 oz. silver. Flotation plant practically completed. August shipments were above average for last quarter.

Fremont County

WILBERT (Arco)—Situated 40 mi. from Arco. Ore found in disseminations and stringers in fracture planes of overturned fold in quartzite. Ore shipped from 800-ft. depth is about 50% lead and has high silver contents. During year ended May 15, mined 7337 tons at cost of $5.70 per ton. Net profit for year was $19,578. Wilbert Annex, adjoining, being developed on strength of results obtained in Wilbert. Machinery shipped includes compressor, drills, cars, etc.; foundations already installed for compressor. A. S. Ross, president of both companies and D. J. Lemmon, superintendent. General offices, 221 Kearns Bldg., Salt Lake City, Utah.

KANSAS

Montgomery County

AMERICAN ZINC, LEAD AND SMELTING (Caney)—Plant here and at Dearing closed down for some time, partially on account of high cost of operations, permitting no profit at 8c. for prime western spelter, to smelteries which buy ore or concentrates, and also because American Metal Co. is treating all of Butte & Superior product, about half of which went to these smelteries previously, permitting a large profit on high-priced spelter.

MICHIGAN

Copper

BEAR LAKE "POOL" (Calumet)—Diamond drill down 300 ft. in decomposed conglomerate.

MOHAWK (Mohawk) — Four heads of this and two of the Wolverine mill working to capacity. New Hardinge mill ready for installation.

ISLE ROYALE (Houghton)—Trace of gold recently found in rock, associated with silver which is becoming an important item in this mine's production.

CHEROKEE (Houghton) — Shaft down 450 ft. and openings latterly at each level extend 300 ft., showing fair amount of copper. Will need no additional financing until next summer. Exploration work still being done.

CALUMET & HECLA (Calumet)—Production in August by C. & H. and subsidiaries was: C. & H., 6,336,986 lb.; Ahmeek, 2,329,000; Allouez, 651,499; Centennial, 196,192; Isle Royale, 1,061,547; La Salle, 159,586; Osceola, 1,119,538; Superior, 183,320; White Pine, 301,037 lb.

LAKE MILLING, SMELTING AND REFINING CO. (Point Mills)—Stamp mill, owned and operated for Calumet & Hecla subsidiaries and Hancock Consolidated, will, by next summer, have larger capacity than any other in Lake Superior district. Has six heads working and is installing two additional stamp heads. Handles rock from Allouez, its largest producer, Centennial, Isle Royale, La Salle, Hancock and other custom ore.

MINNESOTA

Mesabi Range

E. J. LONGYEAR CO. (Hibbing)—Building brick sample warehouse to replace one sold to State for chemical laboratory.

SOUTH UNO (Hibbing)—M. A. Hanna Co. making plans to strip small tract on north side of pit amounting to about 85,000 cu.yd. this winter.

OLIVER IRON MINING (Chisholm)—Nine drills at work on Clark Iron Co. property which lays just south of Hartly mine in N.E. ¼ Sect. 23-58-20.

LINCOLN (Virginia)—Owned by Interstate Iron Co. Fire in main shaft closed mine last week. Quick response of Helmet Men of Oliver Iron Mining Co. Safety Department prevented spreading.

WEBB (Hibbing)—Owned by Shenango Furnace Co., E. J. Maney, general manager, and has just paid off a $2,500,000 mortgage against this mine, making it free from incumbrance. Pittsburgh Trust Co. of Pittsburgh was holder of mortgage to run for 50 years. Shenango Furnace Co. operated mine and paid the Trust company a royalty of 25c. a ton mined. Royalties have satisfied mortgage.

MISSOURI

Christian County

SQUARE DEAL MINING AND ROYALTY CO. (Ozark)—Situated in Elk Valley district, two miles southeast of Ozark. Has lease on C. Y. Bain land. Shaft sunk, striking lead and zinc ore at 25 ft. depth, continuing to bottom at 51 feet. Development work will be done and if showings warrant, mill will be constructed. Office, 938 Landers Building, Springfield, Mo. F. S. Dodge, president.

Joplin District

EAGLE-PICHER (Joplin) — Completed installing district's largest compressor, 4000 ft. per min., at central power plant at Picher, Okla. Weighs 145 tons, set on 13-ft. concrete foundation.

U. S. SMELTING (Picher, Okla.)—Working on big modern mill west of Blue Mound plant in Kansas. Will use ball mill and oil-flotation plant; 600-ton capacity in 24 hours.

REBEKAH (Picher, Okla.)—Shaft sinking and mill building being pushed on tract west of U. S. Smelting Co.'s new plant; 252 acres in lease. W. A. Woods, superintendent and part owner.

ETHEL GRAY (Joplin)—Completed new shaft to west of mill and is building tram and hopper. Drilling to east of mill resulted in rich drill hole, which will be reached by drifting from present workings.

IMPERIAL DEVELOPMENT CO. (Miami, Okla.)—Has three Pomona pumps operating in one shaft on lease east of Douthat, Okla. Total capacity, 2540 gal. per min. Pump shafts go down corners of shaft and still a fourth pump could be used, though shaft is only 5x7 in clear.

HOMESTAKE (Quapaw, Okla.)—New 250-ton mill completed; ground not yet well opened. Turner Mining Co., a subsidiary, started erection of mill on lease adjoining on north, and some investors will build third mill on east part of 60-acre lease. T. P. Turner, manager. R. M. Scott, treasurer.

MONTANA

Fergus County

BARNES KING DEVELOPMENT (Kendall)—August report shows that at North Mocasin, treated 2239 tons, bullion production was $22,800. Gloster and Shannon produced 4586 tons, yielding $103,000 in bullion. Ore from Shannon averaged $27.38 per ton and came from high-grade streak on 500-ft. level. Balance due for Shannon mine, amounting to $44,940 will be paid immediately.

Silver Bow County

DAVIS-DALY COPPER CO. (Butte)—Gross receipts during quarter ended June 30 were $237,244 and expenses $161,512, leaving net profits of $75,732. Treasury balance, June 30, was $160,000. Shipments aggregated 12,326 tons, producing 1,158,356 lb., copper and 71,535 oz., silver. Hibernia mine has new headframe erected and mine equipped with machinery. Exploiting manganese ores outcropping on Hibernia. Estimated manganese orebody contains between 400,000 and 700,000 tons of 43% to 47% manganese. Concentration in Ophir mill of Butte-Detroit company being tested successfully. At company's Great Republic mine, about 1000 ft. beyond Hibernia mine, another manganese body being opened.

NEVADA

Lander County

GEORGE RUSSELL, of Elko, recently discovered tin ore on his cattle ranch in unnamed range of hills, 20 mi. north of Battle Mountain. Nugget was found in April, 1914, and sent to University of California, where it was reported to be high-grade tin ore. Subsequently discovered in several localities by Edward Larson. Small amount of development work done at different points. Ore 4 to 5 ft. wide found at depth of 50 ft. in one place. Lack of capital retards development.

Mineral County

CALAVADA COPPER (Luning)—Group of claims in Santa Fe district under development for last three years, has been shipping to International Smelting Co., at Tooele, Utah; proceeds put back into development.

Nye County

TONOPAH ORE PRODUCTION for week ended Sept. 15 was 9521 tons valued at $166,617, comparing with 8356 tons the previous week. Producers were, Tonopah Belmont, 2692 tons; Tonopah Mining, 2200 tons; Tonopah Extension, 2380 tons; Jim Butler, 900 tons; West End, 854 tons; Montana, 327 tons; Rescue, 128 tons; Cash Boy 40 tons.

UNION AMALGAMATED (Manhattan)—East drift on 600-ft. level cut one of three orebodies developed in Earl claim above 350-ft. level. Heavy flow of water encountered, increasing after vein uncovered. Expect to cut Swanson orebody in short distance.

MANHATTAN CONSOLIDATED MINES DEVELOPMENT (Manhattan)—Working shaft down 80 ft. below 300-ft. level and timbered to point 66 ft. below. In hard limestone and making little water.

OREGON

Josephine County

CHROME ORE is now being shipped from the Gravlin property at Cold Spring. M. A. Delano, of Grant's Pass, in charge.

BRITTEN & WILSON (Waldo)—Rich vein of copper ore being crosscut at this mine on Patricks creek. J. N. Britten, manager.

MONUMENTAL (Waldo) — This gold mine, idle for several years, may be operated by eastern company. E. A. McPherson, in charge.

CHROME AND MANGANESE deposits are being developed on Gray Back Mountain by R. C. Fehely and R. W. Kitterman, of Kerby, and others.

GRIFFIN CINNABAR (Waldo)—Being examined by J. C. Kendare and Earnest Backliff of Nevada. It is adjacent to the Ehrman, Cole & Taggert property. John Griffin, Kerby, manager.

CHROME (Selma)—Five trucks hauling from this chrome mine down the Illinois River to Waters Creek. More will be put on when available. Shipping 50 tons daily to Niagara Falls, N. Y. Employing 18 men. R. J. Rowen, manager.

SOUTH DAKOTA

Lawrence County

TROJAN (Deadwood)—Shipments of ore from Republic mine, which is under lease to company, being made to mill at Trojan.

CUSTER PEAKE (Roubaix)—Concentrator consisting of 10 stamps, Hartz jig, ball mill and four Wilfley tables placed in commission. Ore on 300-ft. level shows about 2% native copper and $3 per ton in gold.

HOMESTAKE (Lead)—Grade for water ditch between Savoy and Maurice nearly completed and laying of wood-stave pipe started. Expected work will be completed by Dec. 1 with exception of power plant below Maurice. Upon completion of new electric plant, works will be electrified, with exception of hoists.

UTAH

Beaver County

KING DAVID (Frisco)—Development to be resumed on 800- and 200-ft. levels. Adjoins Horn Silver on west. Jesse Knight, of Provo, interested.

MOSCOW (Milford) — Ore opened in southern end on 1400-ft. level, continuing upward and downward. The 500-ft. level being developed toward south, stringer of good ore followed. Boston claim, leased for year, marketed one car and another is ready. Ore opened in Commonwealth being developed by G. Wilkin, superintendent of Moscow in three places. Property lies 700 ft. south of Moscow.

Juab County

CHIEF CONSOLIDATED (Eureka)—Old Tetro shaft, 4000 ft. west of main shaft, to be enlarged and sunk further. Present depth, 400 ft.

TINTIC MILLING (Silver City) — Expect $25,000 for precipitates shipped recently; car of bullion ready for market valued at $35,000. Treating 225 to 250 tons daily.

Salt Lake County

UTAH APEX (Bingham)—Estimated to be 50,000 tons of ore in one block of ground, carrying 11% lead and 14% zinc.

COLUMBUS REXALL (Salt Lake) — Production since strike, 10 or 11 weeks ago, estimated at 900 tons.

CENTRAL UTAH OIL SHALE (Salt Lake) — Company capitalized at 100,000 shares, par value $100 each, organized in Salt Lake City. Directors: Judge Le Grande Young, of Salt Lake; S. P. Critchlow, of Ogden and others. Owns about 4000 acres of oil-bearing shale in Sanpete field in central Utah.

Summit County

PARK CITY SHIPMENTS for week ended Sept. 15 were 5,172,930 lb.

NEW QUINCY (Park City)—Car of 47 tons, dry weight, shipped recently.

PARK CITY KING (Park City)—Camp to be built for winter work on Big Cottonwood side near head of Thaynes Cañon. Tunnel in 160 ft. and contract let for another 300 ft. Expect to cut first of three fissures in about 75 feet.

SILVER KING COALITION (Park City)—Shipping 600 tons weekly of crude ore and concentrates. Seeking injunction to prevent Judge Mining & Smelting, Keystone Mining, and Conkling Mining from completing tunnel connecting properties, claiming it drains Alliance tunnel of Silver King, depriving company and town of Park City of water supply.

Tooele County

DEEP CREEK COPPER KING (Gold Hill)—To resume work on Moonlight group extending southerly from Western Utah Copper. Shaft down 32 ft., to be sunk 100 ft. further to follow vein, carrying lead, silver, copper and some gold. Also tungsten. Owns 10 claims. R. C. Naylor, county treasurer, is president, and John Pingree, of Merchants' Bank, vice president.

WASHINGTON

Stevens County

NORTHWEST MAGNESITE CO. (Chewelah)—Shipped 35,000 tons crude magnesite since December, 1916, all calcined in East. Calcining plant now under construction to reduce bulk of shipments and facilitate marketing. One unit, of two rotary kilns, 7½ x 125 ft., completed with capacity of 200 tons per day, reducing bulk 15%. Large motors being installed for power; also coal-pulverizing plant for fuel instead of crude oil, now in use. Up to present, ore hauled from quarries by teams and motor trucks, costing $2 per ton, to be replaced by cable tramway now under construction.

CANADA

British Columbia

CANADA COPPER CORPORATION, LTD. (Greenwood)—Production for August was 212,772 lb. fine copper. Smeltery shut down from June 26 to Aug. 15, owing to coke shortage.

Ontario

FIDELITY MINING CO. (Kirkland Lake)—On one claim 5-ft. vein discovered.

NATIONAL (Cobalt)—Treating 100 tons a day of old tailings by flotation.

McKINLEY-DARRAGH (Cobalt) — In August treated 7500 tons, which is a record.

ELDORADO (Porcupine)—Arrangements made to diamond drill property.

MAIDENS MACDONALD (Porcupine)——Formerly under option to La Rose has now been purchased by Conlagas.

BILSKY (Porcupine)—This claim worked under option by the Apex; drill cut a 15-ft. vein at the 700-ft. level, showing free gold.

GENESSEE (Cobalt) — Main shaft is down 572 ft. Station has been cut at 550 ft. level; driving toward Chambers-Ferland ground.

McINTYRE (Schumacher) — Production during August, $141,394, tonnage treated was 15,410, forming a new high record. Average value, $9.52 per ton.

MINAKER KIRKLAND (Kirkland Lake)—Test pits having been sunk with encouraging results, a mining plant sufficient to develop the property to the 200-ft. level will shortly be installed.

KERR LAKE (Cobalt)—Produced 200,855 oz. silver in August. Production for 12 mo., 2,595,632 oz. Fleming vein, in conglomerate just above the Keewatin contact, shows richness.

HOLLINGER (Timmins)—Developments satisfactory and may resume dividends. Ore reserves largely added to. Some new veins found on upper levels and some known veins cut on 800 and 1200-ft. levels. Employing 1100 men.

NEWRAY (Porcupine)—Being examined by engineers of U. S. Smelting, Refining and Mining Co. who have 60-day option. If accepted will increase capital to $3,000,000, and option taken on 2,000,000 shares at 50c. a share.

NIPISSING (Cobalt)—In August mined ore of estimated value of $293,116 and shipped bullion from Nipissing and customs ore of estimated net value of $588,254. Low-grade mill treated 6395 tons and high-grade mill treated 32 tons and shipped 610,092 oz. of silver.

BRITISH AMERICA NICKEL CORPORATION (Toronto)—Power question not yet settled. Diamond drilling has disclosed additional ore at Murray mine in Sudbury district, according to E. P. Mathewson, general manager. Christiania (Norway) office of company received telegram from representative of British Government, on board of directors, stating that discovery shows copper-nickel ore, 80 ft. thick, and will add 5,000,000 tons to the 11,000,000 tons of reserves already blocked out.

MEXICO

OPERATION OF MINES is reported to be under consideration again by some of the American companies. Conditions show improvement but in the case of most of the companies nothing has been definitely decided. They are awaiting information from their managers in El Paso and at the properties. Several weeks will probably elapse before any actual steps toward resumption are taken. According to a Nogales report the "Cámara de los Obreros" the labor council of Sonora, that has proved so troublesome to American mining companies operating in the State, has been abolished by an order of Acting Governor C. G. Soriano. It is replaced by a "committee on conciliation and arbitration" with only a tithe of the power assumed by the former body, which had promulgated general and special regulations onerous to employers and even laid fines on corporations that were considered in error in their dealings with the workingman.

AUSTRALIA

MINERAL PRODUCTION of West Australia during 1916 was valued at £4,893,117; gold yield was 1,061,398 oz. valued at £4,508,532 ($21,415,627); coal production amounted to 301,626 tons valued at £117,893 ($702,159); balance made up of lead, silver, copper and tin.

The Market Report

Metal Markets

SILVER AND STERLING EXCHANGE

Sept.	Sterling Exchange	Silver New York, Cents	Silver London, Pence	Sept	Sterling Exchange	Silver New York, Cents	Silver London, Pence
20	4.7550	106½	54	24	4.7550	108½	55
21	4.7550	108½	55	25	4.7550	108½	55
22	4.7550	108½	55	26	4.7550	106½	54

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

DAILY PRICES OF METALS IN NEW YORK

Sept.	Copper Electrolytic	Tin Spot.	Lead N. Y.	Lead St. L.	Zinc St. L.
20	*26	61¼	7¾ @8	7.75 @7.90	8.00 @8.15
21	23½	61⅜	7⅞ @8	7.75 @7.90	8.00 @8.15
22	23½	61⅜	7⅞ @8	7.75 @7.90	8.00 @8.15
24	23½	62	7⅞ @8	7.75 @7.90	8⅛ @8¼
25	23½	62	8	7.80 @7.90	8⅛ @8¼
26	23½	62	8	7.80 @7.90	8⅛ @8¼

* Nominal.

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

The quotations for electrolytic copper are for cakes; ingots and wirebars. Beginning with Sept. 21, we quote the price fixed by the U. S. Government.

We quote electrolytic cathodes at 0.05 to 0.10c. below the price of wirebars, cakes and ingots.

Quotations for spelter are for ordinary Prime Western brands. We quote New York price at 17c. per 100 lb. above St. Louis.

Some current freight rates on metals per 100 lb. are: St. Louis-New York 17c.; St. Louis-Chicago, 6.3c.; St. Louis-Pittsburgh, 13.1 cents.

LONDON

Sept.	Copper Standard Spot	Copper Standard 3 Mos.	Copper Electrolytic	Tin Spot	Tin 3 Mos.	Lead Spot	Zinc Spot
20	120	119½	137	243	240½	30½	54
21	120	119½	137	244½	242	30½	54
22							
24	110	110	130	247½	244¾	30½	54
25	110	110	130	247	243	30½	54
26	110	110	130	245½	242½	30½	54

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2,240 lb. For convenience in comparison of London prices, in pounds sterling per 2,240 lb., with American prices in cents per pound the following approximate ratios are given, reckoning exchange at \$4.75½. £30½ = 6.474c.; £54 = 11.462c.; £120 = 25.473c.; £137 = 29.082c.; £240 = 50.946c. Variations, £1 = 0.212277c.

NEW YORK—Sept. 26

The all-absorbing topic this week has been the fixing of the prices for copper, iron ore, pig iron and steel products. The prices were generally satisfactory, but the conditions were a surprise, and have dazed the market in a way from which it has not yet recovered so as to see clearly.

Copper—On Thursday, Sept. 20, the market was in suspense, news from Washington being expected hourly, and no business was done, wherefore our quotation for that day is nominal. On Sept. 21 came the news of the fixing of the price of 23½c., f.o.b. New York, to take effect immediately. We have adopted the Government price for our daily quotation, beginning with Sept. 21 and hereafter until further notice. The subject is discussed fully elsewhere in this issue.

During this week, no business was done by producers. Consumers were anxious to obtain copper, but reported to us that they could not get anything from producers, though small supplies were offered to them by brokers at prices considerably higher than the Government price.

It is the opinion among producers that after the Government requirements are filled, and the orders of the Allies, there will remain for domestic consumers only a small part of what they will want. It is expected that there will be a priority board, comprising representatives of the Army and Navy Departments, together with the principal producers, that will sit in New York and determine how copper will be shipped and to whom.

At a meeting of the copper sales managers at India House on Sept. 25, the matter of introducing trade acceptances was discussed as a substitute for the present practice of selling to domestic consumers on terms of "delivered, 30 days" and waiting for the money. Leopold Fredrick, of the American Smelting and Refining Co., pointed out that the adoption of trade acceptances in the metal business would add many millions of dollars of trade acceptances to the circulation.

Copper Sheets are quoted at 35c. per lb. for hot rolled, and 1c. higher for cold rolled. Wire is quoted nominally at 31c. per lb., f.o.b. mill.

Tin—The market was very narrow and the business that was done was mostly in driblets. The total of transactions in spot tin was probably not over 300 tons, of spot and futures, together perhaps about 600 tons. At the close Straits tin was quoted at 62c. and Banka at 60c.

Lead—The last price named by the American Smelting and Refining Co. was 8c., New York, and was immediately shaded by other sellers, and this continued in the early days of this week, but inquiries swelled in volume as the week progressed, with the result that a rather large volume of business was done and a large part of it was at the full price of 8c. There were some large domestic inquiries in the market, but the bulk of the domestic business was represented by small lots, and prompt delivery generally was wanted. A considerable export business was done, there being sales both to Europe and South America. There are still sellers of lead for future delivery—October—November—at concessions below the present market. However, the fact that important business developed around 8c. lends color to the belief that the decline in lead has bottomed.

Zinc—The market was a shade stronger, but the volume of business continued to be small.

On Sept. 24, it was reported from Washington that a contract for 1000 tons of Grade B spelter had been awarded to the American Metal Co. at 10.67c. per lb. The respective bids were interesting, being as follows: American Zinc, Lead and Smelting Co., Eastern Zinc Refining Co., General Smelting Co., Kusa Spelter Co., Matthiessen & Hegeler Zinc Co., United Zinc Smelting Co. and United States Smelting Co., each offered to supply at 12c.; American Smelting and Refining Co., at 11.875; L. Vogelstein & Co. at 11.45, and Illinois Smelting and Refining Co. at 11.45c.; Trenton Smelting and Refining Co. at 11.3c.; Great Western Smelting and Refining Co. at 11.2c.; Beer, Sondheimer & Co. at 11c., and American Metal Co. at 10.67 cents.

Zinc Sheets—Price of zinc sheets has not been changed. Market is still at \$19 per 100 lb. f.o.b. Peru, Ill., less 8% discount.

Aluminum — This metal was slightly stronger. Quotations are still made at 42@43c. per lb. for small lots of No. 1 ingots, New York, but some dealers are holding for a higher price as miscellaneous stocks are light and inquiries are more numerous.

Antimony—The market was reported a little stronger, but producers are still holding aloof. We quote 15¼@15½c. for spot and 15¼@15½c. for futures, c.i.f., in bond.

Bismuth—Unchanged at \$3.50 per pound.

Cadmium—This metal is quoted at \$1.40@1.50 per pound.

Nickel—Steady at 50c. per lb., premium of 5c. per lb. for electrolytic.

Quicksilver—The market was apparently steady at \$110 but the quotation is more nominal than representative of actual business, and there were intimations that business might be done at concessions. San Francisco reports, by telegraph, \$110, market steady.

Gold, Silver and Platinum

Silver—Market reached the highest figure attained in the present rise, namely, 55d. in London and \$1.08½ per oz. in New York, but owing to lack of Eastern orders at the advance, some reaction has set in and business closes quiet with limited transactions.

Mexican dollars at New York: Sept. 19, 85c.; 20, 86c.; 21, 87c.; 22, 87c.; 24, 87c.; 25, 87c.

Platinum —Steady at \$103@105, with good business reported.

Palladium — We quote \$120@125 and considerable activity.

Zinc and Lead Ore Markets

Joplin, Mo., Sept. 22—Blende per ton, high, \$77.80; basis 60% Zn, premium \$75; medium to low, \$65; calamine, per ton 40% Zn, \$35@39; average selling price, all grades zinc, \$64.63 per ton.

Lead, high, \$83; basis 80% Pb, declined from \$90 to \$75.

Shipments the week: Blende, 8762 tons; calamine, 452 tons; lead, 765 tons. Value, all ores, the week, \$668,590.

Not a carload lot of lead concentrate was purchased this week, and the bulk of this mineral shipped was purchased on last week's price quotation. Buyers are taking from one-third to one-fourth less zinc ore than their midsummer average shipments. With some accumulated stocks buyers have been enabled to crowd medium grades to the level of low, with only \$60 bid today for low on next week's price making

Platteville, Wis., Sept. 22—Blende, basis 60% Zn, \$70 base for premium grade, down to \$65 base for medium grade. Lead ore, basis 80% Pb, \$80 per ton. Shipments reported for the week are 2903 tons of zinc ore, 35 tons of lead ore, and 424 tons of sulphur ore. For the year to date the figures are: 104,250 tons of zinc ore, 5016 tons of lead ore, and 20,440 tons of sulphur ore. Shipped during week to separating plants, 3891 tons of zinc ore.

Other Ores

Chrome Ore—Firm at 90c. per unit per net ton f.o.b. California, minimum 48% chromic oxide.

Manganese Ore—Unchanged at \$1 per unit on the basis of 48% manganese.

Molybdenum Ore — Unchanged at \$2.20 per lb. on the basis of 90% molybdenum sulphide.

Pyrites—Spanish lump quoted at 15½c. per unit on basis of 10s. ocean freight, buyer to pay war risk, excess freight and any duty. Ocean freights are 35s. for northern ports, 40s. for south Atlantic and 42s. 6d. for Gulf ports.

Tungsten Ore—A large business was done at unchanged prices, except that off-grade ores were salable more advantageously than a little while ago. We quote scheelite at \$26 and high-grade wolframite (65%) at \$23@25, while lower-grade ore (60%) might be quoted at \$20@22.

Iron Trade Review

NEW YORK—Sept. 26

Since the announcement on Monday of the prices agreed upon by the Government and leading steel producers the trade has been in utter confusion, says "Iron Age." Surprise that the prices were agreed upon rather than imposed by the Government was followed by excited efforts to get details which thus far are lacking, and meanwhile business practically stopped.

PITTSBURGH—Sept. 25

The whole steel-producing trade, with perhaps an exception here and there, is pleased that the long uncertainty as to prices has at last been ended, and by an arrangement that is regarded as equitable to all concerned. A meeting at which nearly all the steel production was represented was held at Washington, last Friday, and the manufacturers prepared a schedule of prices as follows: Iron ore, same as for the present season; pig iron, $33; bars, 2.90c.; shapes, 3c.; plates, 3.25c. This was given to the War Industries Board, which submitted it to President Wilson, who approved it Saturday afternoon and the formal announcement was made by the Committee on Public Information yesterday afternoon. The ore prices are based on $5.05 for Mesabi nonbessemer at Lake Erie dock. The $33 pig iron is basic, foundry and malleable at valley furnaces, other grades, and iron in other districts, to be worked out by a committee of the American Iron and Steel Institute and then submitted to Washington for approval. Prices for billets, sheet bars, sheets, pipe, wire, etc., are to be worked out in proper relation to the prices that have been fixed. All this will be relatively easy, now that a general price level has been set, for bars, shapes and plates constitute about one-half the total steel output.

The market will not at once become active as a result of this agreement, for there was no buying pressure. The mills are well sold and consumers are equally well covered. Mills will doubtless limit their sales until they have disposed of much of the tonnage now on the books. Not a great deal of this is at prices materially higher than those now fixed, as there is much old business and it was only in recent months that prices advanced to such extremely high points. Bars at 2.90c., shapes at 3c. and plates at 3.25c. will average about 3.10c., having regard to the respective tonnages and at the low point nearly three years ago they stood at 1.05c. as an open market quotation, while some sales were made at less, so that the new prices are approximately triple the lowest. In previous price advances these products did well to advance 40 to 60 per cent.

Pig Iron—To set a precedent, this morning, 1000 tons of basic iron was sold at the fixed price of $33, in return for 1000 tons of bessemer at the tentative price of $33.60, this being 10% higher, as the average spread of bessemer above basic has been about 10% in the past. Business in basic, foundry and malleable is permissible, the price being fixed at $33, valley, but the market has been stagnant and will likely remain so. Some consumers are caught with contracts at higher than $33, but some are always caught in a market decline, though not on as large a tonnage as this time. In other districts trading at precise prices will have to await the approval of a schedule fixing differentials between districts, in harmony with $33, valley.

Steel—It is probable that prices for billets and sheet bars will be submitted by a committee of the American Iron and Steel Institute for approval by the War Industries Board. The billet price will perhaps be on the familiar trade basis of 50% over pig iron, or say $50. Hitherto the spread of sheet bars above billets has not exceeded $1, except lately.

Ferroalloys

Ferromanganese—The market has continued very quiet, with prompt at not over $375 and fourth quarter at $350. It is possible the price will be regulated by agreement. Consumers clearly are indisposed to take hold at anything like present prices.

Coke

Connellsville—Selling of coke is illegal at above $6. Sales of a few spot carloads were made today at this figure, some of it being coke that was offered yesterday at $12.50 without finding takers. The differential for foundry coke is still to be worked out. In the last week there has been additional contracting for furnace coke for 1918 delivery, and on this movement between one-half and two-thirds of the merchant output of the region has been sold under contract, possibly more. The bulk of the business was done at flat prices, chiefly $8, $8.25 and $8.50, though a little went at under $8 and a little at $9, price depending largely on grade. Some business was done on a sliding-scale basis, 4½ or 5 tons of coke against one ton of basic iron, valley. The buying, at prices higher than expected to be fixed by the Government, was done in the expectation that good deliveries would be received when the open market was limited to a lower figure.

STOCK QUOTATIONS

N. Y. EXCH.†	Sept. 25
Alaska Gold M	4½
Alaska Juneau	3
Am Sm & Ref, com.	101
Am. Sm. & Ref., pf	107½
Am. Sm. Sec., pf. A	95
Am. Sm. Sec., pf. B.	‡93
Am. Zinc	18¼
Am. Zinc, pf	54
Anaconda	73
Batopilas Min	1½
Bethlehem Steel.	96½
Bethlehem Steel, pf.	91
Butte & Superior.	25½
Cerro de Pasco.	32½
Chile Cop	19
Chino	52¾
Colo. Fuel & Iron.	46½
Crucible Steel	74
Dome Mines	9½
Federal M. & S.	23
Federal M. & S., pf.	45¼
Great Nor., ore ctf.	35¾
Greene Cananea	43¾
Gulf States Steel	103
Homestake	102
Inspiration Con.	51¾
International Nickel	34¾
Kennecott	41¼
Lackawanna Steel	85½
Miami Copper	35
Nat'l Lead, com.	52
National Lead, pf.	104
Nev. Consol.	21½
Ontario Min	6½
Quicksilver	1¾
Quicksilver, pf.	1½
Ray Con	25½
Republic I. & S., com.	84
Republic I. & S., pf.	100½
Sloss-Sheffield.	47
Tennessee C. & C.	15½
U. S. Steel, com	112½
U. S. Steel, pf	117
Utah Copper	95½
Va. Iron C. & C.	60

N. Y. CURB†	Sept. 25
Big Ledge	1½
Butte & N. Y.	1½
Butte C. & Z.	9
Caledonia	.75
Calumet & Jerome	2⅛
Can. Cop. Corpn.	2½
Carlisle	4
Cashboy	.06½
Con. Ariz. Sm.	2⅛
Con. Coppermines	10
Con. Nev.-Utah	.12½
Emma Con	½
First Nat. Cop.	2¾
Goldfield Con.	.38
Goldfield Merger	.05
Greenmonster	½
Hecla Min	8¾
Howe Sound	5½
Jerome Verde	1½
Kerr Lake	6¼
Louisiana	.87½
Magma	52
Majestic	.38
McKinley-Dar-Sa.	.69
Milford	1¾
Mohican	½
Mother Lode	.38
N. Y. & Hond	13½
Nipissing Mines	9½
Ohio Cop	1⅛
Ray Hercules	3¾
Richmond	½
Rochester Mines	.52
St. Joseph Lead	18
Standard S. L.	1½
Stewart	⅛
Success	.20
Tonopah	6½
Tonopah Ex	2⅛
Tribullion	.15
Troy Arizona	.16
United Cop	.75
United Verde Ext.	36½
United Zinc	4
Utica Mines	.25
White Knob, pf.	‡1½
Yukon Gold	2

SAN FRAN.*	Sept. 25
Alta	.04
Andes	.12
Best & Belcher	.03
Bullion	.02
Caledonia	.10
Challenge Con.	.01
Confidence	.05
Con. Virginia	.20
Gould & Curry	.01
Hale & Norcross	.03
Jacket-Cr. Pt.	.08
Mexican	.09
Occidental	.60
Ophir	.09
Overman	.05
Savage	.03
Seg. Belcher	.02
Sierra Nevada	.18
Union Con	.65
Utah Con	.01
Belmont	4 37½
Jim Butler	.91
MacNamara	.22
Midway	.12
Mont.-Tonopah	.19
North Star	.09
Rescue Eula	.18
West End Con.	.71
Atlanta	.09
Booth	.05
Comb. Frac	.03
D'field Daisy	.03
Florence	.10
Jumbo Extension	.10
Kewanas	.09
Nevada Hills	.12
Nevada Packard	.23
Round Mountain	.25
Silver Pick	.08
White Caps	1 45
Big Jim	‡ 69
United Eastern	4 20

BOSTON EXCH.*	Sept. 25
Adventure	1¾
Ahmeek	97
Algomah	.45
Allouez	63
Ariz. Com., ctfs.	11
Arnold	.25
Bonanza	.21
Butte-Balaklava	.40
Calumet & Ariz.	78
Calumet & Hecla	530
Centennial	16
Copper Range	56½
Daly West	2½
Davis-Daly	4¾
East Butte	11½
Franklin	6
Granby	80
Hancock	13
Hedley	‡17
Helvetia	.25
Indiana	1½
Isle Royale	31
Keweenaw	1½
Lake	10
La Salle	3
Mason Valley	6½
Mass	10½
Mayflower	1¾
Michigan	1¾
Mohawk	82½
New Arcadian	3
New Idria	12
North Butte	16½
North Lake	.95
Ojibway	1½
Old Dominion	48½
Osceola	88
Quincy	83
St. Mary's M. L.	70
Santa Fe	1⅛
Seneca	7
Shannon	7
Shattuck-Ariz.	24
So. Lake	3
So. Utah	.15
Superior	7½
Superior & Bost.	3¾
Trinity	5½
Tuolumne	1½
U. S. Smelting	65
U. S. Smelt'g, pf.	49½
Utah Apex	3½
Utah Con	15
Utah Metal	3½
Victoria	3½
Winona	2½
Wolverine	41
Wyandot	.80

BOSTON CURB*	Sept. 25
Alaska Mines Corp	.37
Bingham Mines	11½
Boston Ely	.50
Boston & Mont.	.64
Butte & Lon'n Dev	.13
Calaveras	2½
Calumet-Corbin	.01
Chief Con	2½
Cortez	.10
Crown Reserve	.26
Crystal Cop	.80
Eagle & Blue Bell	2½
Houghton Copper	.75
Intermountain	1¾
Iron Cap, Com.	17½
Iron Cap Cop., pf.	17½
Mexican Metals	.26
Mines of America	1½
Mojave Tungsten	.44
Nat. Zinc & Lead	.40
Nevada-Douglas	1½
New Baltic	1¾
New Cornelia	16½
Oneco	.35
Pacific Mines	.35
Rex Cons	.15

SALT LAKE*	Sept. 24
Bannack	.26
Big Four	.00½
Cardiff	4 00
Colorado Mining	.15
Daly	1 70
Daly-Judge	8 45
Empire Copper	1 27½
Gold Chain	.16
Grand Central	.52
Iron Blossom	.89
Lower Mammoth	.03
May Day	.04½
Moscow	.11
Prince Con	.98
Silver-King Coal'n	3 15
Silver King Con.	4 20
Sioux Con.	.06
So. Hecla	.97½
Tintic Standard	1 47½
Uncle Sam	.04
Wilbert	.27
Yankee	.06½

TORONTO*	Sept. 24
Bailey	.05
Beaver Con	.40
Buffalo Mines	‡1 00
Chambers Ferland	.15
Coniagas	3 80
Hargraves	.14
La Rose	.62½
Peterson Lake	.11½
Right of Way	‡ 05
Temiskaming	.35
Wettlaufer-Lor.	.07
Dome Exten	.15
Dome Lake	.14
Foley O'Brien	‡ 60
Hollinger	5 10
McIntyre	1 16
Newray	.70
Porcu. Crown.	.40
Schumacher	‡ 42
Teck Hughes	.40
Vipond	.26
West Dome	.17

STOCK QUOTATIONS—Continued

COLO. SPRINGS	Sept. 25
Cresson Con.	5.62½
Doctor Jack Pot.	.04½
Elkton Con.	.04½
El Paso	.20
Gold Sovereign	.03¾
Golden Cycle	1 99
Granite	.44
Isabella	.08½
Mary McKinney	.07½
Portland	1 41
United Gold M	.16¾
Vindicator	.68

LONDON	Sept. 10		
Alaska Mexican	£0	5s	0d
Alaska Tre'dwell	1	0	0
Burma Corp.	3	19	4½
Cam & Motor	0	11	0
Camp Bird	0	8	0
El Oro.	0	11	0
Esperanza.	0	10	6
Mexican Mines.	6	0	0
Nechi, pfd.	0	13	3
Oroville	0	17	0
Santa Gert'dis.	0	12	0
Tomboy	0	18	0

* Bid prices. † Closing prices. ‡ Last Quotations.

MONTHLY AVERAGE PRICES OF METALS

Silver	New York			London		
	1915	1916	1917	1915	1916	1917
January	48 855	56.775	75.630	22.731	26.960	36 682
February	48 477	56.755	77.585	22.753	26.975	37.742
March	50 241	57.935	73.861	23.708	27.597	36 410
April	50 250	64 415	73.875	23.709	30.662	36 963
May	49 915	74 269	74 745	23.570	35.477	37 940
June	49 034	65 024	76 971	23 267	31 060	39 065
July	47 519	62 940	79 010	22 597	30 000	40.110
August	47.163	66 083	85 407	22 780	31.498	43.418
September	48 680	68 515		23.591	32.584	......
October	49 385	67.855	.	23.925	32.361	
November	51 714	71.604	...	25.094	34 192	.
December	54 971	75.765		26.373	36 410	
Year	49 684	65.661		23 675	31 315	

New York quotations cents per ounce troy, fine silver London, pence per ounce, sterling silver, 0.925 fine.

Copper	New York		London			
	Electrolytic		Standard		Electrolytic	
	1916	1917	1916	1917	1916	1917
Jan.	24.008	28.673	88.083	131 921	116 167	142 895
Feb.	26.440	31.750	102.667	137 895	133 167	148 100
Mar.	26.310	31.481	107 714	136 750	136 000	151 000
April	27.895	27.935	124 319	133 842	137 389	147 158
May	28.625	28.788	135 457	130.000	152 522	142 000
June	26 601	29 962	112 432	130.000	137 455	142 000
July	23.865	26.620	95 119	128 409	125 500	140 409
Aug.	26.120	25 380	110 283	122 391	126 304	137 000
Sept.	26.855	......	113 905	.	134 071	.
Oct.	27.193	......	122.750	... .	142 523	
Nov.	30.625	....	134 659	....	155 432	
Dec.	31.890	......	145 316	. ... .	162 842	.
Year	27 202	... .	116.059	.	138 281	.

Tin	New York		London	
	1916	1917	1916	1917
January	41 825	44 175	175 548	185 813
February	42 717	51 420	181 107	198 074
March	50 741	54 388	193 609	207 443
April	51 230	55 910	199 736	220 171
May	49 125	63 173	196 511	245 114
June	42 231	62 053	179 466	242 083
July	38 510	62 570	168 357	242 181
August	38 565	62 681	169 870	243 978
September	38 830	...	171 345	
October	41 241	.	179 307	
November	44 109	..	186 932	
December	42 635		183 368	
Av. year	43 480	...	182 096	

Lead	New York		St. Louis		London	
	1916	1917	1916	1917	1916	1917
January	5 921	7.626	5.826	7 530	31 167	30 500
February	6.246	8.636	6.164	8 595	31 988	30 500
March	7 136	9.199	7.375	9 120	34 440	30 500
April	7 630	9 288	7 655	9 158	34 368	30 500
May	7 463	10 207	7 332	10 202	32 967	30 500
June	6 936	11.171	6 749	11 123	31 011	30 500
July	6 352	10 710	6 185	10 644	28 137	30 500
August	6 244	10 594	6 088	10.518	29 734	30 500
September	6 810	.	6 699		30 786	
October	7 000	.	6 898	.. .	30 716	..
November	7 042	. .	6 945	... .	30.500	.
December	7 513	.	7 405	......	30.500	..
Year	6 853		6 777		31 359	

Spelter	New York		St. Louis		London	
	1916	1917	1916	1917	1916	1917
Jan	16 015	9 619	16 745	9 449	89 810	48 329
Feb	18 420	10 045	18 260	9 875	97 762	47 000
Mar	16 846	10 300	16 676	10 130	95 048	47 000
April	16 695	9 459	16 525	9 289	99 056	54 63[illegible]
May	14 276	9 362	14 106	9 192	94.217	54 000
June	11 752	9 371	11 582	9 201	68 591	54 000
July	8 925	8 643	8 755	8 473	50.750	54 000
Aug	8 730	8 360	8 560	8 190	51 587	54 000
Sept	8 990		8 820	.	52.095	
Oct	9 829		9 659		54 159	
Nov	11 592		11 422		56 024	
Dec	10 665		10 495		55 842	
Year	12 804		12 634		72 071	

New York and St. Louis quotations, cents per pound, London, pounds sterling per long ton.

Pig Iron, Pitts.	Bessemer‡		Basic‡		No. 2 Foundry	
	1916	1917	1916	1917	1916	1917
January	$21 60	$35 95	$18 78	$30 95	$19 70	$30 95
February	21.16	36 37	18 91	30 95	19 51	30 95
March	21 81	37 37	19 20	33 49	19 45	35 01
April	21 63	42 23	18 95	38 90	19 45	40 06
May	21 78	46 94	19 11	42 84	19 58	43 60
June	21 95	54 22	18 95	50 05	19 34	50 14
July	21 95	57 45	18 95	53 80	19 20	53 95
August	21 95	54 17	18 95	50 37	19 22	53 95
September	22 88		19 58		19 53	
October	21 61	...	21 26		21 51	
November	30 07	.	28 18		26 55	.
December	35 16	.	30 95		30 79	
Year	$23 88		$20 98		$21 15	

‡ As reported by W. P. Snyder & Co.

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Present Milling Practice of the Joplin District

By TEMPLE CHAPMAN
Mine Operator, Joplin, Mo.

Ore usually crushed to only ½ inch, but middlings and slimes now receive attention. Some mines have flotation plants. Tendency is toward large plants capable of producing 400 to 600 tons concentrates per week. Power equipments are more efficient and gas or oil engines are being introduced.

THOSE who have been conversant for many years with the Joplin district will probably agree that the modern concentrating plant shows few radical changes from the little mill of 15 years ago, but it does show the effect of steady growth and betterment in every detail of plant construction, milling equipment and power installation.

AN UP-TO-DATE MILLING PLANT IN THE JOPLIN DISTRICT, MISSOURI

Power plants formerly consisted of low-pressure boilers and slide-valve engines. Today there are three types of power in common use. The steam plant, with its high-pressure boilers and Corliss engines and condensers, is preferred by some for its combined dependability and economy. In some instances the kind of power is determined by force of circumstances, situation of mine or time of delivery of certain kinds of machinery, but generally, the builder of a new mill is offered a choice of power.

Many new mills are electrically equipped throughout, notably those of the Picher Lead Co. in Oklahoma. Power is obtained at moderate cost (about 1c. per horsepower-hour) from the Empire District Electric Co. This company has several splendid new power stations which include 20,000 hp. in water power and as much more in a modern steam-turbine plant.

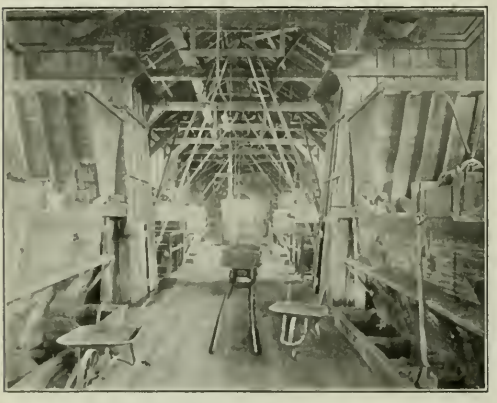
With abundance of natural gas the gas engine produces exceedingly cheap power and has become a general favorite. It is used to drive mills, air compressors and pumps. Several companies, notably those controlled by L. C. Church in the Miami camp, use gas engines, and compressed air from gas-engine-driven compressors is carried to distant shafts for hoisting, pumping, etc. The gas-engine plant undoubtedly shows the lowest power costs. Several oil engines of the Fairbanks-Morse Y type are being introduced and their successful operation and low operating cost indicate that they will compete successfully with the gas engine. The selection of an oil engine or gas engine at any given mine will probably be determined by the relative proximity of a gas main or a railway spur on which to set an oil tank car.

The Joplin district is fortunate in its ample and varied sources of supply of cheap power—coal, oil, gas and electricity—and all of these cost less than they do in most mining or manufacturing districts. The great growth of the mining industry here and the increasing demand for all kinds of power, with generally mounting war costs, will probably make all kinds of power cost more next winter than they cost today.

The design of a concentrating plant in Joplin is based primarily upon the local need of crushing ore to only

½-in. size and then treating this low-grade, free-milling ore on jigs. The gradual increase in tonnage treated has made the middlings and slimes of more importance than formerly and, consequently, more jigs and more tables have been installed. The newer mills, especially in the Oklahoma part of the district, have two rougher jigs, two cleaner jigs and a sand jig and from 10 to 20 tables of the Wilfley type. Even with this better equipment it is found that much valuable mineral escapes in the fines, and now Dorr thickeners are frequently seen and several of the bigger mines have flotation plants in successful operation. The percentage of recovery varies with the richness of the ore, and, whereas the lean sheet-ground mine with a content of 2% metallic zinc will recover 70%, the richer mines obtain a recovery of 80% in some instances.

A point that has a bearing with local operators is that often shafts may be sunk and a mill of medium capacity built so quickly that it would be in full operation within six months from the date of discovery of the ore, and in six months more would have earned 100% on the investment. Against this desire for a cheap mill and quick profits is the safer and more business-like plan, now in vogue, of thoroughly drilling the orebody with dozens of holes and then building a good, substantial, power-, labor- and ore-saving mill capable of treating a large tonnage and treating it well. One practical result of building the bigger and better mills and the practice of developing sufficient ore to supply the mill from several shafts has been the increase in output from the 30 to 40 tons of zinc concentrates per week per mill to the 400 to 600 tons per week now made by the best mills. Zinc-lead prices are averaging about $90 per ton, and thus a property costing inside of $100,000 to develop and equip may produce concentrates of that value in one month. However, it must be admitted that these bonanza mines are only three or four in number, this illustration of earnings being meant to show that the better mining and milling practice is bringing its just reward in vastly bigger earnings.



VIEW OF JIG FLOOR IN A JOPLIN MILL

The large profits being earned by the mines in the Oklahoma portion of the Joplin district are drawing able mining and mill men from other mining regions. These men are building big mills but are making no radical changes in construction or operation; like the local mill men, they are making only such modifications and improvements as the conditions of each mine may warrant. The friendly personal acquaintance which exists among Joplin mining men, developed to a great extent at the weekly meetings of the mine operators' association, facilitates the rapid dissemination through the whole district of any successful new idea in mine or mill practice, sanitation, etc. It seems reasonable to predict that the great growth in the mineral output of the Joplin district will be a powerful influence toward further improvement in the milling practice.

The Indian Silver Trade

The course of the silver trade of India for three fiscal years ended Mar. 31 is reported as below in ounces:

	1914–15	1915–16	1916–17
Net imports, private	60,017,453	35,629,915	
Net exports, private			11,496,760
Net imports, government			104,069,101
Net exports, government	4,251,329	3,697,540	
Total net imports	55,766,124	31,932,375	92,572,341

On these figures Messrs. Samuel Montagu & Co., of London, comment as follows: "The figures are of more than ordinary interest, revealing a remarkable reversal in the movements of silver on private account, by which a net influx of over 60,000,000 oz. during the period 1914-15 has been turned into a net export of over 11,000,000 oz., a net difference of over 71,000,000 oz. This reduction is an emphatic rejoinder on the part of the Indian Bazaars to the advance of 50% which has taken place in the price of the metal.

"Further, it will be observed that there was a large net export on government account in the first two periods, while in the last financial year there was a net import of over 104,000,000 oz. on government account. That is to say, the Indian government imported within the last financial year an amount probably well in excess of half the world's production. When it is recalled that this huge import took place mainly in the latter portion of the year 1916-17, its extraordinary character is emphasized."

Temperature Measurement

In an article entitled "Temperature Measurements in Clay Works Practice," appearing in the "Transactions of the Ceramics Society," 1916 (abstracted by the *Journal* of the Society of Chemical Industry), the author recommends the following for measuring temperatures between the ranges given: For 50°–450° C., a mercury thermometer filled with nitrogen under pressure; for 450°–1400° C., a thermocouple of platinum and platinum-rhodium with recorder; above 1400° C., a Féry radiation pyrometer or an optical pyrometer, depending on the brightness of a lamp filament altering with varying resistance.

To control heating where the effect of time, temperature and kiln atmosphere must be indicated, Watkins recorders, Seger cones, Holdcroft thermoscopes, Wedgwood's pyrometer and Buller's rings are used. Seger cones are preferably replaced by a larger wedge made of the same material, the top of the wedge being half the size of the bottom.

Ideal Shop For Sharpening Drill Steel

BY GEORGE H. GILMAN*

Further reduction in drilling costs through improvement in design of the highly perfected rock drill does not promise strides equal to those of the past. Such results are henceforth to be sought at the mine—rather than at the factory—by the application of the principles of modern shop efficiency. An ideal shop, capable of extension and embracing the best features of American practice, is described. The procedure for making new drill steel and for the upkeep of old steel is also outlined.

DURING the last decade the machine drill as applied to the excavation of rock has been in a state of transition from the cumbersome reciprocating engine to the light pneumatic hammer drill, with the result that machine efficiency has been raised to a point hoped for by only the most optimistic miners of 10 years ago. This great change, largely the result of coöperation between the miner and the rock-drill manufacturer, has been consummated, and for the next few years it is reasonable to assume that, with the object of raising the drilling efficiency of the mine or quarry to correspond, the main lines of development will be in the direction of means and methods for taking full advantage of the hammer drill in its present state—instead of mechanical changes applied to the actuating engine.

The rock-drill manufacturer is constantly striving not only to improve the metallurgy of the drill materials in the effort to secure maximum machine effectiveness and efficiency with minimum weight but also to take full advantage of all improvements in manufacturing methods, thus insuring absolute duplication of parts in regard to their chemical and physical properties, interchangeability and, in addition, the field service that he must render users.

The question that confronts the mine operators is: "Can we stand this new type of progress with its incidental increase in the cost of machine equipment unless we likewise enter upon the program of this new development and take full advantage of it?" The answer is obviously in evidence, for no progressive, right-minded man is harboring the thought of reverting back to hand-drilling methods of the good old days, but instead he is striving to develop all the divisions of his mine to conform with present-day facilities.

The rock-drill bit has been justly termed "the business end of rock excavation" and it is therefore the logical starting point in the campaign to improve drilling efficiency. The importance of the size and quality of the drill steel and of the shape and temper of its bit and shank ends has been emphasized. The purpose, therefore, of this paper is to advance suggestions relative to an efficient method and satisfactory means for the production and upkeep of rock-drill steel.

Fortunately in the mining industry the old-time practice of maintaining secrecy regarding methods and means of production has been broken down, and today a stronger spirit of coöperation exists among mining men than among many operators of kindred industries. This has resulted in knowledge and resources being pooled for the common good. The suggestions advanced in this paper have been gained only as the result of a personal investigation of a great variety of conditions in different sections of the country, made possible by the coöperation of a great many mining companies.

The selection of the best form of equipment to meet a given set of conditions is dependent upon a number of factors, and the extent to which it is profitable to go, in providing facilities for a drill-steel equipment, is largely governed by the volume of material to be handled, which may be determined by the number of rock-drilling machines employed and the character of the ground. In general, it may be assumed that for a mine or other permanent rock-excavating plant of sufficient capacity to warrant the installation of a mechanical drill-sharpening machine a drill-steel plant equipped with the facilities herein described and possessing the following qualifications is warranted.

PRIMARY REQUIREMENTS OF A SHARPENING PLANT

Primarily a drill-steel plant having one mechanical sharpener should be designed so that the output of the smith and his helper may be doubled by the addition of two men, without any increase in the original shop equipment being necessary, and to provide for possible growth, it should be so constructed that by adding space and certain features of equipment to one end only of the building the capacity may be increased further at slight expense without making any change in the original equipment; that the various operations required to make the drill steel and to reforge and temper used steel are performed with the fewest possible movements and with the least amount of exertion on the part of the operator; and that the character of the work when executed conforms with the established standard for the existing conditions.

To secure these results the building should be of such size that the various machines and their appurtenances may be placed in the most advantageous position. It should be built of materials that are accessible and in conformity with the standard surface equipment of the mine. It should be lighted in such a manner that the piece being worked upon and the operating end of the machine employed are clearly visible to the operator, so that his vision of the parts is not obstructed by shadows; in addition, to meet the requirements of a shop of the size and type herein described, certain features of equipment are recommended in Table I.

In order to obtain maximum efficiency in a drill-steel plant it is essential that the transportation of the drill steel be accomplished expeditiously and with a minimum effort, for, regardless of how suitable the mechanical equipment may be, it is impossible to secure and maintain maximum production from the machines and furnaces if a suitable means of transportation conforming to the requirements of the plant is not provided.

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To meet the requirements of the type of plant described in this paper it is recommended that the shop, Fig. 1, be equipped with a permanent track and turntable the gage of which corresponds to the standard gage of the mine or quarry tracks, provided such gage does not exceed 36 in. For transporting the drill steel to and from the shaft, or loading platform, a division car of the Copper Queen type, Fig. 2, described in the *Engineering and Mining Journal*, June 24, 1916, will be found to meet the requirements satisfactorily. This car may be equipped with a body detachable from the truck to facilitate the work of transferring the drill steel to the mine skip, cage or wagon without removing the bars from the receptacle, or it may be employed for the purpose intact, and in the case of the mine the whole may be lowered to the different levels where the distribution of the steel may be made in conformity with standard practice. Of the many forms of carriages or trucks employed for the transportation of the drill steel while it is in the transition stage during the process of working, that developed by the Copper Queen Consolidated Mining Co., and described in the article referred to, is perhaps best adapted for a drill-steel plant of this general type.

TABLE 1.

EQUIPMENT FOR DRILL-STEEL SHOP

Transportation
106 Ft. of 24-in. gage track (rail 35 lb. per yd.) comprising 36 wood ties 4 x 6 x 36 in.
4 Mine-car turntables—24-in. gage
1 Turn plate (if required)
3 Compartment cars with revolving body (Copper Queen type)
3 Division cars with detachable body (Copper Queen type)

Furnace
1 Forging furnace (oil or gas burner)
1 Tempering furnace (oil or gas burner)
2 Drill-steel supports for furnaces
2 Ventilators with hoods for furnaces
1 Oil storage tank
1-in. pipe with fittings for low-pressure air supply
½-in. pipe with fittings for fuel supply.
2 Pyrometers, equipped with base metal couples having indicating voltmeter and cabinet
¾-in. electrical-conduit piping (for pyrometers)
2 Pyrene fire extinguishers

Sharpener
1 Drill sharpener with full equipment of dies and dollies including supplementary gaging dies and pneumatic-hammer punch
1¼-in. pipe with fittings for compressed-air supply
1 Storage cabinet for drill-sharpener appurtenances
2 Suspended drill-steel supports (for sharpener and grinder)
1 Floor grinder (direct electric-driven) with two grinding wheels 18 x 3 in.
1 Electric switchboard for motor

Tempering
1 Rotary quenching and tempering machine (Homestake type), with 1-hp. motor
1 Electric switchboard for tempering-machine motor
1 Oil-quenching tank with cyanide receptacle.
1 Ventilator with hood for cyanide receptacle
Racks, Tables and Accessories
1 Inspection and bundling rack with incline, equipped with one gage cabinet
1 Storage rack for drill-steel bar stock
1 Storage rack for finished drill steel
1 Used steel table

Sanitary Equipment
1 Sanitary drinking fountain
4 Steel double-deck lockers.
2 Wash basins
1 Sanitary towel rack.
1 Urinal
1 Flush bowl
1 Emergency cabinet

General Equipment
1 Work bench equipped with 5-in. machinist's vise
1 Desk with drawers and hinged top
1 300-lb anvil
1 Set of hand chisels and sledges
2 500-watt Mazda lamps with reflectors
1 60-watt Mazda lamp with reflector
Water piping
Compressed-air piping and hose equipped with Davies blowgun
Waste piping
Oil piping
Electric wiring
Concrete floor

The compartment car, Fig. 3, consists of a truck having the wheel gage corresponding to the track standard, on which is mounted a revolvable compartment body supported by a ball bearing and equipped with a latch for locking the body with relation to the truck in any desired position. This car is employed for transporting the steel from the sorting table and the oil-quenching tank to the heating forges. In it the various lengths of steel are segregated and by virtue of the revolvable body the insertion and removal of the drill steel is accomplished advantageously. Subsequent to the final heating of the bit the steel is transported mechanically by the tempering machine and deposited upon the inspection rack, Fig. 4, whence it is loaded into the division car and transported from the shop.

The four turntables with which the track system is equipped provide means for the cars to be bypassed at any point except the dead end and, by having the main line extend through the building longitudinally, a convenient means is provided whereby the track system of the shop may be in intercommunication with the yard system and the other departments of the mine plant. At the outside of the building adjacent to the main entry a turn plate is provided, composed of boiler plate ⅜ in. thick, to facilitate the switching of the cars to and from a series of tracks from the yard system which may terminate at the outer edge of the plate.

Heating Furnaces for Forging and Tempering

The heating of rock-drill steel preparatory to forging and tempering the bit and shank end is an engineering problem and it must be considered as such if maximum efficiency is to be obtained. The success of the furnaces employed depends upon the type and the method adopted for their operation. In order to perform their function in the most uniform and economical manner they must be constructed according to scientific principles in which the following considerations serve as a basis:

1. Size and shape of the drill steel to be treated.
2. Quantity of drill steel to be treated during a specified time.
3. Temperature required to insure proper results, and means for its regulation and maintenance.
4. Local conditions.
5. Most convenient and economical cycle of operations.

Gas as fuel is recommended where it is available at low cost but as oil is of necessity adopted in a large majority of mining camps in this country, the employment of either as a heating agent will apply to the type of furnace described herein. For present-day requirements of the average mine or quarry, situated in many instances in remote and inaccessible places, where the carrying of a varied stock of refractory material is not only difficult but also expensive, simplicity of furnace design with special regard to repairs should be considered primarily. With this in view the refractory material used in the construction of a furnace should be composed solely of standard-size firebrick, procurable in almost every local market, and it should be assembled in such a manner as to enable any blacksmith to repair or rebuild it with ease and success.

The heating chamber of the furnace should preferably be of such size and shape, and its burner so positioned, that the steel is heated by reflection or radiation rather than by direct impingement of the flame on the metal. This will prevent blistering and reduce the formation of excessive scale which is likely to result if the flame is caused to play directly on the metal. The heating chamber should be of such size as to absorb economically the heat of the products of combustion.

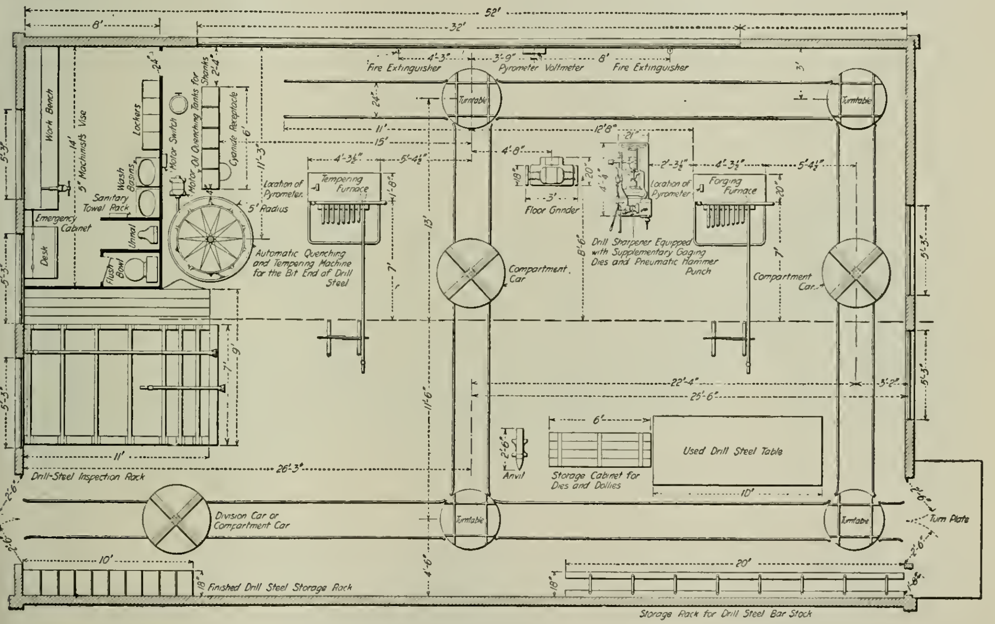

FIG. 1. FLOOR PLAN OF IDEAL SHOP FOR SHARPENING STEEL

A certain amount of flexibility that may be taken advantage of by an untrained operator is desirable, inasmuch as the character of the flame required for heating, to the best advantage, standard types of ⅞-in. hexagon and 1¼-in. round hollow steel will vary with the size of the bit and the shape of the drill shank; and, in the case of the lugs or collars on the shank, will require only the heating of that portion to be upset, without affecting the extreme end of the bar, and thus obviate the necessity of cooling the tip before it is inserted in the dies of the drill sharpener. This flexibility may be secured by employing a burner of such construction that a perfectly round or fan-shaped flame is produced at will by the operator by merely adjusting a thumbscrew. Another desirable feature of such a furnace is to have at the end of the chamber from which the drill steel is withdrawn a maximum heat zone of constant and uniform temperature, from which the temperature is lowered gradually but to an appreciable degree toward the end opposite where the steel is inserted. This will give the steel time to absorb the heat gradually, and will secure uniformity in the opening of the grain as the steel bars are handled in rotation.

It has been determined by experiment that the time period of 4 min. is desirable for heating the larger sizes of bits formed on the 1¼-in. round hollow drill steel and in order to insure an output of one steel every 30 sec. from the forging furnace, the mouth or opening for the insertion of the steel should be 2 ft. 6 in. long with a height of 3½ in. Pyrometer readings should be taken from that part of the furnace directly adjacent the drill steel at the point of withdrawal.

If desirable, the low-pressure air supply for the furnace may be secured from the main high-pressure air supply of the mine or quarry, in which case a pressure-reducing valve should be used to secure a terminal pressure of approximately 15 lb. below the lowest fluctuation of the main-line pressure. This reducing valve may be placed in the wall adjacent to the point at which air enters the building from which a supplementary low-pressure air duct is provided for the two furnaces, as shown in Fig. 1A.

To obtain the best results from any type of burner in point of economy and ease of operation it is of prime importance to have both the oil and the atomizing agent as constant and steady as possible. After passing through the pressure-reducing valve it is desirable to have the air for the furnace supply pass through a pipe mounted directly over and running lengthwise with the mouth of the furnace. In this pipe provision may be made by drilling a series of small holes directed downward—for the escape of a part of the air which will serve the double function of preventing the waste gases from flowing out in the face of the operator—and assisting in keeping cool that section of the drill-steel bar that projects from the furnace. After passing along the mouth of the furnace the air should preferably make two three-quarter circuits on the top of the brickwork, but inside of the cast-iron casing, for preheating it, preparatory to admission to the burner. Fig. 5 shows a furnace constructed along these lines.

The drill-steel support shown by Fig. 6 provides a simple, rugged and convenient means for supporting the drill steel during the heating operation. Constructed from flat bars of ½ x 2-in. low-carbon machinery steel or wrought iron it may be made by any blacksmith with an ordinary forge-shop equipment.

THE DRILL STEEL SHARPENING MACHINE

By far the most essential requisite of a drill-steel plant is the machine for forging the bit and shank ends of the drill steel. There are few apparently unimportant items of expense that are likely to assume more serious proportions than the wasting of time by men, caused by failure of the machine to produce the finished product in a condition that meets the requirements of the plant. Correct sizing and shaping of rock-drill steel are equally as essential to efficient mining as the efficiency of the drill itself and, therefore, a machine sharpener that conforms with these requirements and in addition produces the bit and shank end in the best possible condition to be tempered should be adopted.

It is a well-known fact that the "standing-up" quality of a piece of steel when forged to a finished shape by hammering, under light rapid percussive blows, is superior to that secured by any other known method. For this reason a drill sharpening machine answering this requirement is desirable. It should be equipped with means supplementary to the main forging dies for gaging the various sizes of bits mechanically, within close limits, and for punching out the axial hole of the steel at both the bit and shank ends. In construction it should be strong enough to withstand without undue wear or breakage the severe service to which it is subjected and all control levers should be interlocked in order to insure the various operations being performed in proper sequence and with a minimum of danger both with respect to the operator and the piece being worked upon.

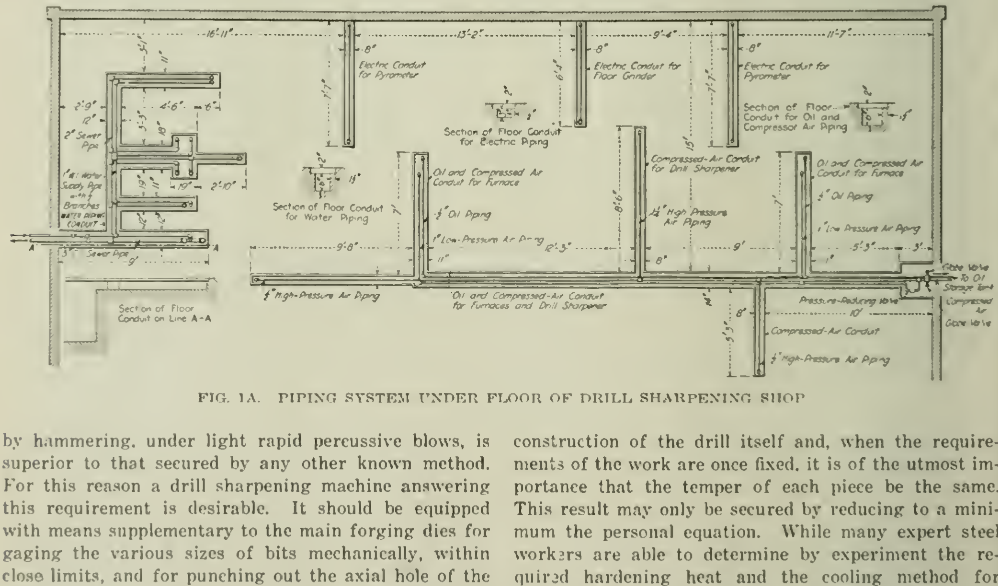
16'-11"
13'-2"
9'-4"
11'-7"
5'-1"
11"
-8"
Electric Conduit for Pyrometer
7'-7"
2'-9"
12"
4'-6"
6"
3'-3"
18"
2" Sewer Pipe
1" Water Supply Pipe with Branches
Water Piping Conduit
19"
2'-10"
12"
A
3"
Sewer Pipe
9'
Section of Floor Conduit on Line A-A
Section of Floor Conduit for Water Piping
Section of Floor Conduit for Electric Piping
9'-8"
½" High-Pressure Air Piping
Oil and Compressed Air Conduit for Furnace
½" Oil Piping
1" Low-Pressure Air Piping
11"
12'-3"
Oil and Compressed-Air Conduit for Furnaces and Drill Sharpener
6'-4"
Electric Conduit for Floor Grinder
7'-7"
15'
Electric Conduit for Pyrometer
Section of Floor Conduit for Oil and Compressor Air Piping
Compressed-Air Conduit for Drill Sharpener
8'-6"
1½" High Pressure Air Piping
8"
9'
7'
Oil and Compressed Air Conduit for Furnace
½" Oil Piping
1" Low Pressure Air Piping
5'-3"
3'
1'
Gate Valve
To Oil Storage Tank
Compressed Air
Gate Valve
Pressure-Reducing Valve
10'
8"
5'-3"
Compressed-Air Conduit
½" High-Pressure Air Piping

FIG. 1A. PIPING SYSTEM UNDER FLOOR OF DRILL SHARPENING SHOP

For the storage of dies, dollies and other drill-sharpener appurtenances the cabinet shown by Fig. 7 will answer the requirements satisfactorily. Placed at a convenient distance with respect to the drill sharpener and between the used-drill-steel table and the anvil, the heights of which correspond, it serves also as a support for the drill-steel bar stock when being cut to proper length preparatory to forging and also as a straightening bed for bent steel by virtue of the three bars of iron rail with which the top of the cabinet is equipped.

A floor grinder, preferably direct-motor-driven and equipped with two 18 x 3-in. corundum or carborundum wheels, should be placed at the left of the drill sharpener where it will be readily accessible to the operator. The function of the wheel adjacent to the sharpener is that of squaring off the ends and redressing drill shanks, while the wheel opposite, which should be preferably of somewhat finer grain, may be employed for refacing dies and dollies and other general grinding. The speed of the grinder when driven by a 5-hp. motor should be 1150 r.p.m. When grinding drill shanks the steel may be supported by a hook suspended from an overhead trolley having its track mounted in alignment with the grinder wheel and at right angles to the grinder shaft. Such a support is described in the *Journal* of Feb. 10, 1917, by James E. O'Rourke[1].

The heat treatment of rock-drill steel is a factor which determines success, as applied to the excavation of rock, to as great a degree as the heat treatment that is accorded the various parts that enter into the construction of the drill itself and, when the requirements of the work are once fixed, it is of the utmost importance that the temper of each piece be the same. This result may only be secured by reducing to a minimum the personal equation. While many expert steel workers are able to determine by experiment the required hardening heat and the cooling method for steel of various chemical compositions, the human potential is influenced by the physical condition of the man, and in order to carry the operation of tempering beyond the point of human influence, machinery must be employed as a substitute.

For the requirements of a drill-steel plant of the size and type described herein, the tempering machine for the bit end of the steel as developed[2] by the Homestake Mining Co. is perhaps the most satisfactory. This machine, preferably motor driven as shown in the plan view, Fig. 1, is placed at a point adjacent both to the tempering furnace and to the main water supply, and

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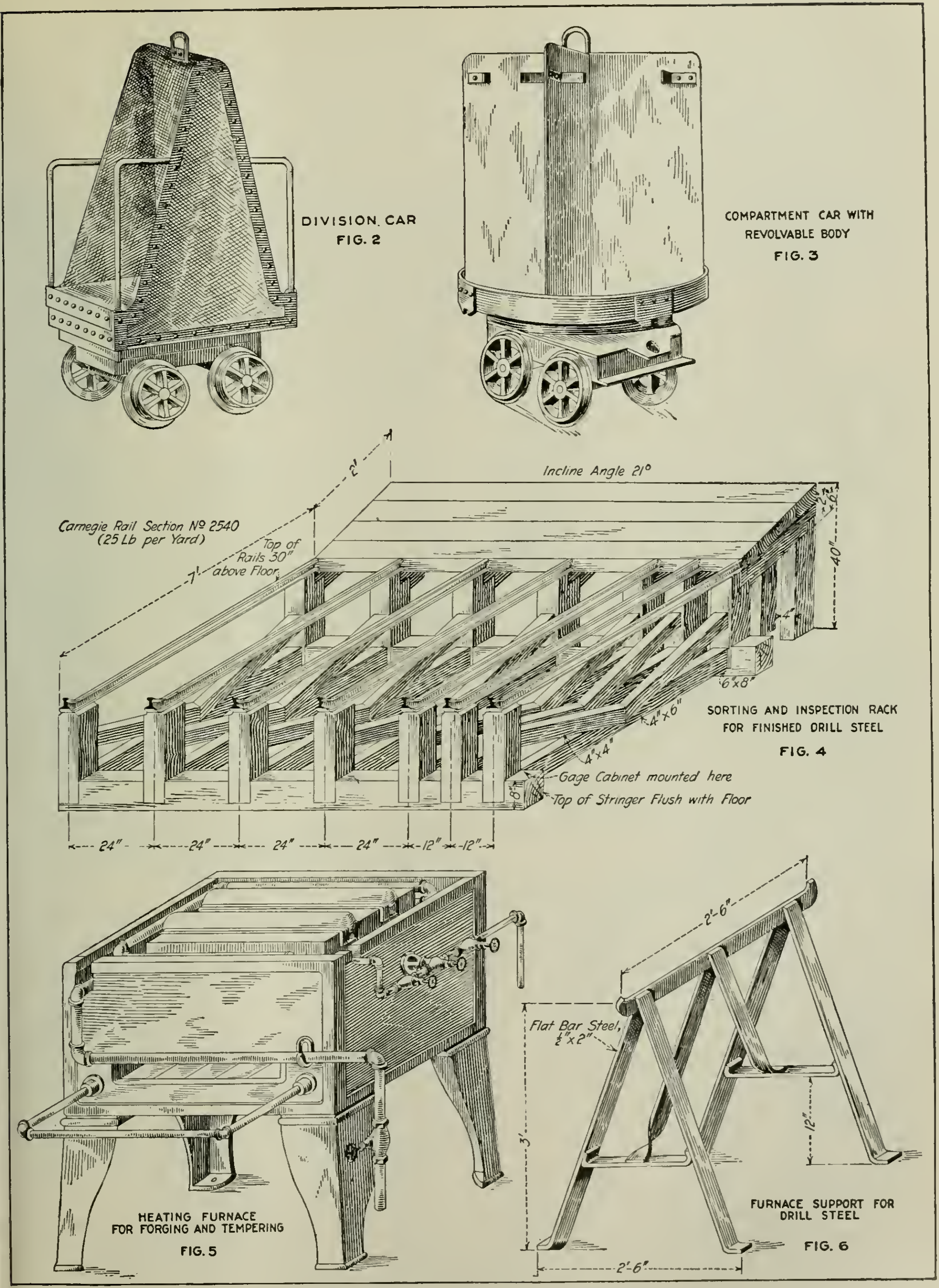
[1] "Operating a Drill Sharpening Shop," by James E. O'Rourke, "Eng. and Min. Journ.," Feb. 10, 1917.

[2] "Eng. and Min. Journ.," May 12, 1917.



DIVISION CAR
FIG. 2

COMPARTMENT CAR WITH
REVOLVABLE BODY
FIG. 3

SORTING AND INSPECTION RACK
FOR FINISHED DRILL STEEL
FIG. 4

HEATING FURNACE
FOR FORGING AND TEMPERING
FIG. 5

FURNACE SUPPORT FOR
DRILL STEEL
FIG. 6

FIGS. 2 TO 6. ACCESSORY EQUIPMENT FOR IDEAL SHOP FOR SHARPENING DRILL STEEL is so positioned and equipped with guide hangers that the drill steel, when discharged, falls on the inspection rack where it is accessible for inspection. Back of the tempering machine and adjacent to the heating furnace, where it is accessible to the compartment car when placed near the dead end of the track, is the oil-quenching compartment tank shown in Fig. 8 with its supplementary receptacle for cyanide of potassium. This is employed only for tempering the shank end of the bar in the manner described in my article on "Drill Steel and Drill Bits for Metal Mining," published in the *Engineering and Mining Journal* of May 12, 1917. Both tanks are preferably of steel construction and it is recommended that the inner surfaces be coated with an acid-resisting paint as insurance against oxidation.

STORAGE RACKS AND TABLES

The used-drill-steel table of the type shown by Fig. 9, on which the used drill steel is deposited from the division car, provides a means for facilitating preliminary inspection. If bent or plugged steel is found, the defects are corrected by using the straightening and cleaning facilities, provided on the top of the drill-sharpener cabinet before the steel is loaded into the compartment car preparatory to heating for forging. In the case of broken steel it is cut to length, piled on the floor at some convenient point until a sufficient quantity has accumulated, when, as regards the necessary forging and tempering operations, it is treated as new steel.

For the storage of finished drill steel a rack, shown by Fig. 10, and placed adjacent to the inspection sorting rack, is recommended. This rack should have compartments preferably made of boiler plate, and should be equipped with a base plank of hard wood to protect the floor and to insure the bit ends of the finished steel against chipping. The various compartments serve to accommodate the different lengths and types of drill steel that may be employed. From its position, as shown by Fig. 1, the finished drill steel may, when required, be transported directly to the division car or to the inspection rack for bundling.

A convenient and inexpensive storage rack for drill-steel bar stock is shown by Fig. 11. This may be constructed by any experienced mechanic or blacksmith from standard materials usually sold by hardware stores in every mine and quarry district. Preferably the base timbers are embedded in the concrete floor while the top stringers may be fastened by any means convenient to the girders of the building. From its position opposite the supplementary doorway in the east end of the building (Fig. 1), where it is conveniently situated for receiving the material, the various sections and sizes of drill-steel bar stock may be readily removed and carried to the anvil and straightening bed for cutting to the desired length for forging.

INSPECTION RACK FOR FINISHED DRILL STEEL

For inspecting the finished drill steel a rack, the details of which are shown by Fig. 4, will be found convenient, as it permits the inspector to walk between the rails and thereby facilitates the work of inspecting and sorting. After inspection the steel bars may be easily rolled to the edge near the track, from which they can be loaded directly into the division car, or transferred to the finished drill-steel rack as desired. As shown by the general plan, the inspector's gage cabinet, Fig. 12, is mounted on the timbers at the operating end of the rack where it is conveniently accessible. In this cabinet, which is equipped with sliding doors, wood pins and shelves, means are provided for storing the necessary gages and measuring devices.

SANITARY TOILET-ROOM FACILITIES

Applications of the principles of scientific management have demonstrated the importance of providing sanitary facilities, not only as applied to the surface equipment of the mine but to the underground workings. The wide-awake mine manager is striving to narrow the gulf between himself and his workmen by the giving of happiness and the meting out of justice. Health is the foundation of happiness and it is on this theory that industrial manufacturers have for years recognized the economic advantage of substituting clean, light and well ventilated buildings for the unsanitary shops of the past.

A workman who finds pleasure in his work and his environment usually prides himself in producing a satisfactory product. It is on this theory that toilet facilities are recommended as applied to the mine drill-steel shop. The toilet room illustrated on the plan view is in a corner of the building where the space it occupies is not required for other equipment. It is adjacent to that part of the plant where running water is required for the tempering machine so that the branch length of water piping necessary for the flush bowl, urinal and wash basin is reduced to a minimum. These accessories are placed near the inner wall of the toilet room in preference to the outer wall of the building, to minimize the liability of freezing in cold weather. Furthermore, this arrangement permits the placing of the work bench and the foreman's desk, Fig. 13, where the light from outside may be used to the best advantage. Double-deck lockers, one for each workman, an emergency Red Cross cabinet and a sanitary paper-towel rack, in addition to the sanitary drinking fountain, placed in the main shop adjacent to the toilet room, complete the sanitary equipment.

COMPRESSED-AIR SUPPLY IN SHOP

Compressed air is necessarily used for operating the drill sharpener and, in the absence of a blower, for operating the furnaces. Another desirable use for the air is to facilitate the work of inspecting the hole in hollow drill steel and to assist in cleaning out plugged steel. For this latter purpose the air is conducted by a pipe line to a point adjacent to both the used-drill-steel table and the inspection rack, Fig. 1A, from which it may be conducted to the work by a 12-ft. length of $\frac{7}{16}$-in plain, pneumatic, air hose equipped with a Davies blowgun[5] (the invention of Thomas Davies, head blacksmith of the United Verde Copper Co.). In the use of this feature the operator, by merely pressing the nozzle of the gun against the mouth of the hole in the drill steel, causes a valve to be automatically opened which allows a blast of air under line pressure to be blown through the opening. The act of removing the nozzle

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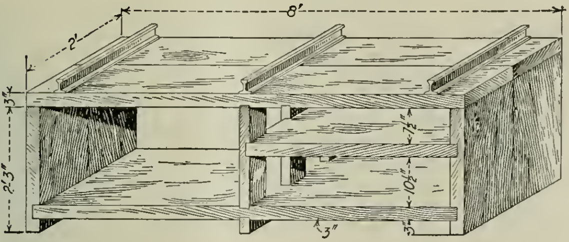
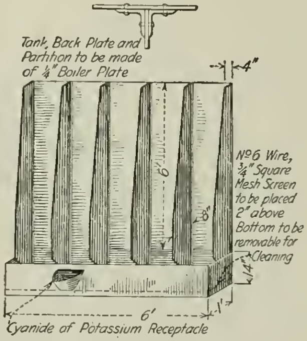
[5] "Drill Sharpening Methods at the United Verde Mine, Arizona," by Frank Richards, 'Eng News,' Feb. 1, 1917.



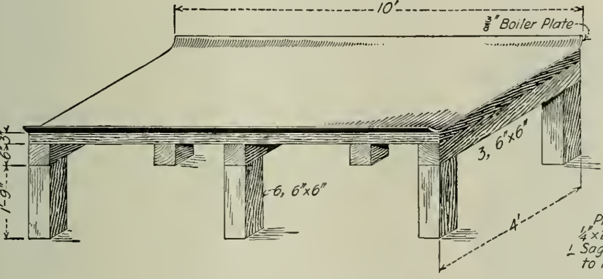
STORAGE CABINET FOR DRILL SHARPENER APPURTENANCES

FIG. 7


Tank, Back Plate and Partition to be made of ¼" Boiler Plate
4"
6'
8"
Nº6 Wire, ¾" Square Mesh Screen to be placed 2" above Bottom to be removable for Cleaning
14"
1'
6'
Cyanide of Potassium Receptacle

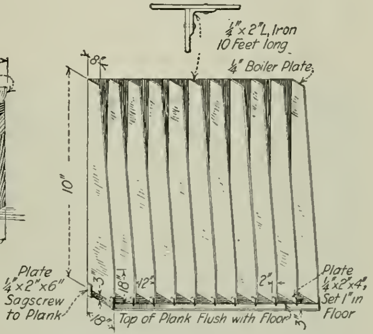
OIL-QUENCHING TANK FOR DRILL SHANKS

FIG. 8



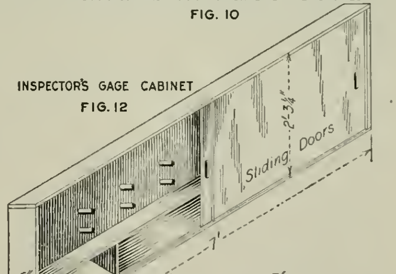
USED DRILL STEEL TABLE

FIG. 9


¼"x2"L, Iron 10 Feet long
8"
¼" Boiler Plate
10"
Plate ¼"x2"x6" ½ Sagscrew to Plank
3"
18"
12"
2"
Plate ¼"x2"x4", Set 1" in Floor
18"
Top of Plank Flush with Floor
3"

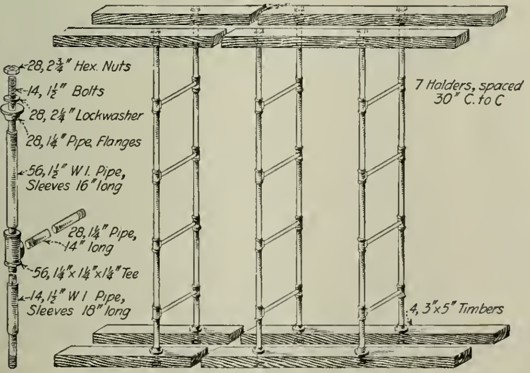
STORAGE RACK FOR FINISHED DRILL STEELS

FIG. 10



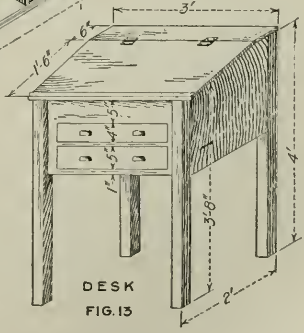
INSPECTOR'S GAGE CABINET

FIG. 12



STORAGE RACK FOR DRILL-STEEL BAR STOCK

FIG. 11



DESK

FIG. 13

FIGS. 7 TO 13. ACCESSORY EQUIPMENT FOR IDEAL SHOP FOR SHARPENING STEEL of the gun from the end of the steel causes the push throttle to be closed automatically. If preferable for the final inspection of the drill steel, water under pressure instead of compressed air may be employed at the inspection rack, in which case the nozzle of the gun is preferably equipped with a backing flange and a soft rubber gasket, which, when compressed against the end of the steel shank, provides a seal and prevents undue leakage. In Fig. 1A subfloor conduits for the compressed-air piping are shown.

HEATING, LIGHTING AND VENTILATING THE SHOP

For heating the building in cold weather a four-coil radiator composed of 2-in. wrought pipe, extending from the west entrance and along the west, north and east walls to the east entrance, will answer requirements satisfactorily except for extremely cold climates in which additional coils may be required. Live or exhaust steam may be employed for the purpose but in either case the precaution of providing suitable drains in the system should be taken to insure against freezing.

The lighting and ventilating facilities of the plant are items that should receive due consideration. In Fig. 1 is shown the location and size of the windows recommended for a plant of the type herein described, on the assumption that the building is placed on a line running east and west and the normal position of the operator faces in a northerly direction to avoid the direct rays of the sun falling upon the front side of the furnace and drill sharpener. A steel sash pivoted at the sides is recommended for the windows and may be operated by means of a rocker shaft procurable from the manufacturers of such apparatus. The windows at the ends of the building may, if desired, be composed of four rows of sash, while the sill of the window in the north side of the building should preferably be mounted at least 7 ft. above the floor and composed of eight panels, in a single row, operated by one gear from the rocker shaft. From such construction, a fair degree of natural light and ventilation is secured. For exhausting the gases from the heating furnaces, suspended hoods, adjustable vertically and equipped with telescope flues extending through the roof of the building, should be provided.

Artificial light sufficient to meet the requirements of the main shop may be secured from two 500-watt Mazda lamps with reflectors, supported from the roof on a center line through the building, one of which should be placed at a point slightly to the left of the drill sharpener, while the other should be slightly to the left of the tempering furnace. One 60-watt Mazda lamp suspended by an extension cord directly over the desk in the toilet room will be found ample for the purpose.

FLOOR PREFERABLY OF CONCRETE

The floor of the shop should preferably be of concrete, poured after the wood base plates of the various fixtures, including ties for the track system, are placed in position. Conduits for all subfloor piping of such size and shape that ample clearance for the pipe and its fittings, with provision for a covering with wood plank, should be provided (see Fig. 1A). The advantage of this construction is obvious as it provides a means for making the system readily accessible in case the pipe should become plugged or broken through accident. If desirable, a wood floor pad made of 2-in. planks may be embedded in the concrete at various points repeatedly covered by the operators. This provides for a certain amount of resiliency which will be found advantageous.

INCREASING CAPACITY OF SHOP

By adding 24 ft. to the east end of the building and the installation of an extra drill-sharpening machine, heating furnace, grinder, cabinet for drill sharpener appurtenances, and track with one turntable, the output of the plant may again be increased approximately 50% by the addition of two operators. The ultimate capacity of the plant will then correspond to the requirements of all but a few of the largest users of rock drills in this country having a central drill-steel plant.

PROCEDURE TO ADOPT FOR MAKING NEW STEEL

Remove the drill-steel bar from the bar-stock rack and place it on the top of the drill-sharpener cabinet with the end of the bar to be cut off supported by the anvil. Nick the bar at the desired point, using a chisel and sledge and break to length, leaving temporarily the pieces to be worked upon on the drill-steel table. When a sufficient quantity of pieces are available, place in the heating furnace, handling the steel in rotation by inserting a new piece when one is removed, after having attained the required degree of heat for forging. Form the shank in the drill sharpener, using the grinder and pneumatic punch, if necessary, after which place in compartment car, shank end down. When the forging operation is completed, turn the compartment car one-half way around, place the shank end of the bar in the tempering furnace, handling the steel in rotation as before and, when the shank has been heated to the required degree for tempering, remove from the furnace, dip the tip end in the cyanide of potassium and then plunge the heated end in the oil vat, allowing it to remain in the oil until cool. Now remove the steel from the oil vat and place it in the compartment car shank-end down. Run the car to its position adjacent to the forging furnace, remove the bar and insert the blank end in the furnace, handling it in rotation as before. Form the bit to the required gage diameter for the particular length of the piece being worked, after which place it in the compartment car at the left of the furnace. When the forging operation of the bit end is completed, turn the compartment car halfway around, place the steel in the tempering furnace, handling it in rotation as before and, when the required degree of heat is attained, quickly insert it in the bath of the tempering machine. After the steel has reached the inspection rack, inspect each piece carefully, place the pieces that pass inspection in the finished-drill-steel storage rack or in the division car and rework the defective pieces if any are found.

PROCEDURE IN REWORKING USED DRILL STEEL

After the used drill steel is transported by means of the division car from the shaft, or receiving platform outside of the building, it is deposited on the used-drill-steel table, where it is subjected to a preliminary inspection. If bent or plugged drill steels are found they are straightened and cleaned out by the use of the anvil in conjunction with the straightening bed on top of the sharpening-machine cabinet, after which they are sorted and placed in the compartment car. If a shank is found broken to such an extent that reforging and tempering are warranted, the steel is discarded temporarily and placed in position convenient for reforging when a sufficient quantity has accumulated to warrant the operation, in which case the procedure will be the same as that required for shanking new drill steel.

In the case of shanks that merely require regrinding to put them into proper working condition the steels are placed in the compartment car (shank end down), which, after being loaded, is pushed to a point adjacent to the grinder, where such steels are removed and redressed, after which they are placed in the car (bit end down) and the whole is transported to a point adjacent to the forging furnace where the procedure for sharpening the bit is the same as that required for the bit end of new drill steel. After the final inspection they are again bundled, if such be the practice, loaded into the division car and transported to the shaft, or loading platform, for distribution.

If desirable, a lessening of the distance covered by the operator, while removing the steels from the furnace, forging and grinding prior to depositing them in the compartment car, can be made. The grinder, drill sharpener and forging furnace may be grouped more closely together and the sharpener and furnace set at an angle of 70° with relation to the longitudinal line of the building by swinging the working end of the sharpener and forging furnace in a westerly direction from the position shown in Figs. 1 and 1A. The oil-quenching tank for drill shanks may also be set at an angle of 60° with relation to the tempering furnace by swinging the end of the tank nearest the north wall in an easterly direction.

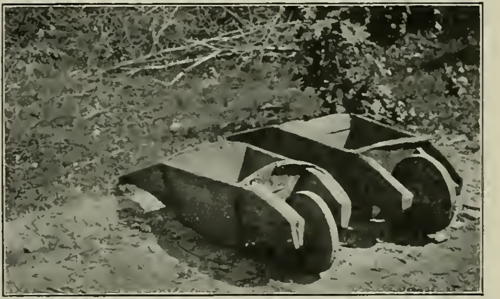
Tin Exports from China

A report from United States Consul-General George E. Anderson at Hongkong says that the present indications are that the Hongkong tin market will be stripped of its supplies in a few months as a result of the marked advance in price in consuming countries and slow supplies from other producing countries. The declared exports of tin from Hongkong to the United States for the first half of the present year have been valued at $2,318,555, as compared with a value of $1,122,242 in the same period of last year, while the highest value of exports in the whole of any previous year was in 1913—$1,632,213. The value of the exports in 1911 was $798,941; 1912, $1,404,115; 1913, $1,632,213; 1914, $769,538; 1915, $983,884; and in 1916, $1,261,737. Exports for the first half of the present year, therefore, are at the rate of about three times the highest record in the history of the trade and in much larger proportion compared with the average.

The exports, up to the limit of the total production, are merely a matter of price. While prices of tin the world over have been high for some time and have stimulated considerable exports from this field, the high exchange value of silver, in terms of which the tin in this field is produced and sold, has operated against this field and in favor of other tin fields where the relations of local currency to gold was more favorable. Fixed exchange for the Straits Settlements, for example, has operated as a direct handicap to Yunnan producers and Hongkong refiners. The extraordinary demand at high prices has so denuded the Straits market, however, that buyers have turned to the Hongkong field perforce. Allowing for delays in supplies from the mines and for a modicum of speculation, there seems to be no question but that at present supplies of tin in the Far Eastern markets generally are barely equal to the demand. There is now on hand in Hongkong a stock of approximately 1200 tons, as compared with about 1500 tons at the beginning of the current calendar year.

Befo' de War in Old Virginny

Among the thirteen original states of the Union it is probable that Virginia has the distinction of being the pioneer in mining. While the premature shipment of sulphur ore brought ridicule upon those who hoped to enrich themselves by mining fool's gold, later efforts of miners in the good Old Dominion state yielded products that were in demand. In the Shenandoah Valley a manganese déposit occurs in "Powell Fort," about nine miles from Woodstock, Shenandoah County. The "fort" did not derive its name from activities tending to disrupt the Union but rather is suggestive of an old retreat of folks who resented inquisitive intrusion. Indeed, it is said that rumors of a mysterious silver mine in the hills, based upon occasional sales of metal, had a tacit relation to contemporaneous stage robberies.


PRIMITIVE WHEELBARROWS FOUND IN VIRGINIA MINE

However, the manganese deposits were really worked, as evidenced by the accompanying illustration.[1] The two crude wheelbarrows were found recently in the workings of a mine now operated by the Stockwood Realty Corporation, Inc. These implements were found embedded in mud, 80 ft. below the surface. There is no positive indication as to the time these wheelbarrows were made and used, as the workings in which they were found antedate the recollection of the oldest inhabitants of the community who are familiar with the intermittent operation of the mine since about 1850. The present state of preservation of these ingenious makeshifts may be accounted for by the fact that they have been under water. They seem to serve as a reminder of the old days, when the darkies may have chanted an accompaniment to the squeaking of the curious wheels as they dreamed of possum, roastin' ears and sweet potatoes.

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[1] Photograph and data furnished by C. A. Burdick, mining engineer, 15 Broad St., New York.

The Needles Concentration Mill

By F. C. Smith
General Manager, Chloride Mining Co., Chloride, Ariz.

The concentration mill situated at Needles, San Bernardino County, California, is operated by the Needles Mining & Smelting Co., which is a corporation subsidiary to the United States Smelting, Refining & Mining Co. Adjacent to the concentrating mill is also a lead smeltery, owned by the same company but not now in blast. The mill is arranged for the treatment of ores from the Tennessee mine, at Chloride, Mohave County, Arizona—the center of the zinc-lead district of the Cerbat Range. This mine supplies about 200 tons per day—practically the entire capacity of the mill. The ores from the Tennessee mine, as shipped to the Needles mill, have averaged for a recent period of three months 6.4% Pb and 15.47% Zn, with certain amounts of gold and silver.

Flow of Ore Through the Mill

The operation of the mill is as follows: The ore is first crushed in an 11 x 18-in. Blake jaw crusher; then passed to a 5-mm. screen from which the oversize goes to rolls and back to screen, the entire 5-mm. product going to the mill bin. Ore from the mill bin goes to a four-mesh trommel from which the oversize is treated in a Harz rougher jig, making a lead-iron product, the undersize going to a six-mesh trommel. From this trommel the oversize goes to one Harz jig, making a lead-iron product in the first two compartments and a finished zinc concentrate in the third compartment. The undersize from the six-mesh trommel goes to an eight-mesh trommel, the oversize from which goes to one jig, making lead-iron products in first two compartments and a finished zinc concentrate in the third. The undersize goes to a hydraulic classifier, for the purpose of washing out fines, and three products are made. The coarse product from spigot No. 1 goes to two Harz jigs with eight-mesh screens, producing lead-zinc in the first two compartments and zinc concentrate in the third, this concentrate being a finished zinc product and the best made in this mill. If the second compartment does not make a good lead concentrate, the material goes to a Wilfley table for further treatment. The product of spigot No. 2 of the hydraulic classifier goes to two Harz jigs, with eight-mesh screens, in which the first compartment makes a finished lead product, the second makes a middling which goes to a Wilfley table, and the third makes a finished zinc product. The product of spigot No. 3 goes to two Wilfley tables. The overflow goes to an 8-ft. Callow settling tank from which the spigot product goes to Wilfley tables after classifying, and the overflow to Deister slimers, making a finished lead product and a finished zinc product. All residue from Deister machines goes to flotation, making a zinc concentrate.

To return to the jigs: The tails from No. 1 (rougher) jig go to a dewatering wheel, thence to a set of 16 x 36-in. spring rolls, and thence by elevator to one line of two eight-mesh trommel screens. From these the oversize is dewatered and carried to a second set of 16 x 36-in. rolls, thence to elevator and through the same line of trommels, the undersize from the trommels going to the hydraulic classifier, above the No. 3 and No. 4 jigs. Tails from No. 3 jig go to the tube mill and from thence are elevated to the Wilfley-table classifier. Tails from jigs 2, 4, 5, 6 and 7 go to the Wilfley-table classifier.

Of the products of the Wilfley-table classifier that of the first spigot goes to one jig with eight-mesh screen, of which the first two compartments make a finished lead product, and the third makes a finished zinc product. Other spigot products go to Wilfley tables, making finished lead and finished zinc products and middlings which go to Wilfley tables on the lower floor. Slimes from Wilfley tables go to settling tanks from which the spigot product goes to Deister slimers, thence to flotation. Tails from Wilfleys go to vanners for retreatment and to waste. Classifier overflow goes to settling tanks from which the spigot product goes to Wilfley tables. Middling products from upper Wilfley tables go to the lower Wilfley tables, making finished lead-iron and finished zinc products, with middlings which go to the tube mill; the slimes being elevated to two Callow settling tanks. The first spigot product goes to tube mill; the others to Wilfley tables, and the overflow to the Callow tank. Part of the spigot product goes from this tank to the tube mill and part is elevated to upper Wilfleys.

CONCENTRATION MILL AT NEEDLES, CALIF

The following machines are used: Nine jigs, one four-mesh, two six-mesh and six eight-mesh; eight trommels, handling three sizes, respectively four-, six- and eight-mesh; fifteen Wilfley tables on upper floor and eight on the lower floor; three Deister slimers, and three vanners for retreating fine sands from upper Wilfley tables.

In this mill about 65% of the total lead and 60% o the total zinc are taken off in the jigs. The object sought is to make a finished product at each step, t avoid regrinding and to prevent sliming.

RATIO OF CONCENTRATION
1 ton lead-iron concentrates to 5.41 tons ore
1 ton zinc concentrates to 3.12 tons ore
Total ratio of concentration, 1 : 1.89

The assay of mill tails is as follows: Gold, 0.01 oz silver, 0.06 oz.; lead, 0.10%; zinc, 2.70; iron, 4.10 silica, 83.60%. The recovery of metals paid for b smelters during three months' run was: Gold 48.42% silver 64.81, lead 86.22, zinc 80.14%. The flotation product consists entirely of zinc concentrate and represents roughly 10% of the total zinc product. The table and slimers produce about 35% of the total lead an about 30% of the total zinc.

Cadmium Salts Prevent Flotation of lead sulphide claims M. H. Thornberry in a paper presented at the Boston meeting of the American Chemical Society. At leas experiments so far completed point to this conclusion.

Mining Practice in the Joplin District[*]

Description and cost of mining operations in the Joplin district of Missouri, giving methods of prospecting and developing typical orebodies. Methods of drilling, blasting, shoveling, tramming and hoisting are given with itemized costs for each operation.

WHERE ore is found at a depth of 100 ft. or more in the Joplin, Mo., zinc-lead district, the prospecting work is done by churn drill. Several akes of churn drills are used in this work, both steam- nd gasoline-driven machines being used. The drilling is sually started with a 6-in. bit, and the size of the bit is educed, if necessary, as the hole is advanced. It is eneral practice to drill from 100-ft. to 400-ft. holes, ut this is governed entirely by the situation and ormation of the ground. In drilling sheet ground, lose spacing of drill holes is unnecessary, but in narow orebodies, the holes are spaced from 15 to 50 ft. part. Ten years ago, few assay records were kept f the drilling, but during recent years records have een accurately kept showing the situation, elevation, ssays, and also the vertical section of the hole.

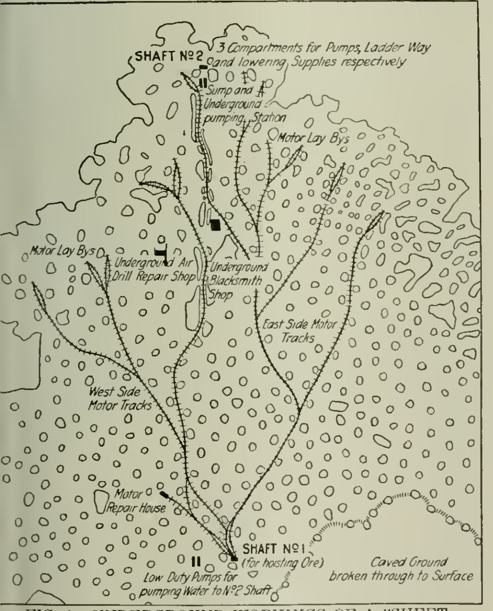
SHAFT No 2
3 Compartments for Pumps, Ladder Way and lowering Supplies respectively
Sump and Underground pumping Station
Motor Lay Bys
Motor Lay Bys
Underground Air Drill Repair Shop
Underground Blacksmith Shop
East Side Motor Tracks
West Side Motor Tracks
Motor Repair House
SHAFT No 1 (for hoisting Ore)
Caved Ground broken through to Surface
Low Duty Pumps for pumping Water to No 2 Shaft

FIG. 1. UNDERGROUND WORKINGS OF A "SHEET-GROUND" MINE

After the orebody is reached, samples of cuttings re taken every 2 or 3 ft. by pouring the water off he cuttings and taking a portion of the coarse material or assay. It has been found, however, that often he fine sludge that floated off with the water contains valuable mineral. To overcome this, cuttings from each 2 or 3 ft. are put in a container and after the water is evaporated, the sample for assay is reduced by means of Jones riffles.

Permanent records of cuttings showing various formations are kept in glass jars or glued on large cards. Drilling at present is costing from $1.25 to $1.50 per ft. In pre-war times, the drilling costs ran from 75c. to $1 per foot.

Development by Shafts Close to Orebody

After proving a property by drilling, shafts are put down to the orebody. These are usually vertical shafts, either single or double compartment. The dimensions of the one-compartment shafts vary usually from 4 x 5 ft. to 5 x 7 ft. in the clear, while those of the two-compartment shafts run from 5 x 10 ft. to 7 x 12 ft. in the clear. Recently a few three-compartment shafts have been sunk. The shafts are usually put down near the edge of the orebody, so that little drifting is required to open up the ground for stoping. The shafts are usually cribbed with 2 x 4-in. or 2 x 6-in. sawed timbers (few square sets being used because of the nature of the ground), and extend several feet below the top of the solid rock. The cribbing is lined or laced vertically with 1-in. boards, which help to make the shaft free from small rocks and water, and permit faster hoisting. The cost of sinking shafts varies according to the nature of the ground, the amount of water encountered, and the size and depth of the shaft. The average cost of a 5 x 7-ft. shaft, at present, where from 100 to 500 gal. per min. of water is handled, to a depth of from 200 to 250 ft. is from $25 to $30 per ft. Usually two or more shafts are sunk on each property. These shafts are connected with an air drift 5 x 7 ft., which gives good ventilation. The cost of driving a drift varies from $6 to $9 per foot.

In the Granby, Aurora and Galena camps, where ore is found at from 40 to 100 ft., the ordinary practice of developing ground is by sinking small shafts; little drilling is done in proving up the shallow orebodies. A good way to increase tonnage where working faces are limited is by driving a 7 x 8-ft. drift ahead of the working faces to a distance of 300 to 600 ft. and opening up the ground so as to permit the use of several machines. Drill holes are usually necessary for proper ventilation where this method is used.

The methods employed in the underground work vary with the nature of the deposits, and have been developed to suit the local conditions encountered in the various mines. The ore deposits lie in a horizontal plane, and are usually found on one level, varying in heights from 8 to 40 ft. In some parts of the district, however, two distinct levels are found and in a few instances as many as four separate ore strata have been found, each being separated by a relatively thick stratum of hard, barren rock, and the several "runs" are mined independently of one another.

In the mines where the orebody is higher than 16 ft. underhand stoping is practiced, especially in the hard-ore "sheet-ground" mines. Pillars are left at close intervals, the thickness and distance apart depending on the nature of the ground and the height of the orebody. The ore is usually found in a hard flint formation, known as Grand Falls chert, which lies between beds of limestone. The lime formation is known as the Mississippian, and is overlaid by the Pennsylvanian series of shales and sandstones.

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[*] Excerpt from paper by H. I. Young before the American In- titute of Mining Engineers to be read at the St. Louis meeting in ctober, 1917.

A comparatively small amount of timbering is required in the mining operations of the district, as there is a cap rock of flint varying in thickness from 1 to 5 ft., which makes a good roof in the majority of mines. In some cases, this flint decomposes into what is commonly known as "cotton rock." This is soft and white, and where it occurs pillars must be spaced closely, and the roof arched. In sheet ground from 10 to 20% of the ore is left in the form of pillars. These are sometimes trimmed, and many of them removed after the orebody has been worked out. Fig. 1 shows the pillar system in a typical sheet-ground mine.

DRILLING DEEP HOLES FOR STOPING

Where the orebody is over 16 ft. in height, it is customary to employ the "heading and stope" method of cutting the ground. The heading is carried on 6- or 7-ft. posts. The face is irregular, which is necessary for the best breaking results. From five to seven holes are drilled at each set up, and the heading is usually advanced from 15 to 20 ft. ahead of the stope. If the stope is over 10 ft. in height, a splitter is drilled horizontally so as to relieve the load on the stope hole. In cases of high stopes, more than one splitter is used. Stope holes are drilled so as to dip below the horizontal in order to maintain a level bottom.

Where the orebodies are less than 16 ft. in thickness, the "heading and overhead stoping" method is profitably employed. A 10-ft. post is used to drive a bottom heading, from five to eight holes being drilled to each round. These holes vary in depth from 10 to 12 ft., and usually from 75 to 150 tons of ore are broken to each round of holes. After the bottom heading is advanced from 10 to 25 ft., holes are drilled in the overhanging ore, and this is blasted down at a low breaking cost. In Fig. 2 is shown a comparison of these two methods.

Two types of air drills are used in this district, the piston and hammer. In sheet-ground mines, where the laying of dust is an important consideration to the health of the miners, the water-hammer drill has been used with great success; it has also shown an increased drilling efficiency of from 25 to 40% above that of the piston machine. Drills are operated by compressed air, at a pressure of from 85 to 100 lb. per sq.in. High-carbon hollow drill steel is used with the wet-hammer drills. Holes are started with a 2¾-in. bit and finished with 1½-in. It is necessary to change the size of gage in each 2 ft. drilled, and it is sometimes necessary to use several steels to drill 2 ft., when the ground is exceedingly hard. The drill steel is resharpened at an underground blacksmith shop, or on the surface where oil forges have been found to give the best results. Because of the large amount used, it is necessary to sharpen the steel by mechanical sharpeners. Drilling costs vary with the character of ore mined. The tabulation in Table I shows costs for four months of 1917, in a mine where the faces are from 10 to 16 ft. in height.

TABLE I COST OF MACHINE DRILLING

Tonnage broken	116,272
	Cost per Ton Ore
Machinemen	$0 0706
Machine helpers	0583
Drill repairs	0257
Drill steel	0193
Sharpening drill steel	0234
Oil for machines	0015
Compressed air	0453
Air hose and fittings	0052
Total	$0 2493

BLASTING PERFORMED BY SPECIAL CREW

After drilling, the holes are chambered and prepared for powder. Both ammonia and gelatin dynamite of a strength of from 30 to 40% is used, in the form of sticks of from 1 to 1¼ in. diameter. No. 8 caps have been found to give the best results. The powder crew, in mines hoisting on two shifts, do their work on the second shift, firing shots at the end of the shift; this gives the mine several hours to be cleared of powder smoke and gases. It is necessary to have skilled labor for this work, both on account of the high cost of explosives, and for the safety of the men. The rounds are loaded with charges varying from 25 to 150 lb., depending upon the formation of the ground, and the burden of the hole. Blasting costs are from 15 to 30c. per ton, varying with different heights of working faces. The costs shown in Table II are for a 12-ft. working face. These costs are on powder purchased on contract, the present open market price being 70% higher.

TABLE II. COST OF BLASTING

Tonnage	136,272
	Cost per Ton Ore
Labor	$0 0294
Powder	1314
Fuse	0057
Caps	0016
Total	$0 1681

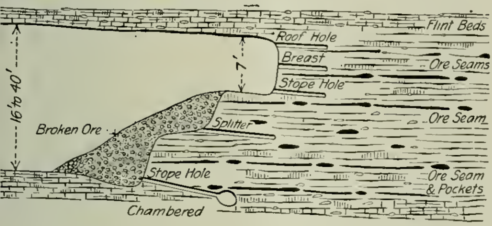
After the ore is broken it is sometimes necessary to drill large boulders with a Jackhamer, and blast them, to reduce them to shoveling size. The usual practice of the district is to shovel into tubs or buckets, which are commonly known as "cans," holding from 800 to 1200 lb. of ore. These are usually 30 x 30 in., 30 x 32 in., or 32 x 32 in., and are trammed to shaft on small trucks. The shovelers use short-handled No. 2 scoops and an average of 20 tons per shoveler per shift is obtained. All shoveling is done on a contract basis, and shovelers earn from $3 to $7 per eight-hour shift. Both the Thew steam shovel and the Myers-Whaley shoveling machine have been used for underground shoveling to good advantage, but without a decrease in the shoveling cost. However, if labor continues to become scarcer, it may be necessary to adopt this method to insure a steady production.

A number of the mines have adopted the use of cars to take the place of "cans." These hold from 1500 to 2000 lb. of ore. The cars are easier to shovel into, as they are lower than the cans. They are also more stable, which permits faster tramming. Shoveling costs vary from 20 to 25c. per ton of ore.

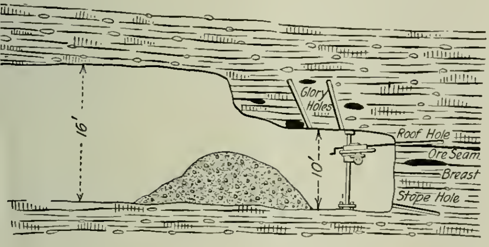
Several different methods of tramming are employed in this field; namely, hand tramming, mule haulage, motor haulage, and rope haulage, depending on the length of the haul, tonnage required and the grade encountered. The tracks are from 15- to 24-in. gage, the rails varying in weight from 12 to 30 lb. per yd.

The trucks are either wooden or steel frames mounted on plain wheel and axle, or on roller bearings. The roller-bearing truck has been found to make a saving in tramming expense.

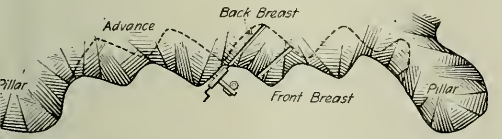
Where the haul is 200 ft. or less, the shovelers usually run their cans directly to the shaft, but for any distance above this and up to 400 ft., additional tramming labor is required to take the dirt from the shovelers' "lay-by" to the shaft. Where a large tonnage is required, as is always the case in sheet-ground mines, and the distance from the shaft to the working faces is from 400 to 1500 ft., mule haulage is successful. A mule will haul 100 tons 1500 ft. in an eight-hour hift, at a cost of from 5 to 6c. per ton. In the large heet-ground mines, where approximately 1000 tons are oisted in an eight-hour shift, and all of this ore must e hauled 2000 ft. or more, motor haulage is necessary. The six-ton gasoline locomotive is the most popular nd gives no trouble with regard to ventilation. Roller-earing cars are required for long hauls. Rope haulage is used in some mines where the grade is severe. The costs in Table III show comparison of gasoline locomotive and mule haulage for four months of 1917. The distance on locomotive haulage is 1750 ft.; on mule haulage, 700 feet.



Heading and Stope Method of Underhand Stoping



Overhand Stoping in "Sheet Ground"



A Plan of Heading "Fence Rowed" for Efficient Breaking

FIG. 2. METHOD OF PLACING HOLES AND BREAKING IN STOPES

TABLE III. COST OF HAULAGE

Gasoline-Locomotive Haulage		Mule Haulage	
Tons hauled.......	136,272	Tons hauled.......	81,145
	Cost Per Ton		Cost Per Ton
ngineer	$0 0138	Mule driver	$0 0230
rakeman	0122	Maintenance mulea	.0051
il for locomotive	0018	Car couplers	.0119
asoline for locomotive	0107	Car greaser	.0058
epairs	0151		
ar couplers	.0164		
Total	$0.0700		$0 0458

Three systems of hoisting are used in this district; cans, cages and skips. The can is the best adapted to this depth of hoisting, and the tonnage requirements of the average Joplin mill. Both steam and electric hoists are used. The hoisting cycle is as follows: A trammer or bumper runs a loaded can to the side of the platform and the hoisting cable is unhooked from the empty can on the platform and attached to the load by the tub-hooker; this operation is done quickly and without any signals to the "hoisterman," who now picks up the loaded can which swings in over the platform where the tub-hooker steadies it in the center of the shaft. This is raised to the top of the derrick, where the hoist is situated. Here the hoisterman hooks a tail rope, which is fastened out in front of the sheave timbers, to a ring in the bottom of the can. The hoisting cable is slacked, and weight is taken by the tail rope, causing can to dump directly into the mill hopper. The hoisting cable is now taken up, and the tail rope unfastened so as to allow the can to descend the shaft. With practice, a hoisterman and tub-hooker will become so expert at their respective operations that as many as 150 cans an hour can be hoisted from a depth of 250 ft. The record of a single-compartment shaft for the district is 1071 cans in an eight-hour shift. Where two compartments are used for hoisting, the hoists are placed side by side in the top of the derrick, and the shaft is divided for its entire depth to prevent cans from bumping. The cost of hoisting is between 6 and 7c. per ton, while surface tramming costs 1c. per ton. Table IV shows a distribution of hoisting cost for four months of 1917.

TABLE IV. COST OF HOISTING

Tons hoisted	136,272
	Cost per Ton Ore
Hoisting engineer	$0.0170
Tub-hooker	0155
Cable	0052
Hoist repairs	0033
Hoist derrick repairs	0008
Shaft lacing repairs	0007
Steam for hoist	0202
Slickers for hooker	0010
Oil and waste	.0005
Total	$0.0642

In order to do all the shoveling on the day shift, and to secure a large tonnage, many of the operators hoist from several shafts, and tram the ore on the surface to the central mill bin by means of inclined surface trams; a few aërial trams are used, but the level topography and short hauls have made the inclined tram nearly universal in this district.

COÖPERATION IN MINE DRAINAGE

The serious problem of pumping in the Joplin mines is not the amount of water to be handled, but, in many instances, the acid character of the mine water. It is seldom that over 1000 gal. per min. has to be pumped at any one mine. In the sheet-ground camp, the mines are so close together that many of them do no pumping at all; where this is the case, a central drainage company is formed, to do the pumping for all the operators benefited. Many types of centrifugal pumps are used underground; the Pamoma, and Texas are favorite surface installations, the Texas being used generally over the district for unwatering mines, while the large-geared duplex or triplex pumps are usually found in the larger permanent underground pumping stations.

There is no uniform system of cost accounting among the mines of this district. At present, operating costs, which include mining, milling, pumping, miscellaneous and administrative, are from $1.20 to $1.75 per ton of ore mined. On account of high prices of supplies and the scarcity and inefficiency of labor, costs are gradually increasing throughout the district. Table V shows a distribution of mining costs over a period of four years, two before-war years and two during the war.

TABLE V. UNDERGROUND MINING COSTS

	1912	1913	1915	1916
Tons hoisted	306,263	303,331	387,436	347,937
	Per Ton Ore	Per Ton Ore	Per Ton Ore	Per Ton Ore
Ground foremen	$0 0101	$0 0097	$0 0115	$0 0119
Drilling	1988	1769	2576	2769
Blasting	1657	.1628	1845	1788
Roof protection	0061	.0044	0159	0182
Shoveling	.1557	.1472	2106	2341
Conveying to shaft	0798	0919	1092	1415
Hoisting	0468	.0433	0399	0483
Lighting	0058	.0070	0062	0051
Miscellaneous	0130	0076	0339	0577
Betterments	0002		.0066	0133
Total	$0 6820	$0 6508	$0 8759	$0 09858

Baekeland Discusses Development of Chemical Industry

The notion that this country had no chemical industry before the war was opposed by Dr. L. H. Baekeland who is a member of the United States Naval Consulting Board, in an address at the Exposition of Chemical Industries in New York. Dr. Baekeland's speech was in part as follows:

"As far as the mineral chemical industries are concerned, this country, even before the war, could stand excellent comparison with Germany or any other country. In fact, when it comes to the production of acids and heavy chemicals, the United States in several of these branches was decidedly ahead of Germany. There is no doubt, however, that we were behind in the manufacture of synthetic organic chemicals, which include the coal-tar dyes. But there was nothing strange or abnormal in this situation. The importation of these products into the United States before the war did not exceed $10,000,000 a year, this covering more than 1000 different kinds of products, all of which require special processes of manufacture, and some having to be worked in very small units. As a business proposition, there was little to attract shrewd American business men.

"One chain of 5c. and 10c. stores in 1913 exceeded the total export business of the whole German coal-tar industry throughout the world by $11,000,000. One mail-order house in the same year did more business than all the German color plants together, and the total dividend payment in 1913 of all the dyestuff manufacturers in Germany was only half of a special dividend of one mail-order house in the United States. In 1913 the entire German color industry paid $11,000,000 in dividends, while the Ford Motor Car Co., with one standardized product, did a greater annual business than all the German coal-tar dye plants together, with their 1200 different products, and earned four times their combined dividend while paying three times their wages.

"If Germany specialized in this branch of chemical industry, it was merely because she did not have the same opportunities for enlisting in other fields of enterprise. In this country, we had new mines to exploit, new fields to cultivate, new railroads to construct, and many more industries of immediate importance claimed the full attention of our men of enterprise or scientific training. No wonder then that a paltry little industry of the kind was neglected.

"Nevertheless, as far back as the early 70's, a few enthusiasts started the manufacture of aniline dyes in the United States. They were making considerable headway, but in 1883 they had to perish through unfavorable tariff legislation. At that time German agents were already at work in this country and were leading our textile manufacturers by the nose and they helped them in their lobbying for the lowest tariff on dyestuffs, claiming that Germany would serve them, furnishing them with what they called their 'raw material.' This situation acted as a boomerang and paralyzed our textile industries at the beginning of the war.

"Since then, this country has realized that we must not estimate the value of the color industry in dollars and cents, but by the direct bearing it has as a key to all other industries. A few cents' worth of the right kind of dyes decides whether a hundred dollars' worth of textiles can be sold or not in the open market. What is most extraordinary, almost a wonder, and bears witness to the flexibility and adaptability of American enterprise, is that in less than three years, we should have made ourselves independent of Germany in the line where she had the start on us since half a century."

Presumptions As To Lode Ownership

BY A. L. H. STREET*

Dismissing suit brought to recover the value of ore taken by defendants from a vein alleged by plaintiffs to apex in their claim, the dismissal being on the ground that the evidence in the case was insufficient to show that the apex was within plaintiff's claim, the Montana supreme court recently laid down the following points of law governing such controversies:

One who extracts ore from a vein under an adjoining claim is prima facie a trespasser until it is shown that the point of extraction was on the dip from an apex lying within his claim. Presumptively the owner of the claim within which ores are found is the owner of such ores. And veins are presumed, in the absence of proof to the contrary, to extend upward at the same angle as exhibited below. These presumptions cannot be overturned by the testimony of expert witnesses who merely give opinions that a vein found under one claim has its apex in an adjoining claim. (Barker vs. Condon, 165 Pacific Reporter, 909.)

A Department of Motor Transport has been created by the Chamber of Commerce of Manchester, England, to assist members in dispatching goods by road and to relieve traffic congestion. A similar scheme is already in operation by the Ministry of Munitions at Birmingham.

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Underground Mine Sanitation*

Review of unsanitary conditions prevalent in metal mines and suggestions for betterment. Evils of quartz dust, hot and foul air as affecting the health of mine labor, and its resulting inefficiency. Abolition of dry drilling urged.

WHEN underground sanitation is mentioned, it generally conveys an idea of the process of cleaning up trash, food refuse and maintenance of proper toilet facilities. Making underground working places healthful and the removal or mitigation of conditions that threaten the life and welfare of the miner imply a great deal more than the cleaning up of what are properly classed as nuisances but do not in hemselves menace life. Underground sanitation has for its sphere the elimination of certain conditions and processes that are intimately connected with mining; conditions directly detrimental to human life, which, unfortunately, are largely considered as inseparable from mining. It is probable that in spite of the utmost care and effort there will always be an accident hazard o the mining industry; there is no good reason why here should be a distinct health hazard, and the prevaence of miners' consumption is an evidence of the general low price at which we hold human life.

THE EFFECTS OF HARD-ROCK DUST

Health conditions that menace human life underground are largely within the domain of the metal mine rather than that of the coal mine. Foremost in the ranks of offenders against mine sanitation is hard-rock dust. I believe it may be safely asserted that for every man killed or disabled by injury in hard-rock mines, there have been 25 victims of hard-rock dust. The history of hard-rock mining districts throughout the world s predominantly overshadowed by the specter of miners' consumption and, unfortunately, the relationship between cause and effect is not as evident in disease as in njury.

Miners' consumption, be it understood, is a disease of the lungs, mechanically produced by the inhalation of particles of siliceous dust, which research has shown to be so small that they average but three to five microns n diameter. The structural changes produced in the ungs by the action of siliceous dust causes shortness of breath on exertion with a gradual disabling of the miner. The injury to the lung tissue predisposes to tuberculosis, so that the victim of rock dust finally succumbs to the latter disease, usually leaving an impoverished and often an infected family. Miners' consumption has been recognized for centuries, but it remained for the machine drill to elevate it to the position of one of the foremost underground occupational diseases. This does not mean that only the machineman gets the miners' consumption; the shoveler, the imber repairer, the loader, or others who move the broken ground, may also be exposed to the inhalation of siliceous dust. I have seen cases of miners' consumption in millmen who had never worked underground. Generally speaking, the more silica in the dust, the more harmful it is; the flinty dust in the sheet-ground mines of southwestern Missouri, for instance, with a silica content well over 95%, being among the most harmful. When dust is once in the mine air, belief in the protection of miners by respirators or other devices is fallacious; no respirator can be comfortably worn by workingmen and eliminate dust particles less than five microns in diameter. The remedy lies in laying the dust by the proper use of water in drilling and sprinkling. In this country indiscriminate dry drilling is regulated but little by law; many states have laws on the statute books, but they do not actually stop dry drilling. England, South Africa, Australia and British Columbia have enacted laws which enforce severe penalties for dry drilling in hard-rock mines; possibly in some places the law is not strictly enforced, but at least an effort is made. Blasting, chambering holes, leading ore out of chutes, and shoveling may all cause much dust under certain conditions, and the elimination of this by proper sprinkling is law in other countries. A recent investigation of the prevalence of miners' consumption among the sheet-ground miners in the Joplin district, in 1915, indicated that about 35% of them were affected, which is about the same conclusion arrived at after the examination of many thousands of miners on the Rand. In other large hard-rock camps in this country it would appear that the percentage is also large. Suppose, however, we put it as low as 5%; an industry showing 5% of the workers afflicted with an occupational disease reveals conditions that should not be allowed to prevail indefinitely; but it would appear that the situation is not materially improving, and this is true especially where mines are getting larger and deeper.

METHODS OF ALLAYING THE DUST EVIL

The elimination of injurious dust, then, is of prime importance for mine sanitation. It can be secured, first, by doing away with dry drilling. Two methods may be resorted to: The use of drills feeding water through a core in the steel, or the application of water to the holes, while drilling, by water lines, sprays affixed to the drills, or squirt guns. The first is the better method because it insures a constant application of water and puts less reliance upon the coöperation of the miner. Consequently it is less likely to fail. If there are two men to a machine, water lines to the working face are good, as these provide a plentiful supply of water while drilling and for wetting down the muck pile at intervals. Spray attachments fixed to the drill are efficacious, when working, but are apt to be messy and a nuisance, and the history of most places where they have been tried records that the men soon have stopped using them. Squirt guns loaded from buckets of water that have to be carried to the working place are likely to be a failure, especially if the men have to carry water up to a stope or a raise. However, local conditions will usually determine which system is most adaptable. While water-hammer drills and water drills of the Jackhamer type have proved successful, there does not seem to be a wholly satisfactory water stoper for drilling overhead holes. The evolution of such a drill is, however, largely a question of demand. The reason why water stopers have not been as successful as other water drills is probably mainly because of the attitude of the men. Miners usually object to using water while drilling overhead, because of the discomfort that would be caused by the falling water. Proper laws, proper discipline and a little educational work would overcome this objection in time. It should be recognized that it is not sufficient to have a law compelling an operator to furnish dust-laying drills or appliances; the law should go further and make their use obligatory on the part of the miner and provide penalties for his failure to do so.

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*Article by Dr. A. J. Lanza, U. S. Bureau of Mines, Pittsburgh, Penn., presented before the mining-section meeting at he sixth annual congress of the National Safety Council, New York, Sept. 12, 1917

Effects of Insufficient Ventilation

Poor or inadequate ventilation is another source of danger to the miners' health. As in the case of siliceous dust, the metal mine, rather than the coal mine, is likely to be the offender. I shall include under this heading mines with high temperatures, excessive humidity, gases and powder smoke, as the lack of proper ventilation usually means one or more of the others. The complex problems of ventilation in metal mines, especially large mines, are within the domain of the engineer rather than the sanitarian, but the latter may point out the ill effects that result where ventilation is insufficient.

Where men work under conditions of high temperature and high relative humidity, there is an impairment of physical ability and vitality in proportion to the severity of the conditions. Experience has shown that such impairment begins when the temperature is above 75° F. and the atmosphere is saturated or nearly saturated. Where heat and dust are combined, and this combination is not infrequent, there result conditions especially arduous. Whether working in moist heat alone produces any permanent ill effect on the physical organism is a matter of dispute; but certainly the decreased vitality, if only temporary, affords a better chance for disease to take hold. Where the winter is severe, the sudden transposition from a hot working place to a cold one is a cause contributing to pneumonia and acute chest infections, which in turn help the advance of tuberculosis. Men with dust-injured lungs are particularly liable to pneumonia and chest colds. Among the lesser evils of poor ventilation is the effect of powder smoke, as it would seem that the headache and temporary disability caused by its fumes are the only damage it does. The presence of deleterious gases in sufficient amount to threaten life usually implies an emergency outside of the scope of the sanitarian. So remarkable are the benefits, so far as efficiency is concerned, where previously inadequate ventilation is remedied that further argument is unnecessary in its favor. An example of this came under my observation recently. The cost of driving a long drift, about 2000 ft. below the surface, was $15 per ft., paying on a day-labor basis; the place was hot and moist; a small blower fan was installed at the shaft, with a canvas pipe leading nearly to the working face. Without any other changes the cost was reduced to $8 per ft. In shaft sinking this mine had made 50 ft. in one month and 60 ft. in another. A small blower with canvas pipe was installed and the next month a progress of 120 ft. was made. No better evidence could be given of the deleterious effect of poor ventilation on working ability.

Requisites for Proper Hygiene Underground

Inadequate systems for the disposal of human waste underground will lead to promiscuous ground pollution. This is often an offense against decency, and where conditions are bad, may lead to the spread of hookworm disease, dysentery and possibly typhoid fever. In some of the southern and southwestern mines, this is a real menace. A proper latrine system, adequate to the size of the mine, should always be insisted upon even if it consist of nothing more than the use of empty powder boxes partially filled with sawdust or other material. It is a requisite for the success of any system, no matter how simple or how elaborate, that it shall receive sufficient attention to be kept clean and odorless. If this is not done, the system will fail. Careless disposal of human waste always involves grave possibilities of disease.

Drinking water underground is usually not of good quality. Too often is seen the keg from whose bunghole all comers drink, or to which is attached the cup or dipper. Common drinking devices are no longer excusable, they are dirty and dangerous. If the mine is piped for water, sanitary drinking devices should be installed. Any pipeman can readily improvise them. Where kegs must be used, the lid should be kept locked and so fixed that the men cannot drink from the keg but will be compelled to draw water from a spigot and to use their own buckets or cups.

Metallic poisoning, notably lead, is of importance in some places, whereas various lesser ills are peculiar to certain localities. These can usually be overcome by strict attention to personal hygiene, and the miners should receive instructions in this regard where necessary. However, give the miner good air, protect him from injurious dust and contamination by human waste, and his working place will be sanitary in the real sense of the word.

The coal miner in this country is apparently free from diseases which may be attributed to his occupation. Coal dust apparently does not do serious injury to the lungs and it is claimed by some that it confers actual immunity from tuberculosis. Natural circumstances have compelled the coal mine to be sanitary as far as ventilation and heat are concerned, while the metal mine has been lagging behind. Not that a great deal has not been accomplished in recent years toward improving working conditions, but exposure to dust and humid heat is still entirely too extensive.

In conclusion I urge that the mining section of the National Safety Council go on record as being opposed to the pernicious custom of dry drilling in hard rock Other countries have done away with it and there is no good reason why it should survive in this country Eradication of the practice of dry drilling will not entirely abolish the dust evil but it will be the first and most effectual step toward that end.

Coal Operators in Kentucky and Tennessee protested t the Federal Trade Commission on Sept. 11 that many mines in both states will be forced to close unless the price fixed by the President are revised upward.

Bauxite and Fuller's Earth in Georgia

The supply of bauxite at present is the subject of considerable attention among manufacturers of many different materials. It is also known that a prominent mining company with large interests throughout the United States has recently optioned bauxite properties both in the northern and southern parts of Georgia.

In this connection a brief report entitled "Bauxite and Fuller's Earth of the Coastal Plain of Georgia," just issued by the state geological department is timely The report, which was prepared by H. K. Shearer, assistant state geologist, contains 340 pages of printed matter and a large number of halftone illustrations, together with a geologic map of the coastal plain, showing the location of the individual deposits of bauxite and fuller's earth. The geologic formation of the Coastal Plain is discussed in the introduction, while Part I describes the mode of occurrence of bauxite, its distribution, physical and chemical characteristics, method of mining, preparation, uses, etc. Part II treats of the occurrence and distribution of the fuller's earth deposits of the region, description of individual deposits, methods of mining, uses, etc.

Just now there is an unusual demand for both bauxite and fuller's earth. The former, when made into aluminum, has an extensive use in time of war, in the manufacture of automobiles, aeroplanes, motor boats and all classes of camp equipment. As an alloy with copper it is used in manufacturing cartridges for rifles, shells, helmets, grenades, and, with soft iron, in making shell fuses. Aluminum dust with ammonium nitrate produces an explosive called "ammonal" which has the advantage of being insensitive and stable and also of remaining in perfect condition for a long period.

Georgia fuller's earth is now largely replacing the English fuller's earth which previous to the war was imported into this country for the refinement of cottonseed and petroleum oils.

Giant Blast by Temescal Rock Co.*

The Temescal Rock Co., of Corona, Calif., in a single blast recently broke up 897,000 tons of rock for its crushing plant without losing any of the shattered material over the edge of the 100-ft. bench that serves as the quarry floor. This was accomplished by a system of tunnels so driven that charges of quick-acting explosive would throw out the toe of the quarry face before the force of the remainder of the 48-ton charge was developed. Thus a barrier was formed which served to retain the major portion of the shattered material.

The rock from this quarry is crushed for use in concrete and is an altered rhyolite of eruptive origin, very dense and hard. The formation was solid, the strata inclining into the quarry face at about 16°. Tests of quarry specimens showed a weight of 167 lb. per cu.ft. and tensile and compressive strengths 2245 and 39,500 lb. per sq.in. respectively.

The duplicate tunnel systems were driven at the quarry-floor level, in each of which 18 explosive charges were placed. The tunnels were 3 x $3\frac{1}{2}$ ft. in section and all powder pockets were of such size as to allow $1\frac{5}{8}$ cu.ft. of space for each 100 lb. of powder in the charge. The tunnels were driven 140 ft. into the quarry face, and the charges were placed in drifts at right angles to the tunnels, as shown in the accompanying sketch. In the first, or outer, drifts the powder pockets were sunk 4 ft. below the quarry-floor level. In the second drifts the pockets were 2 ft. below the quarry floor, and in the third or last drifts the pockets were at quarry-floor grade.

The quantity and the grade of the several charges are given in the following table. Note that charges 13 to 18 consisted of the quick-acting explosive calculated to move the toe of the slope face first. The 60% powder

NO ROCK WAS LOST OVER THE EMBANKMENT DUE TO SPECIAL METHODS OF LOADING AND FIRING is simply the priming charge. The detonator used in firing these charges is known as Bickford cordeau, which is chiefly trinitrotoluol, and, in this instance was incased in a ⅜-in. tube. A single No. 8 cap detonated all the charges simultaneously. This cap was attached to one end of the line of cordeau, which was strung through the tunnels, each branch terminating in a 20-ft. coil embedded in the charge.

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*An article entitled "Large Blast Accurately Places 897,000 Tons of Rock" in "Eng. News-Record," Sept. 6, 1917.

QUANTITY AND GRADE OF BLASTING CHARGES

Load No.	Powder Charges					
	Tunnel No. 1 Grade and Quantity			Tunnel No. 2 Grade and Quantity		
	60%	40%	25%	60%	40%	25%
1	50		4,150	50		4,300
2	50		3,650	50		3,850
3	50		3,800	50		3,900
4	50		4,450	50		3,550
5	50		4,050	50		3,300
6	50		4,750	50		4,150
7	50		3,250	50		3,100
8	50		3,100	50		2,900
9	50		3,200	50		2,950
10	50		2,950	50		2,700
11	50		3,100	50		2,800
12	50		3,350	50		3,200
13	50	550		50	900	
14	50	850		50	850	
15	50	800		50	800	
16	50	800		50	750	
17	50	850		50	700	
18	50	950		50	850	
Total	900	4,800	43,800	900	4,850	40,700
Grand Total		95,950 lb.				

Measurements of the slope after the blast led to the estimate that the 897,000 tons of rock had been shattered by the blast. So effective was the work of the powder that only a slight amount of secondary shooting would be required to prepare the rock for the crusher—probably about one ton of 40% powder for bulldozing each 100,000 tons of rock.

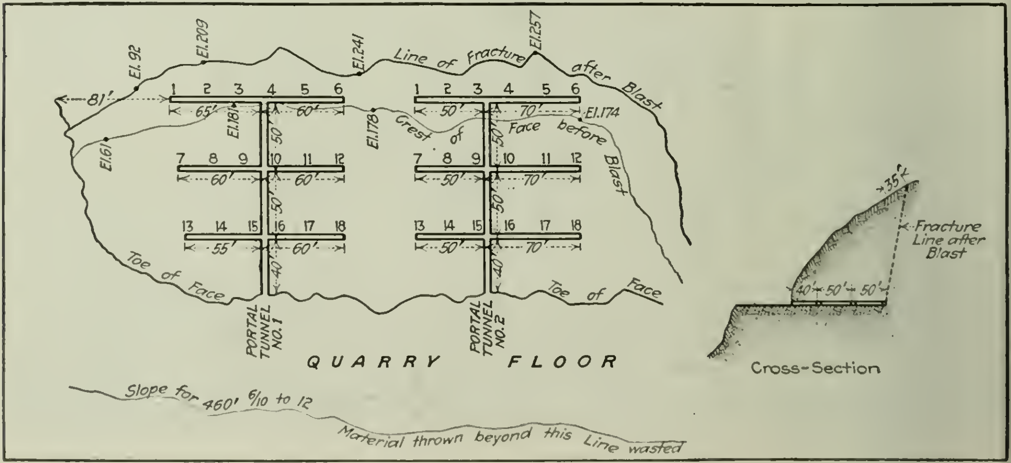


DIAGRAM SHOWING CHARGES AND QUARRY CRESTS

The cost of driving 1000 ft. of tunnel at $5 per foot was $5000. The cost of the explosive was $14,808, to which was added $96.72 for 1860 ft. of cordeau. Loading, tamping and incidental expenses amounted to $603, so that the total cost of the blast was $20,508, or about 2 c. per ton. The tunnel work and the placing of the charges was done under the direction of J. C. Costello (who supplied the foregoing information) and J. C. Cushing, engineers for the California Trojan Powder Company.

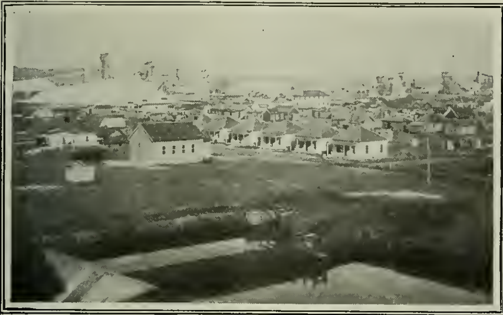
Chemists Display Their Progress

The Western front still holds but the lines of German manufacturers have fallen to American chemists. Evidences of the inroads made were everywhere apparent at the Exposition of Chemical Industries held in New York on Sept. 24-29. Over 300 exhibitors, representing every branch of the chemical and allied industries filled the three floors of the Grand Central Palace. There was something to interest both the technical man and the layman and to impress them with the importance of the chemist in the war's progress and also in everyday life.

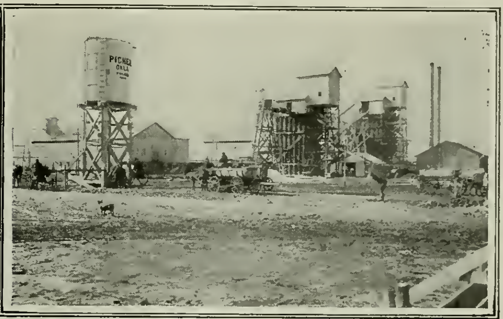
Among the many companies upholding the chemist's banner (or spatula) were the du Ponts who were represented in all the branches of their activity; the General Chemical Co.; Semet Solvay Co.; Roessler & Hasslacher; Eimer & Amend; American Cyanimid Co., J. T. Baker Chemical Co. and the Contact Process Co. The displays of laboratory glassware by the Corning Glass Works and the Whitehall-Tatum Co., were notable. The Thwing Instrument Co. showed pyrometers and the Bristol Co. all kinds of recorders. From Denver came exhibits of Wm. Ainsworth & Son, the Denver Fire Clay Co., and the Mine and Smelter Supply Co. Mineral exhibits were abundant; the Freeport Sulphur Co., the St. Lawrence Talc Co., and the Foote Mineral Co., had displays. Several railroads sent exhibits, chief among which was that of the Southern Railway.

Of particular interest to those in mining and metallurgy were the displays of the Anaconda Copper Mining Co., the American Metal Co., the Canadian Department of Mines, the Chile Copper Co., the Dorr Co., Goulds Manufacturing Co., Groch Centrifugal Flotation, Ltd., of Cobalt, Ont.; Hardinge Conical Mill Co., the Huff Electrostatic Separator Co., the Oliver Continuous Filter Co., the Pennsylvania Salt Co., the Raritan Copper Works; Joseph P. Ruth, Jr., (flotation machine) Sturtevant Mill Co., American, Kelly and Sweetland filter presses, Tennessee Coal, Iron and Railroad Co., and Virginia Smelting Co. The Buffalo Foundry and Machine Co. had the most pretentious machinery exhibit.

Views from Joplin Zinc-Lead District

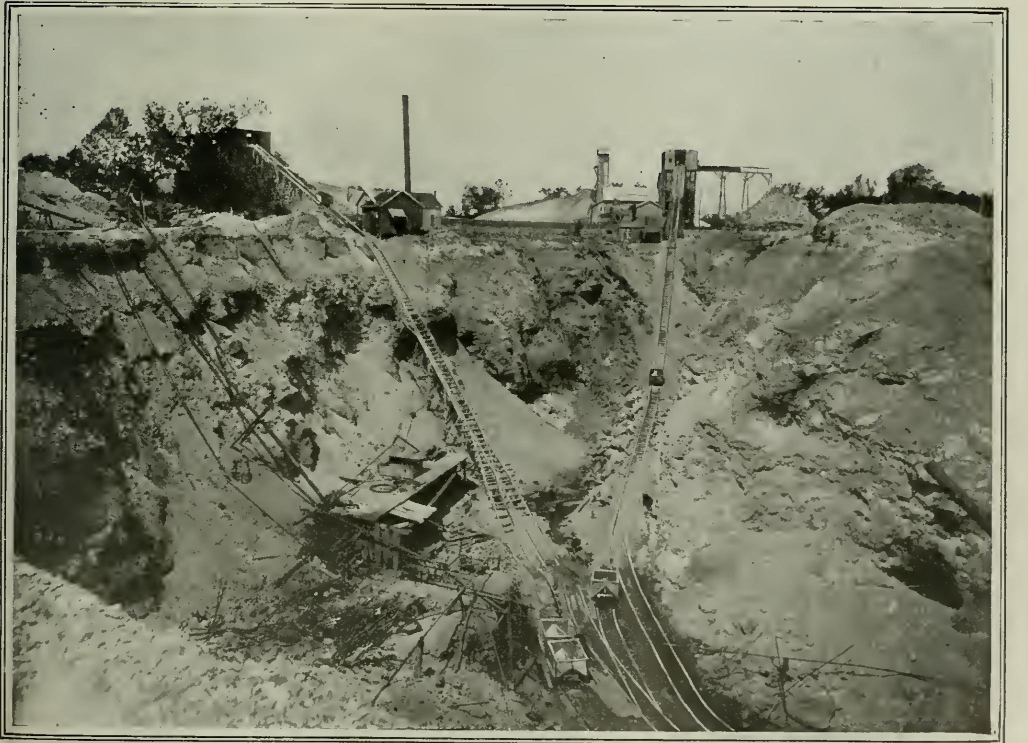


PICHER, OKLA., TWO-YEAR OLD MINING CAMP OF 5000 INHABITANTS, JOPLIN DISTRICT

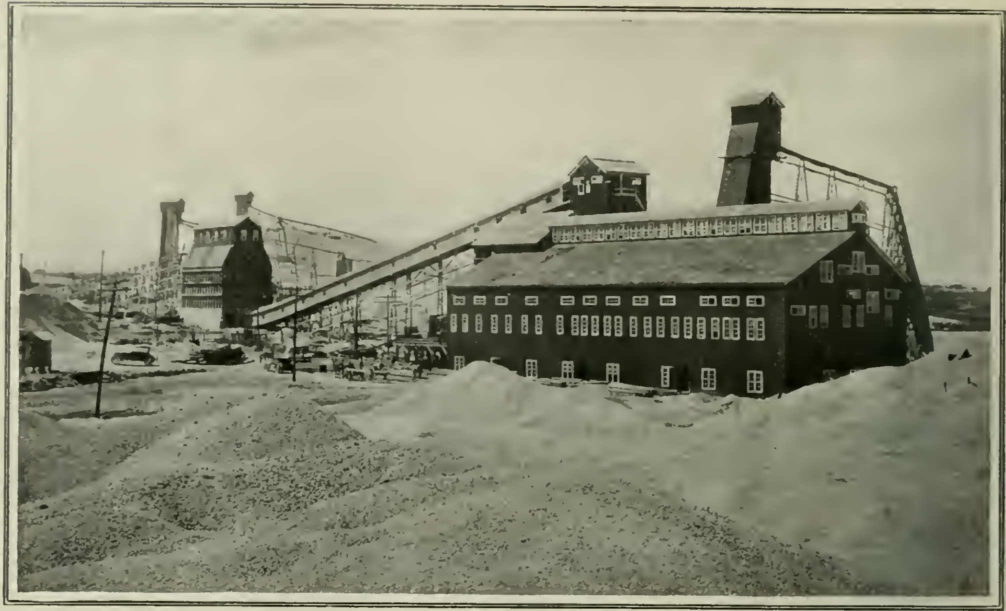


NETTA MILL, PICHER, OKLA. ONE OF THE LARGEST CONCENTRATING PLANTS IN THE DISTRICT

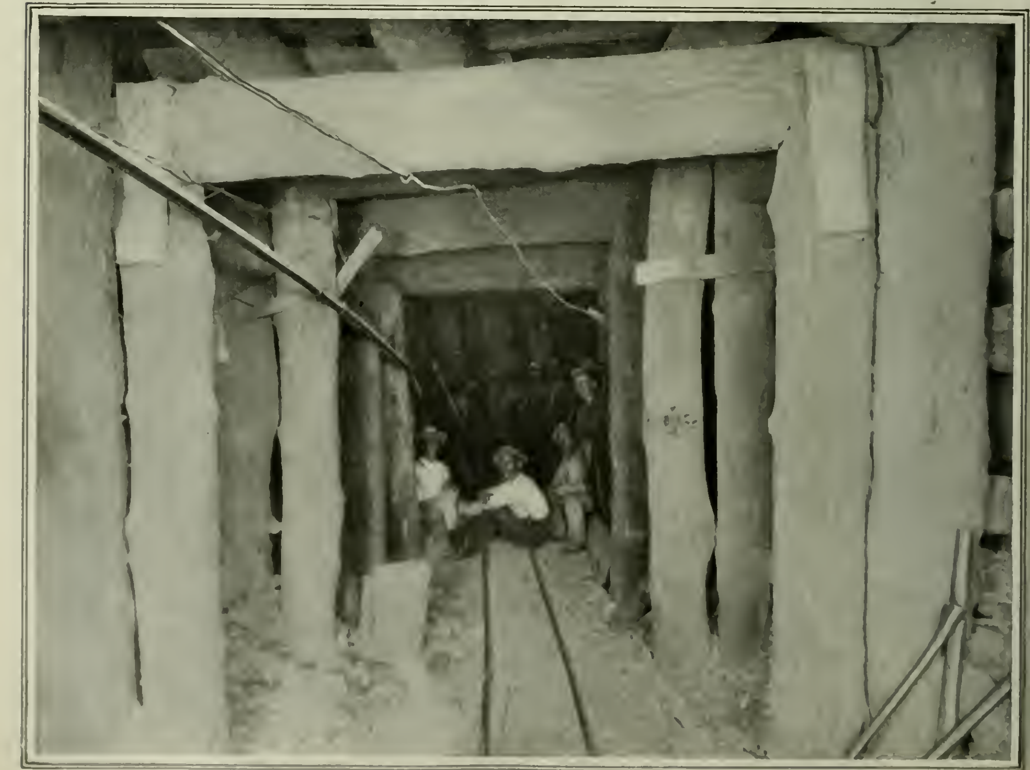
The Joplin district covers an area which includes southwest Missouri, southeast Kansas and northeast Oklahoma. There are over 100 mills in operation and in course of construction in the district treating the zinc-lead ores from 1000 mines operated by nearly as many companies. The ores occur in small lenticular bodies as replacements in a cherty limestone of Mississippian age, known as the Boone formation and forming the so-called soft ground mines. The "sheet-ground" mines are more extensive laterally and are found in a cherty bed below the soft ground deposits, varying from 8 to 50 ft. in height. Joplin produces more zinc than any other district in the country and is noteworthy for its low cost of mining.



OPENPIT MINE AT CARL JUNCTION IN THE JOPLIN DISTRICT OF MISSOURI



THE NEW ORONOGO CIRCLE MILL OF THE CONNECTICUT ZINC CORPORATION
One of the district's largest mills; rated capacity 2000 tons daily; fed mainly with ore from steam-shovel cuts.



HEAVY TIMBERING IN SOFT-GROUND MINING, JOPLIN DISTRICT, MISSOURI

RAMAGE MINING CO.'S NEW MILL AT DOUTHAT, OKLA.
This mill has just been completed and has a capacity of 250 tons per shift. The company will install an experimental flotation plant

UNDERGROUND MINING AT THE MISSION MINE, LINCOLNSVILLE, OKLA.
In the "sheet-ground" mines of the Joplin district the ore is broken from the breast and shoveled into "cans" or buckets placed on trucks, trammed to the shaft, and the cans hoisted to the surface

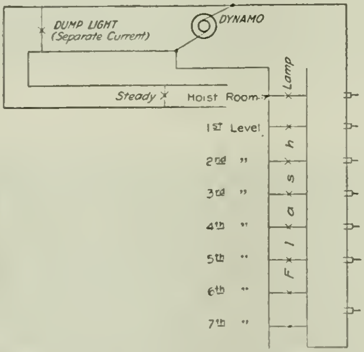
Details of Practical Mining

Electric Signal System for Shafts

In small outlying mines, where power cost is high, only a bell-rope system of signals is to be found in general use. Many accidents have occurred from conflicting signals on the same bell-rope, and wherever this possibly can be avoided by a simple and inexpensive installation there is little excuse for neglect.

If the mine is hoisting from several levels by cages or skips, it probably also operates a compressor. A small dynamo sufficient for a dozen lights or more can be belt-driven from a countershaft belted to the compressor, without noticeably affecting the load.

Electric lighting at shaft stations is so desirable as to require no further comment, and if electric lamps, placed one at each station and one in the hoist room, can be made to serve as a signal also for calling the cage or skip, a double purpose is accomplished.



WIRING DIAGRAM FOR DIRECT-CURRENT FLASH SIGNAL SYSTEM

To illuminate shaft stations a two-wire parallel circuit is all that is necessary. To make it serve as a signal system a third wire in the shaft is required, as shown in the diagram, and a small but stout two-point switch is put in circuit with this third wire at each station.

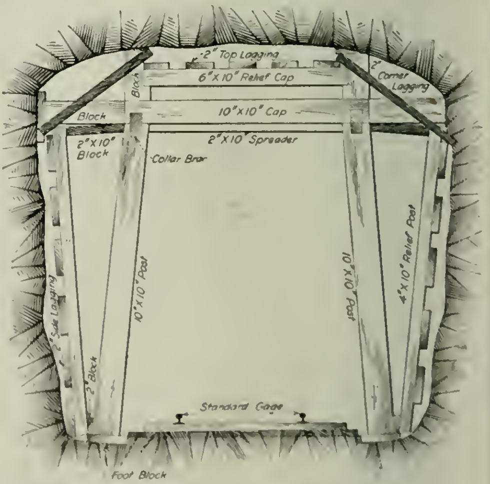
When all the switches are closed all lights are on, but when any one of the switches is open all the lights on the circuit flash out. By flashing out the lights from any station switch according to the signal code in use at the mine the hoist engineer and cagers know simultaneously which level is calling the cage, and at the first opportunity the cager goes to that level by signaling the hoist engineer with the bell rope to send the cage to that level.

By proper insistence all hands but the cagers are thus kept off the bell rope, and station calls cannot be confounded by hoisting or lowering bell-rope signals given from the deck of the cage. Danger from misunderstood signals is far greater with skips in use than with cages. In this case an additional lamp should be placed at each pocket skip-loading platform as well as at each station. Economy in power or greater intensity of illumination can be had by loosening each of the lamps in its socket at all skip-loading stations except the one in immediate use. This decreases the load by nearly 50% of the total number of lamps.

Additional lamps in the hoist room, compressor room, and on the dump, etc., can also be put in a separate circuit with the dynamo and will not be affected by the flashing from the shaft-signal system.

Timber Sets for Large Tunnels in Swelling Ground

The drawing shows a typical timber set such as is in use in the Niagara tunnel of the Burro Mountain Copper Co., Tyrone, N. M. The tunnel is approximately a mile long and for the most part in ground that requires such timber sets. The tunnel is designed for the passage of 30-ton railroad-ore cars of standard gage with the minimum practicable amount of clearance for cars and motor. Where the ground swells it is imperative that this clearance does not become diminished and this object is accomplished effectively by the use of relief caps and posts that take all the bending stress and can be relieved or replaced if necessary without hindrance to the passage of trains.

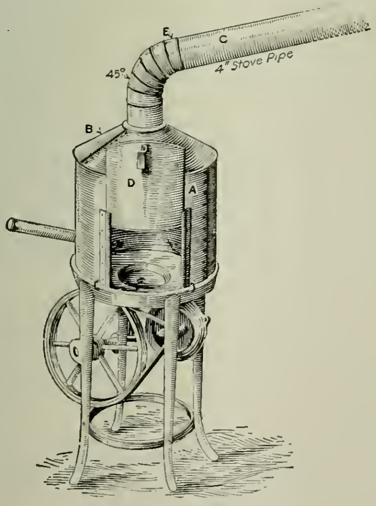


RELIEF SET FOR DRIFT IN SWELLING GROUND

In the drawing the cap rests on battered posts. A 2-in. spreader is nailed under the cap and the long cap end blocks are set against headboards. The posts likewise rest on foot blocks. A relief cap is set over the main cap somewhat as shown and supports 2-in.-spaced lagging overhead between sets. The two relief posts project laterally at all angles but usually, as in drawing, being separated at top and bottom from the main posts by 2-in. blocks. The side lagging consists of 2-in. boards and these are set outside the relief caps and are held against them by a single piece of cross lagging (not shown in drawing) which is blocked against the side of the drift. Small blocks placed between the lagging at the ends keep them properly separated. To protect the corners between sets over the collar braces, short 2-in. lagging is set diagonally, as shown, the ends resting on the top and side lagging or other bracing as sometimes used. The main sets are mostly 10 x 10-in. square timbers but the dimensions of the relief sets shown in the drawing vary in different parts of the tunnel. The main object is to design relief sets that will fail before the main sets become affected by the squeezing of the ground. As soon as a movement is started the bending of the relief timbers gives the warning and the pressure can be relieved by trimming down the back and sides between the lagging and around the blocking.

Hood for Portable Forge

At a small prospect in the tropics a portable forge was used for sharpening and tempering drills and for miscellaneous jobs. As the smithy, carpenter shop, office, etc., were all under one inflammable roof, it was not what an insurance man would call a good risk. The cheapest remedy was to put a hood on the forge, such as is shown in the accompanying sketch. The cylinder *A* and the inverted funnel or cone *B* were made of heavy galvanized iron, firmly riveted together. This contrivance was fastened to the forge proper by boring suitable holes in the rim of the cast-iron hearth and in the base of the cylinder *A*. Loops of telegraph wire were then passed through and twisted inside before the clay hearth was tamped in.

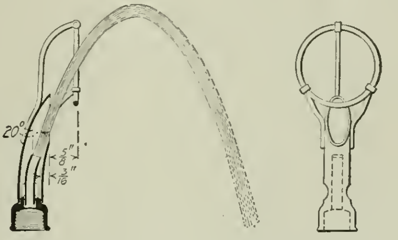


PORTABLE FORGE HOOD

A light-weight galvanized stove pipe *C* was connected with the hood by a 45° elbow, so that the products of combustion could be discharged at a suitable distance outside the building. The door *D* was made to slide up and down in simple guides. For special kinds of work, two such doors might be advantageous. At first a piece of wire cloth was inserted in the elbow at *E* as a spark arrester, but it was found to be troublesome and unnecessary. All the sparks and cinders came to rest in the inclined pipe *C*, the cleaning of which when cold was a simple matter.

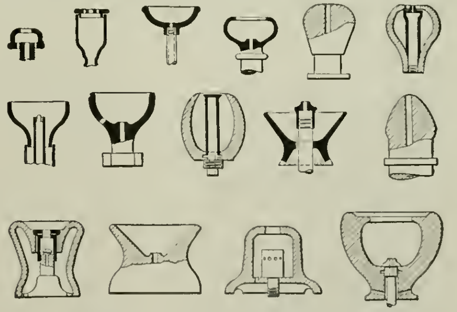
Types of Drinking Fountains

Tests of 77 drinking fountains of 15 different types at the University of Minnesota, according to *Engineering News-Record* showed that due to improper design all were possible sources of infection of the users. No less than 80% of the fountains and the water from 11% of them contained streptococci, although none were found in the water supplied to the 18 buildings in which the fountains were located. The infection was due to contact between the lips of users and the structure of the fountains, or to water falling back from lips to fountains, owing to vertical discharge of the jet.



THREE TESTS OF THIS PROTECTED DRINKING FOUNTAIN SHOWED NO STREPTOCOCCI INFECTION

To keep lips away from the fountain structure and water from falling back on it, and to prevent water from being retained in fountains with cup- or ring-shaped depressions, the fountain shown herewith was designed. Three bacterial tests showed no streptococci on either the fountain or the water discharged from it. The study here outlined is reported in detail in a paper by H. A. Whittaker, director of the Division of Sanitation, Minnesota State Board of Health (Reprint No. 397, Public Health Reports, Washington, D.C.). George W. Putnam assisted in the investigation.



TESTS SHOWED 80% OF THESE FOUNTAINS TO BE INFECTED WITH STREPTOCOCCI

Events and Economics of the War

A heavy blow against the I. W. W. has been struck by the Government in the indictment and arrest of over 200 prominent members of the organization on a charge of seditious conspiracy. The leader Haywood was held in $25,000 bail. The campaign for the second Liberty Loan has begun with the objective of raising a minimum of $3,000,000,000. The Trading-with-the-Enemy act has become law, incidentally placing in the President's hands the long-sought power of censorship over the press. The creation of an Aircraft Production Board of nine members has been approved of by Congress. The Senate passed the $8,000,000,000 deficiency bill and adopted the War Revenue bill unanimously as amended in conference. San Francisco ship strikers have been ordered back to work; coal miners in the central field have demanded an increase in wages. The President has fixed the retail price of coal. Hundreds of German messages passed through Swedish channels have been turned over to the Argentine ambassador by Secretary Lansing.

The British have defeated the Turks beyond Bagdad, capturing a general and 4000 men; further advance was made by Haig east of Ypres. In France, Bolo Pasha, a native Frenchman, has been arrested as head agent for German propaganda. The Italians have driven the Austrians from heights in the Isonzo sector. In Russia, the conflict between contending factions goes on. In Argentina, President Irigoyen has so far prevented a declaration of war against Germany; a strong sentiment for neutrality is said to be growing.

Steel Men Receive Instructions on Priority

Twenty-five thousand circulars, giving instructions as to priority in orders and work for all individuals and firms engaged in the production of iron and steel and in the manufacture of articles and implements therefrom, have been sent by Judge Lovett to manufacturers in all parts of the United States.

The War Industries Board divided industry into three classes, directing that preference in transportation of iron and steel and their products be given to them in the order of their importance as related to the conduct of the war. Class A, comprising war work, comes first; Class B, comprising industries indirectly related to the war, second; and Class C, comprising all other industries, last.

War orders of the Allies will be placed in Class A, as will those of the United States. Contracts already placed by the War or Navy departments or by the Emergency Fleet Corporation will be placed in subdivision A1. Orders already placed by the Allies will be put in A2. Orders and work in Class A will take precedence irrespective of the date the orders are given. Both Classes A and B will be divided into subdivisions, as A1, A2, A3, A4, etc., each comprising orders within its class which are regarded respectively as of greater moment. All materials required in the manufacture of an article will be classed with the article itself.

Certificates will be issued on application specifying the classification of the work. Certificates of a subsidiary nature will be issued on request for the furnishing of material and articles required in the manufacture of the commodity ordered. Applications for Class A certificates will be made by the contracting officer of the United States department making the purchase and in the case of the Allies by their agents. Applications for subsidiary certificates covering materials for Class A work will be made by the producer. Applications for Class B certificates will be made by purchasers, as will subsidiary certificates in Class B.

Government Will Purchase Nitrate

Ten million dollars was recently appropriated by Congress for the purpose of securing nitrate of soda, at the discretion of the President, and supplying it to farmers at cost for cash. In regard to this the Secretary of Agriculture has made the following announcement:

> It is proposed to coördinate all the Government purchases of Chilean nitrate for this country through the purchasing committee of the War Industries Board, under the immediate supervision of Mr. Baruch, so that there will be no competitive bidding for this material. . . . The price of nitrate on board ship in Chile has greatly increased within recent months without justification. Shipping rates also have increased. The increase is due in part to unfounded statements regarding the demand for Chilean nitrate for munitions purposes and for fertilizer, especially in connection with the $10,000,000 recently appropriated by Congress to purchase nitrate of soda. As a matter of fact, the demands of this country for nitrate of soda will be smaller than heretofore. . . . The quantity which may be purchased for fertilizer use under the special appropriation of Congress will not be an addition to the quantity normally used, but will simply take the place in part of quantities heretofore supplied to the farmers through private agencies.

Incorrect rumors caused by this announcement have led the Secretary of War to issue the following:

> Statements having appeared in certain publications indicating that the United States is intending to make at once very large purchases of sodium nitrate for the purpose of immediately establishing a war reserve of 500,000 tons of that material, the Secretary of War authorizes the denial of such intention. No such large purchases have been made or are contemplated, but, on the contrary, practically all the sodium nitrate which it has been planned to procure for the gradual building up of the war reserve, which has been in progress for years, has already been contracted for.

Garfield Rules on Coal Traffic

The following rulings on coal-traffic questions have been made public by the Fuel Administrator, Dr. Harry A. Garfield:

> Operators who maintain their own sales department, whether in their own name or under a separate name, and dispose of coal directly to the dealer or consumer are not to be regarded as "jobbers" and may not charge the jobber's commission specified in the President's proclamation of Aug. 23.
>
> Free coal shipped from the mines subsequent to the promulgation of the President's order shall reach the dealer at the price fixed in the President's order, plus only a proper jobber's commission (if purchased through a jobber) and transportation charges, provided, however, that in no case shall the jobber's commission exceed 15c. per ton of 2000 pounds.
>
> Coal from wagon mines or coal delivered from mines direct to the consumer by wagon or truck may be sold at the President's price, plus a sum representing the cost of hauling.

> Coal bought by a railroad for its own use as fuel, from a wagon mine, may be sold at the President's price, plus a sum representing the cost of hauling.
>
> If the claim is made that any specific coal has been acquired by the dealer in accordanec with a bona fide contract, enforceable at law, existing prior to the date of the order of the President applicable thereto, the burden of proof is upon the dealer and other parties to the contract to establish these facts.

The effect of the President's proclamation upon coal rolling when the proclamation was issued is to be decided by first ascertaining whether or not the title had passed from the operator to the consignee at the time the proclamation became effective.

Second Liberty Loan Launched

The terms of the second Liberty Bond issue have been announced by the Secretary of the Treasury. Subscriptions were opened on Oct. 1. The amount that is offered is unlimited, with $3,000,000,000 as a minimum. The total issue will be for $3,000,000,000 plus one-half the amount of the oversubscription. The bonds will mature in 25 years and are redeemable, at the option of the Secretary of the Treasury, in 10 years. They will be issued in denominations of $50 and multiples of $50 and will bear interest at 4%, payable semi-annually, on Nov. 15 and May 15. The terms of payment are 2% upon application, 18% Nov. 15, 40% Dec. 14, and 40% Jan. 15, 1918. Bonds of this issue may be converted into bonds of any succeeding issue bearing a higher rate of interest than 4%, during the period of the war, if such conversion is made within six months of the issue of the higher rate bonds.

Coal Miners Again Ask Raise

Demands for wage increases of 25 to 70% have been made by representatives of the coal miners in the central competitive field. Specifically they call for (1) an increase of 15c. a ton for pick and machine mining at all basing points; (2) the percentage of advance granted in machine mining to be applied to all differentials existing between thick and thin veins; (3) an advance of $1.90 a day for all day men; (4) a 20% advance on all yardage and dead work.

The demands have been refused by the operators, who have conferred with the miners' representatives, on the ground that it was impossible to grant them unless the Government revised the prices on bituminous coal. A plea for efforts to obtain a maximum production of coal during the war was made by the Fuel Administrator, Dr. Harry A. Garfield, at the conference. No decision has been reached. Although the advances asked are only for the central district, the wage scale operative in this field serves as a standard for the rest of the country.

Dangers of Bureaucracy

The increasing Federal control over business will necessarily expand the Government's payroll and create hordes of officials of varying importance and of equally varying efficiency. Of course, an increase in salary expenditure is no cause for worry to this multi-billionaire nation, especially when it is obtaining genius for but a dollar a year in so many cases. But a situation such as is said to exist in England at present may well be viewed with alarm. There, if we may believe the London correspondent of the New York *Evening Post*, one is ever in danger of stubbing his toe over the omnipresent official.

> Dislike of bureaucracy has ordinarily been a British characteristic. Little did the Briton imagine that a day would ever come when many of his own compatriots would lament that England was herself fast developing into an official-ridden country. Yet that is precisely what is happening now. Lord H. remarked the other day in parliamentary debate that new officials seemed about as numerous as iron crosses in Germany.
>
> This immense expansion of the civil service has been one of the inevitable results of the war. The emergency has compelled the Government to lay a restrictive and regulating hand upon almost everything. "Control," in detail, as well as on a large scale, has been one of the watchwords of wartime, and you cannot control the citizen's activities in so many directions, without setting up a huge body of controllers. The functions of most of the old Government departments have been enlarged and many new departments have been created. There have been instituted a Ministry of Munitions, a National Service Ministry, a Ministry of Food Production, a Ministry of Food Control, a Labor Ministry, a Pensions Ministry, a Ministry of Shipping and, latest of all—but who will confidently say it will be the last?—a Ministry of Reconstruction. Each of them has had to find headquarters of its own and to organize an adequate staff for its operations.
>
> What is happening in some instances was thus described not long ago by a city correspondent of the *Times*: "Firms of the highest standing," he said, "have no objection to very heavy taxation—they know that the war has to be paid for—but they do object very strongly to the transfer of businesses, which have taken generations to build up, into the hands of officials, the qualifications of some of whom are being strongly criticized. It is worth remembering that the firms have assumed obligations toward those of their staffs who are now serving with the forces, and while business after business is being transferred to Government hands, their income derived from legitimate enterprise is ceasing."

Procedure in Controlling Exports of Gold and Silver

A statement has been issued by the Federal Reserve Board in regard to the export control of coin, currency and bullion. As to exports of gold and silver it reads:

> It will be the general policy of the board not to authorize the exportation of gold unless the shipment applied for is shown to be connected in a direct and definite way with a corresponding importation of merchandising for consumption in the United States, but in any case authorization will be granted only where the exportation of gold in payment for such merchandise is found to be compatible with public interest. . . .
>
> Applications for the exportation of silver bullion and silver coin of foreign mintage will in general be approved by the Federal Reserve Board upon recommendation of the Federal Reserve bank with which the application is filed.

Travelers leaving the country may carry American silver dollars, subsidiary silver coins and silver certificates not to exceed $200 for each adult; gold coin or certificates not to exceed $200 for each adult.

To Requisition Merchant Vessels

Every American merchant vessel of more than 2500 tons dead-weight capacity available for ocean service will be requisitioned by the Government on Oct. 15, the Shipping Board has announced. In most instances, except where required for actual Government service, the ships, it was said, will be turned back to their owners for operation on Government account subject at all times to any disposition the Shipping Board may direct.

Within less than six months virtually every one of the 458 American vessels now available for ocean service, including regular liners, will be either in the service of supplying American troops and warships abroad or in trades considered vital to the conduct of the war. The intention of the Government is to replace ships drawn from regular trade routes and from the coastwise service with neutral tonnage, for which negotiations now are pending with neutral governments. Foreign ships will be admitted into the coastwise service by suspension of the coastwise shipping laws. A bill to make this suspension possible is before Congress.

Oil Legislation in Great Britain

The possibility of developing oil in commercial quantities in Great Britain has been so impressed upon the British Government that a bill, known as the Petroleum (production) bill, was introduced in the House of Commons on Aug. 15. Its declared object, according to the *Mining Journal* (London), is to "vest all petroleum in the Government." The nationalization of mines in Great Britain, already effected, has hitherto been represented as a purely temporary movement, but, continues the *Journal* "such a development as that now presented suggests that it may not be altogether easy to revert to the *status quo ante* after the war." The waste of capital and oil, as well as the depletion of fields, caused by private competitive drilling, has apparently been impressed upon the Government by its American advisers.

The bill, as abstracted by the *Journal*, places in the hands of the Government all rights to "get" petroleum and to lease and define petroliferous areas; it provides for the payment of oil obtained within the defined zone by fixed royalties. It also prescribes the terms and conditions under which operators must work, in accordance with schemes to be fixed by the Board of Trade, and sets up the machinery necessary for the purpose. During the war, work must be done under the Defense of the Realm act. After the war the acquisition of surface on which to drill or to erect works may be made under those provisions, by private bill or by provisional order.

Referendum on Price Control

A referendum to ascertain business opinion on price control is being sent forth by the Chamber of Commerce of the United States, which carries a committee recommendation that the National Chamber favor additional legislation to create authority to control prices during the war. It is recommended that this authority should be extended to all articles which have importance in basic industries as well as in war, and which enter into the necessaries of every-day life; to raw materials and finished products; to the prices the public pays as well as those paid by the Government; that it should be administered by a small executive board appointed by the President.

It is also recommended that an agency working in harmony with the board controlling prices should have authority to distribute available supplies to those purchasers whose needs are most directly related to the public welfare; and that each leading industry and trade should create a committee to represent it in conference and to advise with these agencies and the board.

Army Motor Truck Standardized

The designing of the new standardized military truck which must meet the field-transportation problem of modern warfare, has been completed, the Secretary of War has announced. A sample chassis, representing the efforts of about two score truck specialists, will be ready by the middle of October. The new truck will be made in two models, class A and class B. The engine used in the two will be the same in design, except for slight differences in cylinder bore, pistons, piston parts, and riggings. Interchangeability of parts will be possible to a large degree. Class A model will have an actual commercial capacity of three tons and the class B model one of five tons. Both trucks will have a two-wheel drive with a speed requirement of 14 and 12 miles respectively for classes A and B. The adaptability of the new trucks to commercial as well as military uses is indicated by arrangements now being made by a number of manufacturers to produce them for commercial purposes.

Mail Delivery by Airplanes

All military airplanes and motor vehicles not serviceable for war purposes or which, after the war, may be dispensed with for such use will be turned over to the Post-Office Department, if Congress acts favorably upon the joint recommendation of the Postmaster General and the Secretary of War, already approved by the President. Airplane mail routes will be established in this country, if this authority is obtained, as soon as any machines are turned over to the department. Italy and France both have aërial mail routes, the former to Sardinia and the latter to Corsica. Italy is said to be able to deliver in this way 500 lb. of mail in two hours. Discarded motor trucks will in like manner be used in the parcel-post service.

Inflation and High Prices

World inflation, as one of the causes of world advance in prices, is discussed in the current issue of *The Americas* issued by the National City Bank of New York. The author of the article, O. P. Austin, the bank's statistician, calls attention to the fact that world money and world "promises to pay" money have enormously increased during the period in which prices have been so rapidly advancing. World currency, he says, has increased 80% since 1913, world national obligations 142%, and world population only 2½%, while prices of commodities show advances ranging from 60 to 100% in the same period.

Larger Mint Capacity Urged

Methods to increase capacity of mints for coining subsidiary silver were discussed at a conference in San Francisco, on Sept. 13, by heads of various mints and superintendents of Government refineries. Dr. R. B. Baker, director of mints at Washington, presided. General revision of working schedules, ways and means of increasing coinage and revision of assay methods were among the subjects for discussion. The conference was said to be the outcome of the advance in silver quotations.

Industrial News from Washington

By Paul Wooton, Special Correspondent

Exports Board Conservation List

A complete list of the commodities forming what the Export Administrative Board terms its conservation list has been announced as follows:

> Acetone, alcohol, aluminum, ammonia salts, ammonia nitrate, anhydrous ammonia, animal fats, arsenate of lead, arsenate of soda, boiler tubes (iron and steel), boring mills, vertical, 42 in. and larger, butter, carbolic acid (phenol), castor oil and castor beans, caustic soda, chrome nickel steel, cotton linters, cotton-seed oil, cyanide of sodium, ferromanganese, ferrosilicon, ferrovanadium, flax, foodgrains (including, among others, wheat, barley, corn, rice, oats and rye); glycerin, iron and steel plates, including ship, boiler, tank and other iron and steel plates ⅛ in. thick and heavier and wider than 6 in., whether plain or fabricated; lard, lard compound, lathes with 30 in. swing and larger, mercury salts, nitrate of soda, nitric acid, nitric salts, oil-well casing, oil cake, oil-cake meal, phosphoric acid, phosphorus, pig iron, planers, metal working, 36 in. wide and larger; potash and chlorate of potash, potassium salts, saltpeter, scrap iron, scrap steel, search lights and generators (suited for army and navy use), soaps, sodium sulphite, spiegeleisen, stearine and stearic acid, steel billets, steel blooms, steel ingots, steel sheet bars, steel slabs, sugar, sulphate of ammonia, sulphur and sulphuric acid, superphosphate, tallow, tinplate, toluol, tungsten, vegetable oils, wireless apparatus, wheat, wheat flour, wool rags.

Conservation of the articles on the list is necessary, the Board announces, on account of the limited supply and the needs of the United States, in order that it may prosecute the war advantageously. Exceptions will be made, however, when supplies of these articles are destined for actual war purposes or when they will contribute directly to the same end. In certain unusual cases, when export of these commodities will aid in the immediate production of important articles required by the United States, licenses will be granted. The Board is discouraging applications by telegraph for licenses. It has been announced that no preference will be given telegraphic applications.

Census of Engineers and Chemists Completed

In connection with the census of mining engineers and chemists, undertaken by the United States Bureau of Mines, in coöperation with the American Institute of Mining Engineers and the American Chemical Society, the Bureau has analyzed the returns in a forthcoming publication. Of the 22,000 names which have been classified 15,000 are of men affiliated with chemical industries and 7500 are of those engaged in mining. The returns show that 1840 of the mining engineers have had actual mining experience in gold and silver mines; 1758 in copper mines; 1795 in coal mines; 1384 in lead and zinc mines; 842 in iron mines and 1045 have specialized in petroleum geology.

A separate classification was made of mining engineers, who have had more than one year's experience in a foreign country. Mexico leads this list with 679. Canada is in second place with 384. South America comes third with 241. Other countries in the list are as follows: Africa, 74; Australasia, 46; Austria-Hungary, 7; Central America, 74; Cuba, 68; Belgium, 6; Denmark, 1; France, 23; Great Britain, 116; Germany, 61; Holland, 2; Italy, 5; Norway and Sweden, 19; Russia, 25; Spain, 7; Switzerland, 8; Far East, 105; Greenland, 3; India, 11; Newfoundland, 7; West Indies, 17.

Defense Council Committees Reassured as to Status

In view of an official statement issued by the Council of National Defense, members of its committees, who felt some uneasiness as to their status since the enactment of the food-control law, have been reassured and those who had submitted tentative resignations have agreed to continue to serve. The Defense Council's statement is as follows:

> The function of all advisory or coöperative committees of industry of the Council of National Defense is to advise and furnish information to the Director of the Council of National Defense, the War Industries Board, or members thereof, when called upon to do so or upon the committee's own initiative, regarding industries in their relation to the war needs of the United States and the Allied Governments.
>
> In view of Section 3, of the Food Control Law, of Aug. 10, 1917, . . . it will be seen that in making recommendations regarding contracts or orders, every member, agent or employee interested as defined in the law, must not only make a written disclosure of his interest to his own committee but also himself disclose such interest in writing to persons or bodies receiving his or his committee's recommendation. Furthermore, the disclosure . . . must be made whether or not members participate in their committee's recommendations or actions.

Further Price Increase Needed To Stimulate Manganese Mining

An increase of 20% in the price of manganese ores would result in many western properties being able to double their production. This is one of the conclusions formed by J. B. Umpleby, of the United States Geological Survey, who just has returned to Washington after an examination of manganese deposits at Leadville and Red Cliff, Colo., Phillipsburg, Mont., Pioche, Nev., Silver City, N. M., and Shumla, Texas. The inquiry was particularly concerned with the reserves of ore in these districts and reports will be immediately prepared for publication.

Ten producers at Leadville are shipping ores running from 20 to 25% Mn. This ore contains from 25 to 30% Fe. Shipments of 500 tons per day are being made of material of that grade. At Red Cliff, Colo., a considerable tonnage of manganiferous ores occurs under a heavy outcrop and has been partially developed. This material is of satisfactory grade and only a slight advance in the present price will make its extraction profitable. Phillipsburg is shipping more high-grade manganese ores suitable for making ferromanganese than any other district in the United States. These shipments are going to Chicago, Ill., to Birmingham, Ala.

to Pittsburgh and to electric furnaces on the Pacific coast. The ore runs better than 40% Mn, contains less than 5% Fe and 12 to 20% SiO_2, Mr. Umpleby finds. There are 17 operators in the district, having a combined output of 500 tons a day.

At Pioche a large tonnage of ore suitable for making spiegeleisen is available but its value as a flux, together with its lead and silver content, makes its sale to smelteries more profitable. At Silver City ore is being recovered in considerable quantities from surface cuts. It averages 16% Mn and 35% Fe and is low in silica. Mr. Umpleby believes that the successful use of spiegeleisen at some of the steel mills is certain to lead other steel makers to resort to its use and that this will increase the demand for low-grade manganiferous ores, thereby stimulating mining operations in the manganese-producing districts of the West.

Assessment Bill Passed

Suspension of annual assessment work on mining claims during 1917 and 1918 is provided in a bill which is now before the President for his signature. The bill as it passed the Senate suspended all annual assessment work on mining claims during the war with Germany; the bill as it passed the House limited the suspension to the year 1917. The conferees effected a compromise whereby the suspension of the work was limited to the two years. It is understood that the bill meets the President's approval and will be signed by him within the next few days. The important sections of the bill now read as follows:

> That in order that labor may be most effectively used in raising and producing those things needed in the prosecution of the present war with Germany, that the provision of Sec. 2324 of the Revised Statutes of the United States which requires on each mining claim located, and until a patent has been issued therefor, not less than $100 worth of labor to be performed or improvements to be made during each year, be and the same is hereby suspended during the years 1917 and 1918.
>
> Provided, that every claimant of any such mining claim in order to obtain the benefits of this resolution shall file or cause to be filed in the office where the location notice or certificate is recorded on or before Dec. 31, of each of the years 1917 and 1918, a notice of his desire to hold said mining claim under this resolution.
>
> Provided further that this resolution shall not apply to oil placer location claims and this resolution shall not be deemed to amend or repeal the publication, entitled "Joint Resolution To Relieve the Owners of Mining Claims Who Have Been Mustered Into the Military or Naval Service of the United States as Officers or Enlisted Men From Performing Assessment Work During the Term of Such Service," approved July 17, 1917.

Metal Exports Show Large Increase

Exports of zinc manufactures during the year ended June 30 were $66,108,586, according to a statement issued by the Department of Commerce. This compares with $406,208, the value exported in the fiscal year which ended in 1914. Copper and copper manufactures exported in the same fiscal years were $322,284,174 in 1917, as compared with $146,222,556 in 1914. Aluminum exports in the fiscal year ending in 1917 were valued at $20,299,982 as compared with $1,101,920 in 1914. Lead and its manufactures show an increase from $4,122,007 to $16,563,290.

New Railroad Laws Recommended

The following referenaum on proposed railroad legislation is being submitted to members of the Chamber of Commerce of the United States:

(1) That provision be made for federal regulation of the issuance of railroad securities; (2) that Congress pass a general railroad incorporation law under which all railroad carriers subject to the jurisdiction of the Interstate Commerce Commission may organize; (3) that if Congress passes a railroad incorporation law, all railroad carriers subject to the jurisdiction of the Interstate Commerce Commission, both those now existing and those hereafter to be created, be required to organize under this law; (4) in view of the fact that conflict has arisen with respect to the jurisdiction of the Interstate Commerce Commission over intrastate rates, even though such rates affect interstate commerce, the committee recommends that the Commission be given authority by statute to regulate intrastate rates when those rates affect interstate commerce.

Work at Northwest and Moscow Experiment Stations

An ore-dressing laboratory has been established at the Northwest experiment station of the United States Bureau of Mines. Two flotation machines, a ball mill, a jig and a table have been installed. Work on copper-nickel ores will be the first undertaken. What is said to be a rapid and accurate method of determining tin in tin scrap has been developed at this station. Ore-dressing equipment also has been installed at the Moscow station.

Katahdin Pyrrhotite as a Source of Sulphuric Acid

Pyrrhotite deposits in the Katahdin region of Maine are regarded with some favor by those who have recently examined them for the Government. Large quantities of pyrrhotite containing 30% sulphur are available and cheap transportation is offered by returning coal barges. It seems, therefore, that the deposits may be worked at a profit.

To Examine Black Hills Tin

An examination of the tin deposits of the Black Hills of South Dakota—as thorough as can be made before snows render further work impossible—has been ordered by the United States Bureau of Mines. It is hoped to determine if tin can be mined under present-day conditions of high-priced tin and improved milling methods. Particular attention is to be given to the northern hills. The work will be conducted by Thomas R. Barley and R. R. Hornor, of the Bureau's staff.

Potash Bill Signed

The Potash bill has been sigend by the President No conference on it was asked by the Senate and it wa accepted as amended by the House and promptly sen to the President. As it was known that he would sig the bill, active efforts looking to the production of potash from Searles Lake had already begun.

Editorials

The Price for Copper

THE main thing about the price of 23½c. for copper is, of course, whether it is going to produce the necessary supply. Profits, taxation, bond issues, everything else, are subordinate to production. Unless there be the necessary supply of coal, iron, copper and other commodities, neither we nor our Allies can carry on the war.

We are doubtful whether the price of 23½c. is going to produce all the copper that is needed. It is certain that the copper production of North America in 1917 is going to be less than it was in 1916. So much time has been lost, owing to the labor troubles, that it is impossible to make up for it. Even if there had been no labor troubles, the capacity of our mines, mills, smelteries and refineries had already been so strained that it is doubtful if further increase in production could have been expected.

The present disorganization of the machinery of our industry is likely to have an adverse effect upon our getting raw material from other countries. It is true that there is nowhere else whither producers in South America can now send their copper for refining, and it may be argued that they will have to accept our price willy-nilly. But it must be remembered, on the other hand, that costs of production have risen in those countries, as elsewhere, that many of their producers have very high costs indeed, that their difficulties are further increased by the depreciation of American currency in their markets, and, finally, that the smelters and refiners in this country who heretofore have bought their copper and paid them promptly for it may no longer be able to buy it at all, owing to inability to finance the transactions. The old machinery by which such business was conducted has been smashed and nobody yet knows if, how or when new methods can be devised.

The rising prices for copper, beginning in 1915, did not succeed in forcing any stupenduous increase in the world's production. Indeed, if it had not been that Inspiration and Chuquicamata at the outbreak of the war were just on the point of becoming producers, it is clear that the world would not, in 1916, have had copper enough. Except for those two new producers, the increased output was in the main derived from the expansion of operations by the older concerns, most of whom, apparently, had reached their limits previous to our entry into the war.

Time only will tell whether the price of 23½c. is going to afford copper enough. If it does not, our Government will manifestly be obliged to raise the price. A dangerous thing in this system is that the knowledge as to whether the price ought to be raised may not be had until too late. It is unfortunate that throughout the discussion of the price question with regard to copper there was a failure to recognize that the major market for copper had never risen to an extravagant figure, not even by comparison with peaceful times, and that the talk of extravagant figures was pure buncombe that ought not to have obtained credence in Washington and ought not subsequently to have been circulated with Government sanction, the Government having gratuitously assumed the position not of uttering a falsehood but rather of stating what was only a half-truth. And, finally, there was failure to recognize that the real price for copper in the major market did not succeed in stimulating production unduly, for, had it done so, there would have been an accumulation of stocks. We feel that in spite of all of its hearings, all of its advice, etc., our Government had but imperfect information respecting the true position of the copper industry.

The Revenue Bill

THE war-profits section of the new Revenue Bill was entirely rewritten in conference. In the rewriting its thought and language were made more confused than they were in the bill passed by the Senate. Nobody, apparently not even the conferees, knows now what it means. How any group of men possessing a high-school education could do such a thing is beyond comprehension. Even if Mr. Kitchin wanted to do it, how could a scholar in politics like Senator Lodge consent to it? The conferees' report was adopted by the House of Representatives on Oct. 1, practically with its eyes shut. However, there was a little debate, in the course of which Representative J. Hampton Moore of Pennsylvania remarked that if Mr. Kitchin, one of the parents of the measure, desired "to leave the sylvan recesses of Scotland Neck, N. C., and go to New York, he could find ample employment in explaining to gentlemen there what the bill meant."

Out of the tangle of verbiage we are able (or think we are) to unravel the meaning with respect to mining companies, once the matter of their invested capital has been determined (which, however, is not going to be an easy thing). But, once their capital has been determined somehow, apparently they are allowed an exemption of 9% thereof; on net income between 9 and 15% they will have to pay 20%; between 15 and 20% they will have to pay 25%; then 35% on the net income that figures between 20 and 25% of the capital; 45% on what falls between 25 and 33%; and 60% of the amount in excess of 33% of the capital.

This is not an excess-profits tax at all. It is not a tax on profits due to the circumstance of war, but, as Otto H. Kahn has remarked, it is "an impost on all profits over an arbitrarily fixed return on capital employed, and the arbitrarily fixed return is a percentage inordinately low and made still more inadequate by the definition of 'capital employed' in an excessively restricted sense."

To mining companies this is grossly unfair. Not only are the best of them entitled to a return of at least 10% upon real capital but, under the terms of this bill, only a few of them will obtain the benefit of their real capital. Most of them were originally capitalized at a low figure and have increased their capital by legitimate development without, however, writing it into their accounts. It is properly argued that, although a corporation may not have resold any of its properties since the original acquisition, nevertheless the undistributed interests in assets have been the subject of sale over and over again, to the extent that the stock has changed hands. The cost of a property, the capitalization, in such cases may be rightly regarded not as the original cost to the original owners but rather as the cost to the present owners. Thus the par value of the shares of the Utah Copper Co. is only $10, while their market value during 1917 has averaged over $100. Congress does not, however, recognize such ideas of capitalization, and the operation of the new revenue bill is going to be grossly unjust to mining companies of small capital, like Utah, and are reasonable, by comparison only, with regard to companies, like Anaconda, that have a large capital. In determining what is capital under the terms of the law, there will be a wide ground for debate in the interpretation of what is "earned surplus and undivided profits used or employed in the business."

The entire subject of the new revenue bill, in so far as it relates to war profits, is too big and too complicated to be discussed in a single article. We shall have occasion to refer to it many times, for it is going to be a major matter in the economics of the mining industry.

The Second Liberty Loan

THE Second Liberty Loan, the campaign for which has begun, will further test the sincerity of America in the war. The first loan was hailed a success, but was it the response of deep-rooted patriotism or merely the result of exploited emotionalism? The latter will not endure and the billions to be raised will not be forthcoming if patriotism be lacking. But we know that it is not lacking. If all other evidence failed, the ease and orderliness with which the National Army is being created is sufficient proof.

Answering those who maintain that America has no reason to be in the war, Secretary McAdoo, in a recent speech before the American Bankers' Association, recounted in detail the causes leading up to our entry into the struggle. Summing up, he said:

> We had to fight for our rights and so it is that we engaged in a righteous war—a war which we intend to bring to a successful issue by the organized might of this nation. We intend to match organization against organization, science against science, American skill against German skill, American valor against German valor, and I have not the shadow of a doubt that the victory will be complete.
>
> The first essential is money. . . . Our problem is twofold: To supply essential credits to the Allied governments, because it is vital to the cause that their strength and credit shall be sustained; and, secondly, to meet our own requirements.

The new bonds bear 4% interest and are exempt from all taxes except state taxes, superincome, excess-profits and inheritance taxes. The first issue was exempt from such taxes. The change was made, said Mr. McAdoo, because should the Government "continue to exempt from supertaxes bonds issued during this war, the time would come when there would be created in this country a class of people of great wealth, enjoying great incomes wholly free from tax burden. A grave risk would be involved in such a policy."

The campaign is on and the best banking brain of the country is directing it. The loan must and will succeed. To quote Mr. McAdoo again, "The failure of a single issue of Government bonds would be worse for America than a disaster upon the field of battle. We must never let that happen."

The Zinc Committee

THE Committee of Zinc producers that was organized at the beginning of the war to assist the Advisory Council of National Defense has resigned. The members of the committee felt that they had outlived their usefulness, and also were doubtful respecting the legality of their status. The Lever Bill forbade manufacturers from acting in an advisory capacity to the Government and at the same time selling material to the Government. The Zinc Committee was, moreover, embarrassed by the situation in the zinc market, wherein the price for the metal has declined below cost of production in many cases, owing to the accumulation of unsold stock. The Zinc Committee did not feel that it could advise the Government to pay a price less than the cost of production, yet, on the other hand, it could not advise a price that would cover the cost of production when spelter was to be had for less in the open market.

The committee of copper producers has already become a thing of the past, to all intents and purposes, and will be replaced by a committee whose sole function will be to distribute orders among the several producers. The Lead Committee has already been performing a similar duty. The Government is extremely desirous of having the assistance of the producers in such a way but insofar as playing any part in the negotiation of prices, the day of these subcommittees will soon be over.

Exit the I. W. W.

IF the mining industry of the United States had suc a means of expressing itself, it would unite with u in singing a hymn of joy over the arrest of the I. W. W leaders, during the night of Sept. 28, on indictment charging seditious conspiracy, returned by a Federa grand jury. The hymn might become a public pæan o congratulation over the subsequent news that William D Haywood, who was held in $25,000, and other leaders who were held in $10,000 each, were kept in jail on account of inability to furnish bonds.

The United States District Attorney's office issued statement on the I. W. W. activities, saying:

> The propaganda of the defendants consists of assertion that "We are going to take possession of the industries o this country; first, because we want them; second, becaus we are, in this crisis, possessed of the power to 'put it over. In addition there is, running through all these endeavor a pronounced opposition to the support of the war."

The above impresses us as being a very mild an thoroughly conservative statement of the case agains the I. W. W. In its own constitution, songbooks an other publications, that criminal organization has declared itself as advocating murder, rape, the wanto destruction of property and the commission of nearl all the crimes on the calendar.

William D. Haywood, the leader of this wicked organization, is one who is especially well known, but not favorably, to the mining industry of the United States, having been an erstwhile associate of Charles H. Moyer in the Western Federation of Miners. During their régime that organization was committed to a criminal career and it left a trail of murder, arson and general outrage through the Western states, which culminated in the assassination of Governor Steunenberg, of Idaho, for which Moyer and Haywood were put on trial. One of their previous associates and tools—Harry Orchard—was a witness against them in the Steunenberg case. He charged Moyer and Haywood with being the direct instigators of the series of crimes that had stirred up the West, including the assassination of Governor Steunenberg. The jury in the case refused to credit Harry Orchard, and acquitted Moyer and Haywood, but many people in the mining industry have always been of the opinion that Harry Orchard told the truth. Sometime afterward Moyer and Haywood parted company, Haywood directing his attention to the development of violence, while Moyer pretended to work in behalf of labor in more peaceful ways although he experienced (if he did not incite) stormy periods at Lake Superior and elsewhere.

We hope that the Government will now see to it that Haywood is kept in a place where he will be unable to do more harm. It has been pointed out by officials of the Government that a large number of the men indicted with Haywood are natives of Austria but we regret to notice among the list a disagreeably large proportion of men of purely American names.

Upkeep of Drill Steel

Elsewhere in this issue we have published an article, by George H. Gilman, on an "Ideal Shop for Sharpening Drill Steel," which will not only be of exceptional interest but also of specific adaptable value to all mine operators in connection with their problems of reducing the cost of machine-drill expense per ton of production. Mr. Gilman, as an engineer of wide experience in the field of machine drills and machine drilling, has given us an authoritative presentation of an important subject, the outcome of long study and extensive research at the mine and in the factory. The best in labor-saving equipment that could be found in actual use throughout the mining districts of the country has been collected, remodeled where advantageous, designed where missing or insufficient and then classified, grouped and arranged into one practical standard workshop designed to do one thing—that thing being the collecting, sorting, cutting, forging, gaging, tempering, inspection and redistribution of rock-drill steel so as to yield the best there is in drill bits and shanks on the greatest possible scale with the minimum amount of labor and time. Every progressive mine manager must recognize the value of Mr. Gilman's contribution to his needs, its excellence and its value in practical adaptability to his conditions. A standard has been set for "doing our bit" at the mines. Everything has been given, floor plans, dimensions and details. Illustrations of special steel cars and all the equipment for each and every step in the process of turning out large quantities of perfectly forged and tempered drills have been provided, and the cycle of operations studied and standardized to eliminate every possible lost motion. This paper should be given serious attention by every mining engineer in the country.

BY THE WAY

The man who in stock exchange gambling indulges should buy on the breaks and sell out on the bulges, but be sure that you do not make any mistakes as to which are the bulges and which are the breaks.

Up in the Minnesota iron country the Indolent Wards of Wilhelm, commonly known as I. W. W.'s, meditated fomenting a general strike. They did not meet with any great success, however, especially at Biwabik. Even the most ignorant of the miners quickly absorbed the meaning of the following notice:

> TO THE MINERS OF BIWABIK AND VICINITY
>
> Having duly considered all strike demands which have been made by anyone discontented in Biwabik, we have come to the conclusion that they are without merit, and we believe that the influence which is brought to bear upon those desiring to work is promoted by our public enemy.
>
> Therefore, as loyal citizens of Biwabik and of the United States, and as citizens desirous of maintaining the utmost efficiency of our Government in time of war, we desire to express ourselves as being entirely out of sympathy with any strike movement at this time.
>
> Furthermore, we feel that agitators are agents of our public enemy and should be dealt with as such. Our town is not large enough for agitators, meetings or parades, but our citizens are big enough to enforce the laws.
>
> BIWABIK COMMERCIAL CLUB
> (Of Which Every Loyal Citizen in Town Is a Member).

Mark L. Requa, one of our distinguished mining engineers, is one of the "dollar-a-year" men who are helping Hoover in the food administration. Requa recently addressed the National Bankers' Convention at Atlantic City. So strong an impression did he create that a vote of thanks was extended to him, an unusual honor. One banker arose and expressed the belief that food conservation and food control were more important than selling Liberty Bonds. Mr. Requa, who was applauded again and again, paid high tribute to the "dollar-a-year" volunteers who are helping the Food Administration solve its problems. From all parts of the country they came at a moment's notice, dropping important enterprises, to work early and late at their desks in Washington. Herbert C. Hoover, Mr. Requa said, believes that democracy and self-government in business are on trial. The business of the country is having an opportunity to operate under its own rules in furthering the Government's activities. Thus far it has not been necessary in a single case to invoke the wide powers given to the President to commandeer products and fix prices. Mr. Requa urged the bankers to preach, when they return home, the merits of raising hogs, which, he said, were at present the country's most valuable food product. Should the war end suddenly, there will be a plethora of wheat and sugar, but meats would be seriously short. Europe is confronted with the specter of starvation—making our own food regulation a matter of international importance.

September Mining Dividends

Dividends disbursed in September, 1917, by mining companies reached a high total but amounted to a little less than in the same month last year. There were some increases but practically all of them were offset by a decrease in Butte & Superior from $6.25 per share to $1.25, and by the payments by companies last year which do not appear in the present list, such as Champion ($640,000), United Globe ($414,000), Cardiff ($125,000), Utah Apex ($132,050), and Consolidated Interstate Callahan ($697,485). The last-named company passed its dividend in September, the directors having decided on this course because of the war, increased cost of production, and war taxes, which make it advisable to build up a strong reserve. Payments by 43 United States mining and metallurgical companies making public reports amounted to $34,463,831, as compared with $34,536,408 in the corresponding month last year.

United States Mining and Metallurgical Companies	Situation	Per Share	Total
Am. Sm. and Ref., com	U. S.-Mex.	$1 50	$914,970
Am. Sm. and Ref., pfd	U. S.-Mex.	1 75	875,000
Argonaut Cons., g	Calif.	10	20,000
Big Creek Leasing, s. l.	Ida.	50	2,500
Blackhawk Leasing	Ida.	10	
Blockhouse, z	Wis	1 00	20,000
Bunker Hill & Sullivan, l. s	Ida.	50	163,500
Butte & Superior, z	Mont.	1 25	362,746
Caledonia, l. s	Ida.	03	78,150
Calumet & Ariz., c	Ariz.	3 00	1,927,386
Calumet & Hecla, c	Mich.	25 00	2,500,000
Chino, c	N. M	2 50	2,174,950
Copper Range, c	Mich.	2 50	987,500
Cresson, g. s	Colo.	10	122,000
Eastern Talc	Vt.	15	10,454
Electric Point, l	Wash.	03	23,812
Federal Min. & Sm., pfd	U. S.	1 75	209,757
Golden Cycle, g	Colo.	03	45,000
Grand Gulch	Ariz.	05	11,992
Granite Gold	Colo.	01	16,500
Hecla, l. s	Ida	15	150,000
Homestake, g	S. D.	65	163,254
Internat. Nickel	U.S.-Can.	1 50	2,510,076
Kennecott, c		1 50	4,170,874
Loon Lake, c	Wash.	01	12,917
M & A Mining, z.	Wis.	.25	6,000
Magma, c	Ariz.	50	120,000
Nevada Con., c	Nev.	1 00	1,999,457
*Nevada Hills	Nev	05	53,284
North Star, g	Calif.	20	50,000
Old Dominion, c	Ariz.	1 00	297,071
Oroville Dredg	Calif.	12	82,385
Phelps, Dodge Corpn	U. S.-Mex.	8 00	3,600,000
Quincy, c	Mich.	5 00	550,000
Ray Con., c	Ariz.	1 00	1,577,179
Richmond, l. s	Ida.	02	16,800
St. Joseph Lead	Mo.	1 25	1,761,952
United Copper	Wash.	01	10,000
United Eastern, g	Ariz.	05	68,150
United Verde, c	Ariz	1 50	450,000
Utah Con., c	Utah	1 00	300,000
Utah Copper	Utah	3 50	5,685,715
Yak, s. l	Colo.	07	70,000
Yellow Pine, z. l	Nev	03	30,000
Yukon Gold, g	Alas	07½	262,500

Canadian, Mexican and So. American Companies	Situation	Per Share	Total
Cerro de Pasco, c	So. Am.	$1 50	$999,999
Hedley, g	B. C	50	60,000
Kerr Lake, s	Ont	25	150,000
McIntyre Porcupine, s	Ont	05	180,514
Mexico Mines of El Oro, g s	Mex	1 68	302,400
Mining Corpn. of Canada, s	Ont	18¾	311,260
North Am. Magnesite	Que.	5 00	9,330
Rambler-Cariboo, g	B. C	01	17,500
Utica Mines, l. s	B. C	02	32,000

Holding Companies	Situation	Per Share	Total
General Dev	U. S.	$2 00	$240,000
Yukon-Alaska Trust		1 00	203,431

* Liquidation payment

Canadian and Mexican companies paid $1,063,004 in September, 1917, and $899,678 a year ago. Dome Mines, which disbursed $200,000 last September, passed its dividend this year, the reason being the difficulties caused by the labor shortage.

Holding companies paid $443,433 in September, 1917, and $1,583,492 last year, the difference being due mainly to the dissolution of the Old Dominion Co., of Maine, which paid $880,059 last September.

The totals for the first nine months of the year are as follows: United States mining and metallurgical companies, $169,327,207; holding companies, $4,631,222; Canadian, Mexican, Central and South American companies, $15,094,720.

It is interesting to note that the porphyry copper companies did not change the amount of their quarterly disbursements but designated them differently. In the case of the September dividends and also those of July the terms "regular" and "extra" were dropped and a certain portion was distributed as a return of capital. Details of September dividends were as follows: Utah Copper, regular quarterly of $1.75 and capital distribution of $1.75; Chino, regular quarterly of $1.25 and capital distribution of $1.25; Ray Consolidated, regular quarterly of 50c. and capital distribution of 50c.; Nevada Consolidated, regular quarterly of 50c. and capital distribution of 50c. Kennecott Copper Corporation also did not change the amount of its dividend ($1.50) but designated 75c. of it as capital distribution.

Minerals Separation Denies Allegations

Minerals Separation North American Corporation has made the following statement, denying charges that it is controlled by German interests:

This corporation was organized under the laws of the State of Maryland in December, 1916, with the full consent of the British government specially obtained in September, 1916, as the successor of Minerals Separation American Syndicate (1913), Ltd., a British company. The directors of Minerals Separation North American Corporation are, and have been since organization; John Ballot, chairman and managing director of Minerals Separation, Ltd., and chairman and managing director of the former Minerals Separation American Syndicate (1913), Ltd.; S. Gregory, director of Minerals Separation, Ltd., and vice-chairman and managing director of the former Minerals Separation American Syndicate (1913), Ltd.; Frank Altschul, partner of the firm of Lazard Freres and an officer in the American Ordnance. These are the only directors and they have absolute control of the affairs of the company.

Until August, 1916, the British company, Minerals Separation American Syndicate (1913), Ltd., was represented in America by agents with the special authority of the British government. As an incident of the organization of the present American corporation that agency and representation were discontinued. There is not a single alien-enemy shareholder of the corporation.

The policy of the company always has been, and now is, to encourage the production of metals and particularly those needed for war purposes. With the decisions now in favor of the corporation and its undoubted right to seek and obtain preliminary injunctions against infringers it has refrained from doing so solely for the purpose of not hampering the industry and not reducing the output of metals so vital to the successful operation of the Allied powers. A recent example is the consent that has been given to the continuance of infringement by the Butte & Superior Mining Co. until the termination of the suit against that company. The court had adjudged the absolute right of Minerals Separation to an injunction but it was stated by counsel for Minerals Separation that if this injunction would cause a shutdown of the defendant's mill, the plaintiff would consent to such terms as would permit defendant's infringing operations to continue pending the termination of the suit. The defendant admitted that the injunction would cause a shutdown and the only question debated was what these terms should be.

The court ordered the filing of a bond for $2,500,000 and the monthly deposit in court of all profits from operations of the defendant. A few days later it was stated by the president of the Butte & Superior Mining Co. that the bond ordered by the court could not be obtained and it was suggested that in lieu of the bond the defendant should submit to an injunction against disposing of its assets otherwise than in the ordinary course of its business pending the termination of the suit. This was consented to by Minerals Separation although it involved relinquishment of absolute security for $2,500,000. This consent awaits the approval of the court and therefore no further particulars can be given at the present time. The company stands ready to license any and every responsible concern to utilize its process for the benefit of the Allies and to increase as much as possible the production of metals.

It may be of interest to report that the Minerals Separation North American Corporation has about 275 shareholders, of whom all are British subjects except four who are in America. The directors are Britishers except Frank Altschul who is now in the U. S. Ordnance Department.

Wage Scale and Labor Conditions in Montana Copper Industry

SPECIAL CORRESPONDENCE

There seems to be more or less misconception regarding labor conditions in Montana, particularly about the wages paid to men engaged in and about mines. However, when facts are presented in a concrete form, many people will experience a yearning to be on the payroll of such a concern as the Anaconda Copper Mining Co., accepting the generous rate of pay without a murmur of ingratitude. The complications which recently resulted in the shutting down of the Anaconda works were due to the usual machinations of organizers (more aptly termed disorganizers) who so constantly foment such interruptions of industry.

COMPARATIVE SLIDING-SCALE WAGE RATE OF PRINCIPAL OCCUPATIONS AT THE MINES AND REDUCTIONS WORKS OF BUTTE, ANACONDA AND GREAT FALLS

(Based on the Price per Pound of Electrolytic Copper at New York)

	Under 15c.		15c. and Under 17c.		17c. and Under 19c.		19c. and Under 21c.		21c. and Under 23c.		23c. and Under 25c.		25c. and Under 27c.		27c. and Under 29c.		29c. and Under 31c.§	
	Old†	New‡	Old	New	Old	New	Old	New	Old	New	Old	New	Old	New	Old	New	Old	New
Miners, all underground men engaged in mining	$3 50	$3.50	$3.75	$4.00	$4.00	$4.25	$4.25	$4.50	$4.25	$4.75	$4.25	$5.00	$4 50	**$5.25***	$4.50	$5.50	$4 75	$5.75
Miners in shaft, station cutting and winzes	4 00	4.00	4 25	4.50	4.50	4.75	4.75	5.00	4.75	5.25	4 75	5:50	5.00	**5.75**	5 00	6.00	5.25	6 25
Blacksmiths, carpenters, machinists, electricians, boilermakers, painters	4.50	4.50	4 75	4.75	4.75	5.00	5.00	5.25	5.00	5 50	5.00	5.75	5.25	**6.00**	5 25	6 25	5.50	6 50
Helpers for craftsmen	3.50	3 50	3.75	3 75	3 75	4.00	4.00	4.25	4.00	4.50	4 00	4.75	4.25	**5.00**	4.25	5.25	4.50	5 50
Hoisting engineers (first motion)	4.50	5 00	4 75	5.25	5 00	5.50	5.25	5 75	5 25	6 00	5 25	6 25	5.50	**6.50**	5 50	6 75	5 75	7 00
Hoisting engineers (geared)	4.00	4 50	4 25	4.75	4 50	5.00	4 50	5.25	4 75	5.50	4 75	5.75	5 00	**6.00**	5 00	6 25	5 25	6 50
Boiler cleaners	3 75	4 00	4 00	4 25	4 00	4 50	4.25	4 75	4 25	5.00	4 50	5 25	4 75	**5.50**	4 75	5 75	5.00	6.00
Boiler cleaners' helpers	3 00	3.50	3 25	3.75	3 25	4.00	3 50	4 25	3 50	4 50	3.75	4 75	4 00	**5.00**	4 00	5 25	4 25	5.50
Diamond drill runners	4 00	4 00	4 25	4 50	4.50	4 75	4.50	5.00	4.75	5.25	4 75	5.50	5 00	**5.75**	5.00	6.00	5 25	6.25
Stationary engineers	4 00	4.50	4 25	4 75	4 50	5.00	4 50	5.25	4 75	5.50	4 75	5.75	5.00	**6.00**	5 00	6 25	5 25	6 50
Firemen	3.50	4 00	3 75	4 25	4.00	4 50	4 00	4.75	4 25	5 00	4.25	5.25	4.50	**5.50**	4.50	5.75	4 75	6 00
Laborers, special	3 50	3.50	3 50	3 75	3.50	4.00	3.50	4 25	3 75	4 50	3.75	4.75	4.00	**5.00**	4.00	5 25	4 25	5 50
Laborers	3.00	3.00	3 25	3.25	3 25	3.50	3.50	3.75	3.50	4 00	3.75	4 25	4 00	**4.50**	4 00	4.75	4 25	5 00
Drivers, locomotive, surface	3 50	3 50	3.75	3 75	3 75	4 00	4 00	4.25	4.25	4.50	4 25	4.75	4 50	**5.00**	4 50	5 25	4 75	5 50
Pumpmen	4 00	4.50	4 25	4.75	4.50	5 00	4.50	5 25	4.75	5 50	4.75	5.75	5 00	**6.00**	5.00	6.25	5 25	6 50
Shift bosses	5.00	5.00	5.25	5.50	5.50	5.75	5.50	6 00	5 75	6 25	5.75	6.50	6 00	**6.75**	6.00	7.00	6.25	7.25
Stationtenders	4 00	4 00	4.25	4 50	4.50	4 75	4.50	5 00	4.75	5.25	4.75	5.50	5.00	**5.75**	5.00	6.00	5 25	6 25
Teamsters and stablemen	3 25	3 25	3.50	3.50	3 50	3 75	3 50	4 00	3 75	4.25	3.75	4.50	4.00	**4.75**	4 00	5.00	4 25	5 25
Tool sharpeners	4 00	4.50	4.25	4.75	4.25	5.00	4.25	5 25	4.50	5 50	4.50	5.75	4.75	**6.00**	4 75	6.25	5.00	6.50

* Heavy-faced type indicates the minimum-wage rate set by the agreement fixing the price of copper at 23½c. per pound.
† Under the columns "Old" are tabulated the rates in effect prior to July 1, 1917.
‡ Under the columns "New" are tabulated the rates in effect from July 1, 1917, till the time the price of copper was fixed.
§ The schedule did not stop at 31c. but continued as per the foregoing increase at the rate of 25c. for each unit of advance in the market price of copper.

The initial trouble was between the electrical men and the Montana Power Co. The men asked for $6 instead of $5 per eight-hour day and also for 5½ days per week and other concessions. It seems that the Montana Power Co. was reluctant to comply with all their requests. Through the union of the I. W. W. and other organizations they got the mechanics of the Anaconda Copper Mining Co. stirred up and this union then sent a committee of three to present demands to John Gillie, general manager of the Anaconda company. The mines are buying power from the Montana Power Co. and the union evidently tried to use this fact as an argument, as they stated that their committee had been instructed to present the following demands: "Unless the mining companies will bring pressure to bear to have the Montana Power Co. grant their demands, and the mining companies grant the demands recently made by the miners, the members of No. 65 employed by the mining companies will be pulled off." Mr. Gillie turned down their proposition and the International Brotherhood of Electrical Workers Local No. 65, walked out.

On June 12 a general strike was called among the miners in Butte. This strike was not very effective until picketing started. Both men and women among the Finns and Austrians started picketing and threatening until only about 50% of the men reported for work. About this time the Anaconda Copper Mining Co. offered the new scale of wages shown in the accompanying table. Conditions were improving when the more radical element organized and went up to Anaconda, encouraged by the promises of Jeannette Rankin, Congresswoman from Montana, who is reported to have told the unions that they were right and that if they stuck it out the Government would take over the entire works and pay them just what they desired. This radical element succeeded in getting the smelter men to quit and on Aug. 24 the smeltery was forced to shut down. This made it necessary for the mines in Butte to close because there was no place to store the ore. The Metal Trades Council, which is composed of 21 different unions, had passed on and accepted the new scale of wages offered by the Anaconda Copper Mining Co., but, in spite of that, these individual unions violated the council ruling and walked out anyway.

W. H. Rogers, the Federal mediator, came and investigated conditions and on Sept. 11 a general meeting was held in Anaconda and the union voted to reconsider the offer of the new wage scale. As a result they accepted this scale and at once they began signing cards requesting to return to work (this in Anaconda at the smeltery), about 1800 having been signed when the company decided to open up again. Work was resumed at Anaconda, Butte and Great Falls. It seems almost assured that German money has been very instrumental if not solely the cause of this unrest.

Right To Drill Through Coal Mines has been established in the Circuit Court of Marion County, Illinois, by Judge Thomas Jett, in an injunction proceeding brought by the Chicago-Sandoval Coal Co. to restrain the Southwestern Oil Co. from drilling an oil and gas well through the mine. The case was dismissed with costs against the coal company, on condition that the hole be drilled through one of the mine pillars that are permanently left to support the surface.

Personals

J. M. Lovejoy, geologist, with the Producers Oil Co. since 1916, has been commissioned a lieutenant.

G. P. Watson, metallurgist, has returned from Chile where he was connected with the Braden Copper Company.

Frederick G. Clapp, chief of the petroleum division of the Associated Geological Engineers, is in Kansas and Oklahoma.

Rush M. Hess, manager of the United Mines Co. of Arizona, is visiting in the East and will be in New York about Oct. 1.

Thomas Neilson, metallurgist, lately returned from Siberia, will sail for the Philippines early in October on professional business.

James S. Douglas, president of the United Verde Extension Mining Co., has gone to France to engage in active Red Cross work.

J. N. Popham, who is operating the Abangarez Goldfields' properties under lease in Costa Rica, arrived in New York on Oct. 1.

Victor Ziegler is the new head of the department of geology and mineralogy at the Colorado School of Mines and **M. F. Coolbaugh** is professor of chemistry.

Charles F. Williams, formerly with the Tonopah-Belmont Co., has been commissioned a lieutenant in the Engineer Corps and is stationed at Fort Leavenworth.

Duke of Devonshire, Governor General of Canada, is making a tour of the mining districts of northern Ontario—the first visit ever paid to this section by a governor-general.

E. L. Hermann, engineer of the Hancock Consolidated Mining Co., at Hancock, Mich., has been appointed assistant superintendent, and **F. C. Schwartzenberg**, engineer.

H. B. Pulsifer, formerly a member of the faculty of Armour Institute of Technology, Chicago, has been named professor of metallurgy of the Montana State School of Mines, Butte, Montana.

Prof. W. G. Haldane has resigned his position in the department of metallurgy at the Colorado School of Mines to become associated with a company operating in the potash fields of Nebraska.

A. A. Krogdahl, in charge of the Lake Superior car of the United States Bureau of Mines, has accepted a position as head of the safety department of the Oliver Iron Mining Co., at Virginia, Minnesota.

Walter E. Segsworth, consulting engineer of Toronto, Ont., has been appointed administrator of the vocational department of the Military Hospitals Commission of Canada, with headquarters at Ottawa.

G. E. Le Vegne, engineer for the Interstate Iron Mining Co., at Virginia, Minn., has been appointed chief engineer on the Mesabi Range for the company. **R. Johnson**, of Hibbing, Minn., succeeds him at Virginia.

Ritaro Hirato, H. Tojado and **S. Yamaki**, of Tokio, Japan, were visitors at the Washoe smeltery of the Anaconda Copper Mining Co. at Anaconda, Mont., on Sept. 20. Mr. Hirato is a professor at the University of Tokio.

R. S. Walker, chief engineer of M. A. Hanna & Co.'s iron-ore properties, has been appointed consulting engineer for the company, with offices in Cleveland, Ohio. He will have supervision over the coal mines and furnaces as well as over the iron mines owned by the company.

P. K. Lucke, formerly consulting mining engineer for the Cia. Minera de Peñoles and Cia. de Minerales y Metales, has resigned his position with those companies and will resume independent practice at 621 Bedell Bldg., San Antonio, Texas. He will be in Cuba in October on professional business.

Obituary

Cortlandt E. Palmer, a well-known mining engineer, died Sept. 21 at Arlington, Vt. We shall publish a biographical sketch of Mr. Palmer in a subsequent issue.

William James Young died in New York, Sept. 22, aged 71 years. He was born in Pittsburgh, Penn., and lived there and in Oil City, Penn., all his life. He was well known in the oil country and was, at different times, head of the Forest Oil Co., the Washington Oil Co., and of a firm which shipped oil down the Allegheny River on barges.

Societies

Coming Meetings

American Institute of Mining Engineers	St. Louis	Oct. 8-13
American Iron and Steel Association	Cincinnati	Oct. 26-27
National Association of Purchasing Agents	Pittsburgh	Oct. 9-11

American Chemical Society—At the fall meeting recently held in Boston, the following papers were presented: "Some Problems in the Metallography of Steel," H. M. Boylston; "Effect of Annealing on the Electrical Resistance of Hardened Carbon Steels," I. P. Parkhurst; "Thermophysics of Zinc and its Alloys," J. W. Richards; "Recent Developments in Connection with the Use of Sulphur Dioxide in Hydrometallurgy," Edward R. Weidlein; "Importance of the Flotation Process in the Metallurgy of Copper," E. P. Mathewson; "Theory of Froth," Wilder D. Bancroft; "Chemicals Used in Ore Flotation," Oliver C. Ralston and L. D. Yundt; "Selective Action of Cadmium Salts on Lead and Zinc Sulphides in Flotation," M. H. Thornberry; "Flotation Experiments on Zinc Sulphide Tailings," W. A. Whitaker, S. F. Farley and H. P. Evans.

American Institute of Metals—At the annual meeting at Boston, on Sept. 24-28, the following papers were among those presented: "Electrolytic Production of Antimony," Prof. D. J. Demorest; "Electrical Properties of Some High Resistance Alloys," Prof. M. A. Hunter and F. M. Sebast; "Amorphous Theory in Metals," Zay Jeffries; "Volatility of Zinc and Cadmium," John Johnston and Edward Schramm; "Surface Tension and Deoxidizing of Metals," W. J. Knox; "Antimony—Its Metallurgy and Uses," K. C. Li; "Development and Reabsorption of the Beta Constituent in Alloys which are Normally of the Alpha Type," Prof. C. H. Mathewson and Philip Davidson; "Pyrometers—Their Construction and Application," John P. Goheen; "Comparative Tests on Test Bars and Actual Castings," W. M. Corse; "Consumption of Copper and its Varied Uses," H. D. Hawks; "Recent Industrial Uses of Aluminum," F. G. Schull; "Stellite," Elwood Haynes; "Electric Furnace and Nonferrous Metals," Dwight D. Miller; "Crucible Situation," M. McNaughton; "Raw Materials Used for Crucibles," Prof. A. V. Bleininger.

American Electrochemical Society—Thirty-second general meeting of the society took place at Pittsburgh on Oct. 3-6. The program included the reading and discussion of the following papers: "Trend in Electric Furnace Design," W. H. Coggswell; "Electric Pig Iron in War Time," Robert Turnbull; "Method of Procedure for the Commercial Analysis of Ferrosilicon," R. E. Lowe; "Resistance Furnace," Frank Thornton, Jr.; "Electric Furnace in the Development of the Norwegian Iron Industry," Haakon Styri; "Copper Castings for Electrical Use," W. M. Corse and G. F. Comstock; "Silver Peroxide and the Valence of Silver," H. C. P. Weber; "Suggested Reforms in some Chemical Terms," Carl Hering; "Application of Radium in Warfare," C. H. Viol and G. D. Kammer; "Chlorine as a War Factor," W. D. Marshall; "Synthetic Gasoline by Electrochemical Means," L. B. Cherry; "Spectroscopic Determination of Small Amounts of Lead in Copper," C. W. Hill and G. P. Luckey; "Electrolytic Recovery of Copper and Sulphuric Acid from Copper Mill Pickling Solutions," J. L. Jones; "Electrolytic Pickling Process and its Effect on the Physical Properties of Metals," J. Coulson; "New Electro Analysis Apparatus," J. L. Jones; "Corrosion of Metals by Acids," O. P. Watts and N. D. Whipple; "Poisoning of Catalytic Agents," W. D. Bancroft; "Fractional Combustion," W. D. Bancroft; "Theory of Contact Catalysis," W. D. Bancroft. Trips of inspection were made to various industrial plants and technical institutions in Pittsburgh and vicinity.

Industrial News

Mark R. Lamb has received an inquiry for a 6-km. pipe line and a 6-km. transmission line for Bolivia.

Gaston, Williams & Wigmore, Inc., merchants of New York, announce that Thomas S. Garrett has resigned as manager of their machinery department. Mr. Garrett will go into business for himself.

Homestead Valve Manufacturing Co., of Homestead, Penn., announces that it has almost completed the rebuilding of its manufacturing plant and office buildings, whereby it now has 75% greater space to take care of the increase in its business. It has also added new machinery and equipment, especially in the foundry where production has been almost doubled in a short time.

Worthington Pump and Machinery Corporation announces the opening of a new branch sales office at American Trust and Savings Bank Bldg., Birmingham, Ala., to take care of a portion of the large territory hitherto controlled by the Atlanta office. Edward Stauverman, formerly with the Atlanta office, will be manager. The territory controlled by the new office will be all of Alabama, excepting the following counties: Choctaw, Clark, Monroe, Washington, Conecuh, Mobile, Baldwin and Escambia; all of Florida, excepting the following counties: Okaloosa, Escambia and Santa Rosa; all of Georgia south of the Seaboard Air Line running from Columbus to Savannah. All inquiries originating in this territory should, hereafter, be addressed to the Birmingham office, instead of to Atlanta.

New Patents

United States patent specifications listed below may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

Alkalies—Process of Producing Alkalies from Kelp. Harlan L. Trumbull, Seattle, Wash. (U. S. No. 1,238,600; Aug. 28, 1917.)

Compressor. Rudolph Conrader, Erie, Penn. (U. S. No. 1,239,567; Sept. 11, 1917.)

Compressor—Unloader and Relief Device for Compressors. Rudolph Conrader, Erie, Penn. (U. S. Nos. 1,239,566 and 1,239,568; Sept. 11, 1917.)

Drill—Roller Boring-Drill. Clarence Edward Reed, Houston, Tex. (U. S. No. 1,236,983; Aug. 14, 1917.)

Drill-Head for Drilling-Machines. Joseph F. Buhr, Detroit, Mich. (U. S. No. 1,237,017; Aug. 14, 1917.)

Electrolytic Cell. Noak Victor Hybinette, Christiania, Norway. (U. S. No. 1,239,012; Sept. 4, 1917.)

Excavating System. Charles A. Morris, Montclair, N. J.; Clara R. Morris, executrix of said Charles A. Morris, deceased, assignor to The Hayward Company, New York, N. Y. (U. S. No. 1,238,801; Sept. 4, 1917.)

Excavation—Distant-Power Excavating-Machine. William F. Brinton, Washington, Iowa. (U. S. No. 1,236,904; Aug. 14, 1917.)

Excavator Bucket or Shovel—Robert M. Downie, Beaver Falls, Penn., assignor to Keystone Driller Co., Beaver Falls, Penn. (U. S. Nos. 1,237,878, 1,237,879; Aug. 21, 1917.)

Ferrouranium—Process of Manufacturing Ferrouranium. Robert M. Keeney and Louis F. Vogt, Washington, Penn., assignors to Standard Chemical Co., Pittsburgh, Penn. (U. S. No. 1,240,056; Sept. 11, 1917.)

Furnace. Richard Ziesing, Cleveland, Ohio, assignor to The Grasselli Chemical Company, Cleveland, Ohio. (U. S. No. 1,237,141; Aug. 14, 1917.)

Furnaces—Hearth of Blast-Furnaces. Rudolf Kunz, Georgsmarienhütte, near Osnabrück, Germany. (U. S. No. 1,236,721; Aug. 14, 1917.)

Metallic Sulphides—Process of Treating Substances Carrying Sulphur and Metals. Arthur S. Dwight, New York, N. Y. (U. S. No. 1,238,279; Aug. 28, 1917.)

Miner's Gas Lamp—Frederic E. Baldwin, New York, N. Y. (U. S. No. 1,237,450; Aug. 21, 1917.)

Power-Shovel. Edwin J. Armstrong and Holger Rommerdale, Erie, Penn., assignors to Hull Engine Co., Erie, Penn. (U. S. No. 1,239,554; Sept. 11, 1917.)

Rotary Furnace Structure. Byron E. Eldred, New York, N. Y., assignor to the Commercial Research Co. (U. S. No. 1,238,394; Aug. 28, 1917.)

Rotary Pump. Albert Hayes, New York, N. Y., assignor to Carnot Development Corporation. (U. S. No. 1,238,139; Aug. 28, 1917.)

Sand-Settling Box. John F. Reinert, South Elgin, Ill. (U. S. No. 1,237,959; Aug. 21, 1917.)

Slag-Removing Mechanism for Open-hearth Furnaces. Walter A. Kosinski, Chicago, Ill. (U. S. No. 1,238,526; Aug. 28, 1917.)

Suction Dredge. Vasco F. Casey, Minneapolis, Minn. (U. S. No. 1,238,260; Aug. 28, 1917.)

Editorial Correspondence

SAN FRANCISCO—Sept. 28

Petroleum and Gas Deposits are under protection of a law recently amended by the legislature in 1917, providing for elective commissioners sharing certain powers and responsibilities with the state oil and gas supervisor. The state for this purpose is divided into 5 districts: (1) Including the counties of Los Angeles, Riverside, Orange, San Diego, Imperial, San Bernardino; (2) Ventura; (3) Santa Barbara, San Luis Obispo, Monterey, Santa Cruz, San Benito, Santa Clara, Contra Costa, San Mateo, Alameda, San Francisco; (4) Tulare, Inyo, Kern; (5) Fresno, Madera, Kings, Mono, Mariposa, Merced, and all other counties not included in other districts.

Sixty-eight New Oil Wells were completed n California fields in August. In the week f Sept. 7, the number of new wells was 3. The total from Jan. 1 to Sept. 15, was 53. The nine wells reported for abandonment in the second week of September were mostly poor wells in developed areas and id not represent failures in new ventures. There was an increase in production of il in August over July which is attributable mostly to a total output of 20,000 bbl. daily rom three wells. These wells are in Midway Sunset field. One of the most emarkable developments recorded by the tate Mining Bureau was the discovery of as in the Casmalia field in Santa Barbara County. The well is less than 800 ft. deep nd after flowing three days was said to ave produced at the daily rate of about 00,000 cu.ft. The oil and gas supervisor f the bureau reports elections of district il and gas commissioners from the various istricts on Sept. 17. The commissioners will coöperate with the supervisor in proecting oil fields from damage by improper rilling methods.

Discovery of Gold in California, in respect o the exact date and precise site, is gain puzzling the pioneers and the sons of he pioneers; and the state administration, hich has been prolific in the creation of ommissions, has just appointed two commissions to look after these very important atters. One of these commissions will ot only decide where the gold was discovered by Marshall on the American River, ut will also make some improvements and ossibly, changes in the Marshall monuent. The other commission will decide hether or not the date which has been ritten into the history of the state is eally the date on which the gold was scovered, and if it should prove to be roneous, the date will be changed on the onument. The commissions are made up rincipally of native sons and daughters of he Golden West. So it is quite likely that he pioneers who have selected a site differ rent from that commonly known as the ace of discovery are not likely to have uch to say, about it. Whatever the desion may be, the administration is likely write it into the history of the state y legislative act. The fact that gold was ally discovered and some of it shipped Boston a great many years before arshall's discovery, does not seem to have ny effect upon 49'ers or their following. When or where gold was discovered in alifornia is not so important just at the resent time as when and where other imortant minerals may be discovered and ow they may be treated to commercial dvantage. While the administration is lding to the commissions for the sake of story, the State Mining Bureau and the ate university are endeavoring to add to e prospective mineral production of the ate by investigations and explorations in e field of special minerals. This work vastly more important just now than e work of these commissions.

Deaths in California Mines and Mills in e first half of 1917 numbered 30, an inease of eight over the same period in 16. The fatalities in 1917 were from the llowing causes: Five by rock falls; nine, owder smoke; one, hang-fire shot; one, un over by ore train; one, fall from uck pile: one, fall of drill steel down raise; one, drowning in sump; one, bucket lling down shaft; two, runaway skips; ne, struck by skip; one, electrocuted in ansformer house; one, clothing caught in rive shaft in shop; four, caught in mahinery belts; one, electrocuted in mill. In addition to the 30 above described, five men were killed in tunnels; one, fell off runway with wheelbarrow; three, caught by hang-fire shot; one, suffocated by powder smoke. There were four fatal quarry accidents; one, from suffocation from rope attached to a belt improperly used to prevent falling into rock bin; three, rock falls. There were two fatal gold-dredge accidents during the first six months of the year; one man was killed by having his arm caught in the stacker belt, the other by collapse of a derrick. H. M. Wolflin, chief mine inspector, is inclined to attribute the high death rate at the mines, partially to the fact that many inexperienced men have sought work because of the increased wages. There has been a continued scarcity of mine labor during the whole of the present year. The higher wages paid at the copper mines has been largely responsible for the scracity of men available at the gold mines. The mining division of the Industrial Accident Commission and the California Metal Producers Association are doing all possible to urge mining men to greater diligence in the observation of safety rules, not only the rules laid down by the commission, but the common-sense rules that all intelligent, careful miners are expected to observe. Stress is laid upon the surprising fact that so many miners have been overcome by powder smoke. Most of these have have been experienced men who seemed to believe that it was safe to work wherever their candles or carbide lights would burn. Reference is made to the recent fatalities in a Mariposa County mine to men who tried to work in a drift of the lowest level during a shutdown of the compressor plant. Too much stress cannot be laid upon this feature of mine accidents. In a description of this particular accident, the "Journal" in the issue of June 16, 1917, called attention to the ignorance or negligence of the men who went into the drift knowing that the air had been shut off for several hours, although with permission of the underground foreman. The lesson taught by that accident is that there are times when men can stand a great deal of powder smoke without serious injury, while at other times the smoke contains so much poisonous gas that they are quickly overcome. Falling rock is another feature of mine accidents in this state. Prior to the organization of safety work, the green men employed as muckers, mostly foreigners, resented the advice of experienced men and adopted their own methods of barring down loose rock in stopes. Under the laws governing the operation of mines with respect to accidents. these men are now compelled to obey orders. So that for some time after mine inspection was inaugurated the accidents from this cause were chiefly unavoidable. Now that there is increased necessity for the employment of inexperienced men, the miners who wear the Safety Bear buttons are urged to employ greater care and diligence when warning green men of the dangers of carelessness and ignorance.

BUTTE—Sept. 29

Montana's Compensation Law, according to the second annual report of the state industrial accident board, has caused to be paid out in compensation, medical and hospital fees for the two years ended June 30, 1917, the sum of $804,168, which has gone to 15,127 injured employees and to beneficiaries and dependents. Pending claims will call for an expenditure of about $231,500, making a total liability for the two years of $1,035,668, or a constant average payment of about $1500 a day. The cost of administration was about $20,000 a year which is infinitely less than similar costs in other states of the union.

Strikers to Publish Daily Newspaper in Butte, it has been definitely decided. The strikers, as well as the labor element and public generally, are constantly expressing their grievances against the Butte newspapers, charging that they will not print the news, or any news unless it is favorable to the mining companies and censored by them, and that they constantly and maliciously misrepresent local conditions. They will try the novel experiment in Butte of publishing a newspaper without a copper mine or bank to liquidate a monthly shortage, or overdraft. They can at least count on a lot of experience and excitement, although they also claim to have sufficient money and at least twice the number of paid up subscribers that any of the other papers has. While the strike of miners and smeltermen in Anaconda and Butte has not been settled, and a large number of men still refuse to return to work, the Anaconda company officials say the return of men is satisfactory. In proportion there are more men at work in the mines than in the smeltery at Anaconda. The official claim is that 6500 men are at work in the Butte mines, which is about 60% of the normal, but the production of ore is not in the same proportion, as there is a large percentage of inexperienced men employed. Many men, attracted by the high wages, have been going into the mines for the first time. Several thousand men are still on strike and several thousand more have left the district, many of them for good.

Fixing of Copper Price brings feeling of relief by ending the uncertainty as to the effect of it on the wage scale. The Anaconda company announced the scale of wages would not be reduced for the next four months. The announcement was made in the form of notices being posted at all of the company's properties in the district and reads as follows: "Under the arrangements with the United States government, fixing the price of copper at 23½c. per pound, it was understood that so long as the price remains so fixed, the wages of employes should be continued upon the same basis as at the date of the agreement, Sept. 20, 1917. The wages at that time, under the sliding scales in force, were based upon a price for copper between 25c. and 27c. per pound. This scale is higher than would be payable under the existing contracts and schedules, but will be continued by the Anaconda Copper Mining Co. so long as the arrangement fixing the price for copper at 23½c. is in force. When this is no longer in force, the Anaconda Copper Mining Co. will follow the sliding wage schedules in force at the time of the above fixing of the price of copper by the United States government." Under this schedule the miners will receive $5.25 a day. Every effort is being made to reach normal production in the Butte mines and at the smelteries in Anaconda and Great Falls. At several of the Butte mines practically full day and night shifts are already working and new men are reporting every day at all the mines and smelteries, so that full crews are expected to be employed within a short time.

DENVER—Sept. 29

Highgrading in various mining camps of the state, notably the Cripple Creek district, has resulted in the passage of a law providing that it shall be unlawful for any person, whether acting for himself or as agent for another, to sell or purchase any ores, concentrates, amalgams bearing gold, silver, tungsten, vanadium, uranium, molybdenum, or other rare minerals, gold dust, gold or silver bullion, nuggets or specimens of a value of $10 or more, unless at the time of the sale the vendor shall sign and deliver to the purchaser a memorandum in which he shall state the date of the sale, his residence, the nature and amount of the article sold, the source from which the vendor obtained the same, and the consideration actually paid. Every person required to receive a memorandum shall preserve the same for one year, so that at any reasonable time it may be inspected by a representative of the Secretary of State. Violation of the law shall be punished by a fine of not less than $50 nor more than $500, or by imprisonment in the county jail for a term not to exceed six months, or by both fine and imprisonment. The act does not apply to those persons or corporations duly licensed in the milling, sampling, or ore purchasing business.

Compensation Insurance Laws were amended by the Twenty-first General Assembly in a manner which is of special interest to lessor and lessee. The owner of any property upon which any business is carried on, who contracts out work on his premises to any contractor, subcontractor, person or persons who hire four or more employees is liable for injuries or death.

The phrase "every employer" is synonymous with the phrase "every lessor" to the exact extent that every lessor of mining property is liable for compensation to men employed by the lessee. The employer is liable for an injury in case of accident to the lessee or his employees when the lessee employs less than four men and when he employs more than four men. The phrase "every employer" includes a non-resident lessor who owns mining property in the state, even though he may not be the direct employer of the lessee's men. It is evident that the legislature in enacting this section intended it to be highly remedial and somewhat analogous to the mechanic-lien laws. The law was intended to catch every person who owns property or operates his business exclusively or in part in the different ways set out in the amendment, and the intention of the amendment was to afford security to the employees of subcontractors and lessees.

Colorado School of Mines will continue to be without a president for at least 20 days longer, according to the action of Judge James Cooper of Canon City, presiding in the Denver district court. The court has dismissed the complaint in the suit instituted by Edwin H. Platt, A. F. Hewitt, Lester C. Thompson, John G. May, and Herman Fleck, whereby an attempt was made to restrain the trustees of the Colorado School of Mines from ratifying the recent appointment of Victor C. Alderson as president of the institution. However, the court left in force a temporary restraining order which prevents the confirmation of the appointment until the Supreme Court, to which the plaintiffs gave notice they would appeal, obtains jurisdiction in the case. It was held that the plaintiffs, who sued in the capacity of taxpayers, had no right to maintain such an action because no money was involved. Council for the plaintiffs asked for a 30 days' stay of execution of the judgment which was entered in favor of the defendants, but upon objection of the defendants' attorney the court limited the time to 20 days. Plaintiffs will now make application in the Supreme Court for a writ of supersedeas. At the earliest opportunity the state's highest court will be asked to review Judge Cooper's decision. The original complaint named the entire board of five trustees, but was aimed at A. E. Carlton, James T. Smith and H. M. Rubey, who according to the charge, entered into a conspiracy to place Victor C. Alderson at the head of the school, without consulting the other members of the board. It appears that these three members of the board, who took independent action, insisted upon following their course in spite of the fact that they had been recipients of vigorous protests from prominent members of the alumni association of the school and former members of the faculty. According to those who oppose the appointment of Alderson, the most convincing evidence of his unfitness was placed before Messrs. Carlton, Rubey and Smith, who ignored all statements that were in conflict with their personal views of the matter. The unfavorable publicity which three of the trustees have given to the school has attracted the serious attention of certain members of the state legislature. These lawmakers confess freely that they are sick and tired of the continual rumpus at the school of mines, due to incompetent trustees and unfavorable local influences, and that they propose to launch a campaign designed to accomplish the removal of the school from Golden to Boulder, where it may be made an important branch of the state university and be permitted to develop as it well deserves, under the supervision of a competent board of regents. Such a change would mean not only greater efficiency, but much duplication of work would be avoided and considerable money would be saved by the state. Many of the substantial graduates of the school are now heartily in favor of such a change, for they believe that as a prominent branch of the state university the school of mines will prosper in a favorable atmosphere and, instead of losing its identity, will become more famous.

SALT LAKE CITY—Sept. 28

Tunnel at Park City being driven jointly by the Judge Mining and Smelting Co., the Conkling Mining Co. and the Keystone Mining Co. to develop their territory has been held up by an injunction granted the Silver King Coalition Mines Co., under contention that a diversion is threatened of the water supply in the Alliance tunnel of the Coalition company, which affords water for the company's mill and a part of the water for town use in Park City. Preliminary arguments have been presented by the contending companies, and work on the tunnel will be discontinued until such time as the case is fully heard before the court, and the matters at issue are fully presented.

WALLACE, IDAHO—Sept. 28

Idaho Mining Association has undertaken to compile a pamphlet giving valuable information regarding the mining industry of Idaho, which is expected to be of great value in attracting investments to the state. The work is in charge of Ravenal Macbeth, secretary of the association. It will give a comprehensive description of mining development in the various counties and the actual amount of money being spent annually in bona-fide mining operations, the idea being to impress investors with the fact that Idaho is not a "wildcat" mining state; that it possesses great and varied mineral resources and that their exploitation offers a legitimate field for investment.

Star Mining Co.'s Litigation with the Federal Mining and Smelting Co., in which the ownership of ground valued at millions of dollars is involved, is set for trial on Oct. 25. The case is brought in the Federal court for the district of Idaho, and by special agreement Judge Deitrich will hear the case in this city. The Star company alleges that in the course of operating the Morning mine the Federal company has trespassed upon the ground of the plaintiff on various levels and extracted therefrom ore valued at more than half a million dollars, and in the course of which has developed orebodies estimated at more than a million tons. The case will turn on the question of apex to the vein. Since the case was filed several months ago both litigants have been carrying on extensive work to establish their respective contentions, which consists mainly in making raises to the surface to prove the apex. Incidentally, this work has opened up immense orebodies, some of which were not known before and might never have been found. Noted experts, men of national and international fame, have been engaged by the contestants, and it is expected that the trial of the case will bring out points of great interest to the mining world.

HOUGHTON, MICH.—Sept. 29

No Shutdown Because of 23½c. Price for copper will occur in any of the mines in the Michigan copper district. A number of exploration properties will continue to operate at a loss in the hope that there may be a slight reduction in the cost of their production. But the great majority of properties in and about Houghton will operate to the limit of their capacity which at present is only influenced by the number of men who can be secured for work. There is not much hope of any substantial increase in working forces excepting such temporary increase as comes in the fall and winter following the completion of farm work. Costs at every mine in this district will be higher this year than ever before in the history of Lake Superior mining; this in spite of the fact that there is no construction going forward that is not necessary. Of course, practically all of the substantial companies have added to the number of residences for employees and have expended sums for improvements and repairs on these residences. While these expenditures have come high, the money so paid out came from extraordinary profits made last year. The Calumet & Hecla, for itself and subsidiaries, is going forward with extensive improvements, enlargements and betterments, particularly at Lake Linden. All of this work is of a nature that is necessary and more than pays for itself in the savings brought about. The great mutual plant at Tamarack City is one notable instance of improvements for subsidiaries, as is the new coal dock with its modern equipage. Quincy is completing a large number of new homes, so is Isle Royale. The Copper Range and the Mass companies did some very sensible and practicable work in this line early in the year.

HIBBING, MINN.—Sept. 27

Prices on Ore Leases taken by the Hanna company on Great Northern Ore properties are, it is intimated, on the approximate basis of $1.23 royalty a ton, which is said to be the highest ever paid for Lake Superior iron ore. The U. S. Steel corporation lease on the same properties was on a basis of 81c. a ton. Other leases concluded between 1907 and 1915 range as high as $1 a ton and leases for part of Great Northern Ore lands in 1916 called for a royalty of $1.10 a ton for all ore mined by Butler Bros. on these leases.

JOPLIN, MO.—Sept. 29

No Hope for Better Prices for zinc ore, as a result of activities of the Government Zinc Committee, is longer entertained by local producers. Charles T. Orr, of Webb City, this district's representative on the committee, has unofficially stated that the work of the committee is virtually at an end. Members are understood to have offered their resignations, but Government authorities requested that they continue to act in advisory capacity. While representatives on committee were being criticized in some quarters for recommending a price for spelter higher than it could be obtained in the open market, they were also being criticized in other quarters for naming a price lower than the metal can profitably be produced for, at present cost of ore, labor and supplies. All the work of the committee appears to have been for nothing.

Orenogo Circle Mining Co.'s end was officially recorded here last week when a petition by stockholders for dissolution of the company was favorably acted upon by a local judge. The company is the veteran of the camp and is still a big producer. The change is merely a change in name and the company henceforth will be known officially as the Connecticut Zinc Co., and 179,990 shares were listed in the petition as belonging to this organization. The Logan Trust Co. of Philadelphia holds 120,000 shares, and the remaining ten shares are held by individuals, A. S. Raymond, president and E. Allendorf, treasurer, both of Joplin, having one share each. The company just now is spending approximately $500,000 for a new mill and equipment for conducting opencut mining at its Oronogo, Mo., property.

TORONTO—Sept. 29

Cancellation of Oil-Flotation Patents controlled by Minerals Separation North American Corporation is being urged to prevent curtailment in production. The Minerals Separation North American Corporation has for some time threatened to bring actions for infringement against the Cobalt mining companies using the flotation process. It is alleged that the Minerals Separation corporation is the agent of the firm of Beer, Sondheimer & Co., and that oil-flotation patents are being made use of to promote German interests by restricting the output of metals in Canada. The matter has been taken up by the Toronto "World," owned by W. F. Maclean, M.P., who took a prominent part in the agitation for the prohibition of the export of nickel ore, and is conducting the campaign against the Minerals Separation corporation in much the same strain. However, at a meeting of the Temiskaming Mine Managers' Association, held at Cobalt on Sept. 28, the following resolution was unanimously adopted: "Whereas, the attitude of the Minerals Separation North American Corporation, who claim to control all the basic patents for the treatment of ores by oil flotation, has restricted the output of war metals and retarded the economic development of the mineral resources of this country by claims for unreasonable royalties and by threatened lawsuits, it is hereby resolved that the Temiskaming Mine Managers' Association lend their sympathy and hearty coöperation to The Northern Miner of Cobalt in its endeavor to have the patents and personnel of the Minerals Separation North American Corporation thoroughly investigated by the Government, with a view of having the patents annulled."

[Readers are referred to the statement of the Minerals Separation, North American Corporation, appearing on p. 616, of this issue, respecting the inaccuracies in these Canadian reports—Editor.]

MELBOURNE—Aug. 23

Thames Gold Field, New Zealand, wa discovered in July, 1867, so it has now reached its jubilee. At that time the country was in the hands of the Maoris, bu arrangements were made for the throwin open of a tract of country for mining purposes. At first the field was worked fo the alluvial gold, but it was soon foun that the reefs were more valuable. Th famous Shotover claim, which in less tha 18 months paid each of the four owner £40,000, was discovered on Aug. 13 of tha year. Other claims which paid big dividends were the following: Golden Crow £141,901; Caledonian, £500,000, in its fir year; Moanataiari, £117,973; Prince Imperial, £60,750; Cambria, £69,300; Manukau, £15,750; Nonpareil, £14,670; Kuranu £41,277; All Nations, £41,415; Old Wha £11,650; and Cure, £17,000. On the fir anniversary of the opening of the field t population had grown to 12,000 and 10 582 miners' rights had been issued in r spect of 1500 claims, employing 6000 me The area open for prospecting had bee increased to 340,000 acres, of which t claims working occupied 10,000 acres. total of £80,000 was invested in the mi and £16,000 in battery plants. The annu production has fluctuated considerably, t highest output being reached in 1871 wh the value amounted to £1,188,708; for t year 1915 the value was only £30,966, a owing to the failure of the scheme f draining the deep levels its future outlo is uncertain.

The Mining News

ALABAMA

JIRAMA ORE CO. (Gadsden) — Announces uncovering a 15-ft. Irondale ore seam on property at Greasy Cove, near Tumlin Gap.

SHEFFIELD IRON CORPORATION (Sheffield)—Work started on reconstruction of furnaces. Railroad tracks laid and building materials begun to arrive.

TENNESSEE COAL, IRON AND R.R. CO. (Birmingham)—Will erect brick and concrete club house at Wenonah mine, which is the geographical center of the company's holdings in this county.

ALASKA

ALASKA UNITED (Treadwell)—Ready Bullion mine produced in July 8316 tons yielding $16,140; operating expense, $30,010; operating loss, $13,870; construction expense, $4791; net loss, $18,661. The 700 Claim mine produced no ore, 21 tons concentrate being saved from clean up. Ready Bullion had total of 565 ft. development work done, on 450- and 2400-ft. levels; decrease in broken ore stock was 1755 tons.

ARKANSAS

Boone County

ROYAL (Zinc)—H. M. Waddell and Lee Buie, purchased lease on Royal and took possession.

MILLER (Zinc)—J. P. Harvey & Co., composed of J. P. Harvey, Lon Brown and associates, purchased fee in 20 acres from Clyde Miller; will build mill.

MINNIE LEE (Zinc)—R. L. Marler and James Osenborough purchased lease on Minnie Lee in Coon Hollow, and took possession.

RHODES-MANCHESTER (Zinc)—Lease owned by McCurry Mining and Milling Co. Will build small plant. Installing battery of tables at their custom mill at this place.

Marion County

BEN HARRISON (Dodd City)—Under lease to S. T. Peeler and associates. Struck body free lead. Will ship from Pyatt.

ARIZONA

Cochise County

THUNDERBOLDT MINING CO. (Dragoon)—Installing 40-hp. Fairbanks-Morse gasoline hoist; also new headframe.

DRAGOON COPPER LEASE (Dragoon)—Shipped first car this month to smeltery. Finished timbering shaft; sinking for water level.

EMPIRE (Dragoon)—Consists of 190 acres, purchased by Eastern man. Work will commence Oct. 1. Has two-compartment shaft down 280 ft.; at 100-ft. cut vein 5 ft. wide showing good copper ore.

Gila County

MIAMI (Miami)—Labor situation improving gradually, a total force of 900 men working, of which 400 are employed underground. Surface force complete with exception of electricians. Handling 4000 tons daily in five sections of mill which under normal conditions handles 6000 tons in six sections. Production for September was about 2,000,000 lb. copper compared with 250,000 lb. in August. According to report, the Inspiration company refuses to take back any of strikers except Americans and therefore resumption of operations delayed somewhat more than Miami.

Greenlee County

LABOR SITUATION has not improved. Companies' offer to take back all men who reported for work on Oct. 1 resulted in picketing of the district by the union, indicating men would not return. Believed that union leaders encouraging men to hold out until arrival of Commission appointed by President Wilson now en route to Arizona. Commission composed of following: W. B. Wilson, Secretary of Labor; J. H. Walker, former president United Mine Workers; S. D. Marsh, president Washington State Federation of Labor; J. A. Spangler, Pennsylvania coal operator; Berner C. Reed, Colorado capitalist.

Mohave County

SCHENECTADY (Chloride) — Chloride & Telluride Leasing, Mining and Milling Co., opened several feet good ore in South drift, 175-ft. level. Considering installing electric power. Bulkeley Wells, of Colorado, one of principal owners. H. L. Heath, superintendent.

NEW MOHAWK MINING (Chloride)—Face of excellent ore, streaked with ruby silver, about 4 ft. wide, opened in east drift, 150-ft. level of shaft No. 2. Sorting tables being constructed. Shaft No. 3 down 60 ft., opened 8 in. good ore. J. J. Robertson, general manager.

Pima County

DAILY ARIZONA (Tucson)—Control of Daily Consolidated Copper Co. acquired by W. H. Martin and associates of Kokomo, Ind., formerly held by W. H. and J. Daily. Will be reorganized and development resumed under G. S. Hancock, manager.

Pinal County

GILA DEVELOPMENT (Kelvin) — In west drift at first level 3 ft. of ore assaying well in gold recently opened. Shipping ore being sorted.

MAGMA (Superior) — Reported that strike made below 1600-ft. level shows over 12% copper for last 22 ft. Stated that width of vein on 1800-ft. is 30 ft. showing 10% copper; 50 oz. silver; and $1.80 gold.

U. S. VANADIUM (Kelvin)—Harry S. Bryan of Minerals Recovery Co., of Denver, has been in Phœnix demonstrating adaptability of Bryan dry sizing and concentrating appliances. Special stockholders' meeting held to authorize construction of reduction works having 50-ton daily capacity. Property three miles east of Kelvin. E. Payne Plamer, of Phœnix, president.

Yavapai County

CALUMET & JEROME (Jerome)—During week ended Sept. 29, opened in 2-R crosscut same slate formation found in No. 1 containing chalcopyrite. Drifted in 2-R, 25 ft. and started crosscut.

AMULET (Prescott)—General Mining Co. purchased this old property of J. M. W. Brown. Located in 1886; situated few miles east of Howell smeltery on Lynx Creek. New shaft to be sunk 500 ft. and hoist and compressor being installed. Buildings being erected.

CALIFORNIA

Amador County

ALLEN COPPER (Sutter Creek)—Installing air pipe. Jackson men said to be interested in reopening of mine.

SOUTH EUREKA (Sutter Creek)—Reduced force pending repairing and deepening shaft. Low-grade orebodies opened, but desire higher-grade ore.

OLD EUREKA (Sutter Creek)—Enlarging and retimbering shaft reached 1800-ft. point and 250 ft. remains to complete enlargement to three compartments. New electric surface hoist will be exclusively used, leaving underground hoist for emergencies. The 800-, 1200- and 1700-ft. levels have been opened and expose pay ore left by early-day operators. In caved ground in other levels new drifts or crosscuts may be driven instead of reopening old ones.

Butte County

BOSTON (Mokelumne Hill)—Fire which started at this mine has spread into Rich gulch and done large amount of damage; reported to have been checked on Calaveras River. Also reported to have crossed river into Jesus Maria district.

BUTTERFLY (Oroville)—Blue ground formation reported to indicate diamonds. Property is between Cherokee and Oroville Diamond mine within area claimed by M. J. Cooney of Forbestown Consolidated to contain kimberlite. Cooney mined in the South African diamond mines and discovered the Oroville Diamond mine. Diamonds have been found in the vicinity of Cherokee, some in the early days and others in recent years. W. T. Baldwin, R. S. Kittrick and C. F. Belding, of Oroville, are interested.

Calaveras County

BISHOP GRAVEL (Vallecito)—Mark N. Alling, of Downieville, superintendent, and Dwight G. Vedder, assistant, with crew of 10 men, started development of gravel beds on Table Mountain.

PURE QUILL MINING CO. (Angels Camp)—Permitted to issue 20,000 shares capital stock to Fred Bender for assignment of purchase option of mining claims. Also to sell 10,000 shares at $1 per share for cash to be used in development and purchase price.

ANGELS CAMP DEEP (Angels Camp)—Company reorganized. John C. Benson, manager, will go to Oklahoma with Jesse J. Dunn to raise money for development. San Francisco men formerly interested have withdrawn.

Inyo County

SKIDOO (Skidoo)—Mill, pipe line and mine machinery being dismantled and iron and steel shipped to Trona by teams and motor trucks. The mine, once a fine producer, recently abandoned and present price of old iron and steel makes dismantling and shipping attractive. Estimated that 8-in. pipe line will require 160 railroad cars for transportation. Pipe line is 18 miles long and was installed and maintained at large cost to furnish water for stamp mill.

Kern County

RANDSBURG-ATOLIA (Randsburg)—New mill, crusher and concentrator in operation. Mill specially designed by Radcliffe and associates for treating high-grade ores near old Paige property.

Mariposa County

MARIPOSA MINING CO. (Mariposa)—John Kent Kane of New Jersey has brought suit in superior court to recover $8000, value of eight bonds, with interest.

CHAMPION MINING CO. (Los Angeles)—Permitted to issue 675,000 shares capital stock to C. H. White and associates. Contemplate development of property situated on Black Creek, near Coulterville.

Placer County

FOREST HILL DISTRICT active, employing about 100 men. Yukon Gold dredges being dismantled for reconstruction and removal from middle to north fork of American River. Excelsior mine employs 75 men; property worked by R. B. Elder through old Baltimore ground. Spanish Ledge being developed by E. A. Garrison, disclosed chrome- and gold-bearing ore; shipping by motor truck to start in October. Wieland Mining Co. cleaning out 1800-ft. tunnel, to drive into gravel channel.

Plumas County

INDIAN VALLEY R.R. CO. filed application with State Railroad Commission for authority to sell Engels Copper Mining Co., $150,000 of capital stock, proceeds to pay mining company and Western Pacific Ry. certain sums due; to purchase Iron Bar property for terminal uses; to build hotel and cottages at Paxton, a new station at Veramount; and other improvements.

ENGELS COPPER MINING CO. (San Francisco)—Application for permit to issue 167,686 additional shares to be filed. Proposed improvements will include second unit of mill.

San Bernardino County

PHOENIX (Johannesburg)—Stamp mill crushed 200 tons tungsten ore concentrated on Wilfley table in last six weeks.

BUCKBOARD (Randsburg) — Twenty-five tons crushed ore ready for concentration, to be treated when installation of mill completed.

MINNIETTA (Johannesburg)—Two concentrators installed and mining and milling resumed after closing down during July and part of August on account of hot weather interfering with motor-truck and team hauling.

Shasta County

CRAIG INTERESTS said to be preparing for drilling gravel near Igo. William McKee, of Oroville, will be in charge.

NOBLE ELECTRIC STEEL (Heroult)—One furnace in continuous operation producing ferro-mangenese as 80% product. Producing 200 tons per month supplying the Pacific Coast and shipping to Eastern plants. W. H. French, manager.

Siskiyou County

CINNABAR property on west fork of Beaver Creek sold by Cowgil to Boston men at reported price of $40,000. Situated at Garretson Springs to be connected to county road by new wagon and motor road to mine.

Tuolumne County

HALES & SYMONS (Sonora)—Leased to C. E. Rives. Prospect shaft below main working shaft disclosed copper and gold ore of high grade.

KERSHAW (Jacksonville)—Payable ore in slate reported to have unusually uniform contents. Ore shoot said to extend south into Clio.

COLORADO

Clear Creek County

GRAND CLEAR CREEK (Empire)—Daily district mine will resume work.

CONSOLIDATED MINES CO. (Alice)—New compressor installed.

JOSEPHINE (Georgetown)—Mill operating to capacity.

DOCTOR (Empire)—Machinery being installed in mill. Mine in Daily district operated by Argo Leasing Co.

DIVES PELICAN (Silver Plume)—Taken over by Wellington Mines Co., of Breckenridge.

PRIDE OF THE ROCK (Dumont)—Tunnel repaired and will be driven to cut Ohio vein, now in 800 feet.

PRIMOS CHEMICAL CO. will build milling plant at Molybdenum mine in Daily district. Contracts let for lumber; also for building power line from Colorado Power Co.'s main line.

Lake County

BOHN (Leadville)—Mine reopened by lessees. Shaft repaired to 600-ft. level where crosscutting opened large shoot milling-grade manganese ore. Stated, stringers of silver chloride occur, and can be mined separately.

SMALLER PAY ROLL IN LEADVILLE since strike settlement, wages having been readjusted upward. Wages paid are $4.50 for machinemen and $4 for muckers, etc., but in few cases more is paid to best men. Raise caused considerable curtailment in development work and lesser one in production. Stated about two-thirds the number of men now employed as before strike.

La Plata County

DURANGO GIRL (La Plata)—Operated by lessees. Smelting-grade gold-telluride ore shipped

TENBROECK (La Plata)—Operated by Lewis Mountain Mining Co. Compressor and machine drills installed and new boarding house built. Crosscut tunnel in 600 ft. being driven to cut vein at 1700 feet.

Ouray County

BARSTOW (Ironton)—Lease taken by Engineers' Corporation, of Boulder, Colo., on "Spar" vein; intend to make commercial fluorspar product. Vein cuts main Barstow vein; shows 3 ft. high-grade fluorspar.

Park County

BIG TOAD MINING CO (Alma)—Operating North Star mine; will install cyanide process

WEBBER (Alma)—Operated by Metal Mines Development Co. Shipping-grade lead-silver ore produced.

NELSON (Alma)—Developing good-grade lead-zinc ore. Operated under lease and bond; owned by Walker Investment Co., of Denver.

San Juan County

DELANO (Silverton)—Trial shipment to Silver Lake mill.

ASPEN (Silverton)—Small force working; shipping lead-zinc-copper ore.

SILVER LAKE (Silverton)—Portion of workings will be operated under lease by Fred Dillon.

GOLD KING EXTENSION (Silverton)—Contract let to drive tunnel on this Ross Basin property

VALLEY FORGE (Silverton) — Lease taken and work started Ore contains lead, zinc and silver

JOE & JOHN (Silverton)—Property in Dry Gulch being worked by lessees. Shipments to begin soon.

HENRIETTA (Silverton) — Being reopened by Adam & Eve Mining Co. under management of E. W Palmer.

MEARS-WILFLEY (Silverton)—Mill remodeled and new machinery installed; again treating old tailings from Silver Lake mill.

San Miguel County

BALLARD (Telluride)—Lessees resumed operations at milling plant

FAVORITE (Ophir)—Being worked by lessees

LIBERTY BELL (Telluride)—Two electric locomotives installed for lower tunnel

DUFFY (Ophir Loop)—Being developed by lessees Crosscut tunnel driven to vein; drifting now under way

VAN ANDRETT (Telluride)—Vein lead-silver ore opened near Trout Lake; shipment from near surface.

STANDARD CHEMICAL CO. (Placerville)—One 3½-ton motor truck and two four-horse teams employed shipping concentrates to Placerville, whence product shipped East by rail.

CARBONERO (Ophir) — Development resumed under management of G. B. Pickett. Electric power line extended to mine, and compressor operating. Ore opened and shipments will be resumed soon.

TOMBOY (Telluride) — In August mill ran 28 days crushing 12,000 tons, yielding $34,600 bullion. Concentrates shipped amounted to $63,200. Profit was $29,700, expenses amounting to $97,700.

Summit County

BAKER (Breckenridge)—Lessees working 2-ft. vein lead ore.

CONSOLIDATION in Montezuma district of Jumbo, Pennsylvania, Peruvian and Toledo being effected.

MICHIGAN (Kokomo)—Shipping sulphide ore. Tramway may be built from mine to railroad.

ROBINSON MILL (Robinson)—Overhauled and new machinery installed, to treat lead-zinc ore from Michigan mine.

WELLINGTON MINES CO. (Breckenridge)—Shipping lead-zinc concentrates. Crosscutting on sixth level for Great Northern oreshoot.

IRON MASK (Breckenridge)—Tunnel level reopened and repaired for over 1200 ft. Mixed sulphide ore opened in winze below. Formerly producer of lead carbonate ore from upper levels.

Teller County

LEORA (Cripple Creek)—Sold to Victory Gold Mining Co.

ELKHORN (Cripple Creek)—Leasing company operating.

EL PASO (Cripple Creek)—August output by lessees, 530 tons, gold ore.

KOMET LEASING CO. (Cripple Creek)—Shipping from Victor mine.

DILLON (Cripple Creek)—August output 2360 tons. Owned by Granite Gold Mining Co.

CALEDONIA (Cripple Creek)—Reopened by lessees; first shipment of good-grade gold ore made.

PORTLAND (Cripple Creek)—Strike of rich ore on 2000-ft. level from No. 2 shaft; details not available.

NEW BOSTON (Cripple Creek)—Stratton estate property, being worked by lessees. Two-ounce gold ore being shipped from 60-ft. level.

J. H. B. LEASING CO. (Cripple Creek)—Opened shoot of good-grade ore at depth of 50 ft. on Big Banta claim of United Gold Mines Co.

EL PASO (Cripple Creek)—Narrow-gage spur being broad-gaged to No. 1 shaft, and connection made with Midland Terminal railroad. Shipments being made.

AJAX (Victor)—Main shaft recently sunk to 1800-ft level. Development work on this level has recently opened shoot of good-grade ore. Being worked under lease. W. S Black, superintendent.

OCEAN WAVE MINING CO. (Cripple Creek)—Incorporated recently; capitalization, $100,000. Controlled by Eastern men; holds long-time lease on Ocean Wave and Little Mary claims, controlled by Portland company.

DIG GOLD MINING CO (Cripple Creek)—Operating Alpha and Omega claims on Bull Hill; will install machinery and sink shaft from present depth of 100 ft to 500-ft level Good-grade ore opened on first level; shipments will begin soon.

EXCELSIOR (Cripple Creek)—Operating Longfellow mine of Stratton estate under lease Shaft 400 ft deep will be sunk by contract to 600-ft. level. Connection will be made on 500-ft. level with Golden Cycle Extraction of ore to begin as soon as shaft work completed

IDAHO

Shoshone County

PINE CREEK R.R. has started construction work; expected that track will be laid by January One new mill, the Nabob (Stewart), and probably two more, the Northern Light and Amy & Matchless, will be constructed in spring Highland-Surprise and Constitution mills already operating

YUKON GOLD (Murray)—Has about completed reconstruction of 7½-cu ft dredge, formerly used in Alaska Electric power line expected to be completed by middle of October and dredging will continue during winter

FEDERAL (Wallace)—Announced that Federal Mining and Smelting Co. purchased Independence lead mine near Ketchum, in South Idaho. Is old producer, closed down for several years on account of litigation. Is second property Federal has bought in district, first being North Star.

DOUGLAS (Beeler) — Announcement of dividend of 1c., Oct. 1—second disbursement—represents accumulation of royalty paid by the Anaconda company operating the Douglas under lease. Amount of each payment is $8500. Shipments resumed after interruption of few weeks on account of closing of Anaconda's works.

MIDNIGHT (Mullan)—Recently bonded by eastern men represented by Robert Sweeney; reincorporated as the Early Dawn Mining Co. Practically surrounded by Federal company's ground and No. 5 tunnel of Morning mine cut its vein years ago, showing body of lead ore. Since bonding drifts run both east and west from Morning tunnel show oreshoot averaging 8 ft. in width. Raise being made to explore vein to surface.

MICHIGAN

Copper

KEWEENAW (Calumet)—Losing men to big towns and mill not running to capacity.

FRANKLIN (Demmon)—September tonnage about 26,550 tons.

ISLE ROYALE (Houghton)—September tonnage 64,000 as against 73,000 for August.

NEW BALTIC (Houghton)—Management confident new lode, still showing rich copper, is the new Arcadian.

VICTORIA (Victoria)—Short of labor of all kinds especially surface men. September production about 100 tons mineral. Mill improvements completed in two weeks.

SENECA (Calumet)—Piers for shaft house constructed. Boilers and hoist secured but not yet delivered. Hope to have plant under cover before snow flies.

HOUGHTON (Houghton)—Closed temporarily Sept. 28; will place part of force on the 19th level of Superior drifting to boundary to explore Superior lode and West Vein.

QUINCY (Hancock)—Electric haulage on all long hauls using storage battery locomotives and overhead trolleys; latter about half as expensive as former, but carry with them danger of electrocution.

HANCOCK (Hancock)—Shipping 1100 tons daily, 26,400 for September, 700 from Quincy shaft No. 7, and 400 from Hancock No. 2, an increase of 250 tons daily over August, as more men have been taken on.

OSCEOLA (Osceola)—Sub-shaft, in 1800 ft. on 45th level, has track laid to 46th; hoisting a rock car in cage to 45th where rope haulage pulls it to No. 6 shaft. Every lower level south shows continuation of good ore.

WHITE PINE EXTENSION (Ontonagon) — Underground showing continues good. On 1800 ft. of openings on first level, copper from 17 to 42 lb. per ton shown. No additional financing necessary for a year.

WHITE PINE (Ontonagon)—With flotation secures 27 lb. of copper out of rock that carries 30; highest recovery in Lake Superior district. Flotation not in use on all tailings, but will be when tanks can be put in.

SOUTH LAKE (Houghton)—Has five crosscuts, one each on surface, third, fourth, fifth and sixth levels. All showing up fairly well. Only new one is the surface crosscut in progress for 90 days. Shipments are good grade and could be increased if more men were available. No assessment contemplated at present and financial condition is dependent upon price of metal and securing more rock.

MINNESOTA

Mesabi Range

HARTLEY (Chisholm) — Shipments stopped Entire crew switched to stripping which will continue throughout winter.

CAVOUR (Kinney) — Stockpiles being shipped this year by Hartley interests, of Duluth, former operators.

STEVENSON (Stevenson) — Contracted with J Dawson, of Hibbing, for scramming portion of pit and loading ore into cars by means of small steam shovel.

HANNA ORE CO (Chisholm)—Will produce close to 400 000 tons this season from this district Will do development work this winter

MIDGET (Hibbing)—Large crew of men scramming ore from under banks so that it can be loaded by steam shovel into cars C Richards, superintendent.

MESABA MOUNTAIN (Virginia)—Large 300-ton Bucyrus steam shovel being set up in pit by Oliver company to remove overburden this winter; first large shovel used by this company.

MISSOURI

Joplin District

BLUE MOUND (Baxter, Kan.)—Started construction of second mill, the Blue Diamond, immediately west of present plant.

WOODCHUCK (Commerce, Okla.)—Lost hoist room by explosion. Only property damaged. Cause unknown.

COMMERCE (Miami. Okla.)—Building mill, the Webber, of 250-ton capacity per shift in Kansas, just north of Blue Mound mine.

VINEGAR HILL ZINC (Baxter, Kan.)—Installing two new jigs and doubling capacity of Barr mine. Opening rich second level run at 210 ft.

ST. JOE (Joplin)—Substituting steam pumps for electric pumps at new mine at Picher, Okla. Mill recently completed and first nine-hour run produced 42 tons zinc concentrates, a yield of 26%.

IMPERIAL (Joplin)—Sinking mill shaft to 225 ft. at property just north of Cave Springs. Mill supplied from two field shafts. Ore face 75 ft. thick. Budd M. Robinson, Joplin, owner.

LUCKY JACK (Baxter, Kan.)—Started 400-ton mill operating. Mining at 90-ft. level; will sink shaft to 200 ft. Main ore run indicated by drilling at 150 to 200 ft. G. K. Williams, Farmington, Mo., principal owner.

LUCKY STRIKE LEAD AND ZINC (Quapaw, Okla.)—Bought mill at Porto Rico and will move to lease just north of Quapaw, where company secured rich drill holes. Will enlarge 200-ton mill to 300 tons. R. L. Austin, Miami, Okla., president.

ACME LEAD AND ZINC (Picher, Okla.)—Building No. 2 mill on west portion of 40-acre lease of Walker land. Will be electrically equipped with 250-ton capacity per shift. Operations at 165-ft. level. J. A. Wingfield, Webb City, manager.

KANSOURI (Baxter, Kan.)—Constructing mill on lease, west of Baxter in Blue Mound territory, 30 drill holes, having shown ore. Mill to be of 350-ton capacity. Mining at 240-ft. level. C. B. Boylan, Miami, Okla., president.

TENNESSEE LEAD AND ZINC (Joplin)—With drills, has discovered another rich ore run at old Yellow Jacket property at Klondike, Mo. For several months has been making bonanza profits with 100-ton mill. R. H. Allen, Joplin, manager.

MAHUTSKA (Picher, Okla.)—New 250-ton mill operating. Ore taken from two shafts from one of which yield has been 25% since starting Sept. 6. Making about 25 tons concentrates daily with mill operating one shift. R. Y. Ramage, principal owner. W. L. Kepner, Joplin, superintendent.

MONTANA

Jefferson County

BOSTON & CORBIN (Corbin)—Annual report for year ended July 31, 1917, shows 36,910 tons ore mined (all from Bertha property), yielding 8945 tons of concentrates, containing 810,677 lb. copper and 48,254 oz. silver. Cost of production was 25.564c. per lb. of copper and price received was 29.512c. per lb. Development was started on 900-ft. level and toward Corbin vein in 1202 crosscut in November. Development cost averaged 2.038c. per lb. of copper produced. Crosscut over 1200 ft. on 1200-ft. level to explore Corbin vein at depth; future of property depends to great extent on results obtained.

Lewis and Clark County

AMERICAN SMELTING AND REFINING (Helena)—The second largest brick stack in the United States has just been completed. It is 400 ft. high, 24 ft. in diameter at base and 16 ft. at top. Erected in 46 days. Expected to mitigate smoke nuisance and save metals heretofore passing off in fumes.

Musselshell County

TRI-CITY OIL CO. (Roundup)—Oil struck at 1700 ft. in well in Crazy Woman's Pocket Basin, west of here. On account of flow of water unable to tell importance of strike.

Silver Bow County

NORTH BUTTE (Butte)—Two more damage suits, each to amount of $10,000, filed by administrators of estates of Patrick Shields and Daniel Kennedy, victims of fire in Granite Mountain shaft on June 8.

ANACONDA (Butte)—Hoisted 11,000 tons on Sept. 29 and 9800 on Sept. 25, against normal of 17,000. Reported that there were 7400 underground workers in Anaconda mines on Sept. 29. Training all men in corps of mining engineers in use of the gas helmet since Sept. 20. Expected to increase efficiency of the safety-first department as engineers will hereafter be able to give information about underground workings as well as render assistance in rescue work.

NEVADA

Clark County

BULLION (Goodsprings)—Shipped 20-ton carload, lead-silver ore recently, receiving $2001. Another carload shipped Aug. 26 and another in readiness. Putting auxiliary mill in shape for operation. J. J. Daynes, Jr., president and manager. General office, 61-3-5 Main St., Salt Lake City, Utah.

Nye County

TONOPAH ORE PRODUCTION for week ended Sept. 22 was 9388 tons, valued at $164,290, comparing with 9521 tons the previous week. Producers were: Tonopah Belmont, 2445 tons; Tonopah Mining, 2400; Tonopah Extension, 2380 tons; Jim Butler, 750 tons; West End, 905 tons; Montana, 71 tons; Rescue, 191 tons; North Star, 54 tons; Midway, 94 tons; Cash Boy, 40 tons.

UNION AMALGAMATED (Manhattan)—Discontinued third shift to permit ventilation of workings. Water in Mushelt oreshoot decreased and development resumed. North crosscut advanced 14 ft. to footwall shows 2 ft. ore next hanging wall. East drift from No. 7 crosscut encountered broken up limestone but face now in milling ore. South crosscut on Earl fault shows free gold; hanging wall side in heavy shale formation requiring close timbering.

WHITE CAPS (Manhattan)—Hanging wall crosscut No. 5 cut White Caps fault and drifting started. South crosscut driven off east drift through limestone to cut downward extension of pipe of ore developed by last raise. Raise No. 405 from 400-ft. level, now up 114 ft. in good grade milling ore. From fifth level, south crosscut driven 197 ft. in limestone for 45 ft. and expect to encounter east orebody within few feet. Hoisting 100 tons, after sorting limestone, per day.

NEW MEXICO

Grant County

EL PASO MINING (Pinos Altos)—Working on Pacific No. 2 shaft on Skilacorn vein encountering high-grade gold ore; also developing low-grade tonnage. Using Huff electro-static separator and flotation.

CALUMET NEW MEXICO (Pinos Altos)—Expect to erect first 40-ton unit of mill shortly using tables and flotation. Shipping to smeltery at Coffeyville, Kan. Receive no returns for 0.50 oz. gold, 10 oz. silver and ½% copper content of its lead-zinc ore from smelters. Mine development well advanced. J. A. McCallum, superintendent. Head office, 154 W. Randolph St., Chicago.

OREGON

Baker County

HOMESTEAD GROUP (Homestead)—W. S. Kuhn of San Francisco, purchased this group of copper claims from W. B. Macdougall. Situated near here on Snake River. Sale price was $125,000. Negotiations being made for extension of power line from Idaho Power Co.'s terminal at Homestead. W. S. Kuhn, in charge.

Josephine County

J. M. FINCH and T. P. Johnson taking out chrome ore near Kerby, and will ship soon.

HOME (Waldo)—Assays from lower levels of this gold mine on Monkey Creek encouraging reopening. J. N. Britten, manager.

UTAH

Salt Lake County

UTAH COPPER (Bingham)—Will receive refund amounting to $43,750 payable in 30 days on protested taxes paid in 1913-1914. Less than amount asked by company but finally agreed to by attorney for mining company and county commissioners.

MONTANA-BINGHAM CONSOLIDATED (Bingham)—Three cars of concentrates from Fortuna workings shipped week ended Sept. 7. Machinery ordered for second unit. Tunnel reached Fortuna fissure; drifting to be started here, and raising done to workings 1400 ft. higher.

Tooele County

WEST TOLEDO MINES (Sells)—Situated in Cottonwood district. Machine drills being installed for exploring Manitoba fissure, 1500 ft. long showing mineralization. Expect to strike Toledo fissure dipping 60 deg. to north within 150 ft. Embargo almost completely lifted and mine shipping three or four cars good ore per week.

Summit County

DALY WEST (Park City)—August shipments were 1700 tons crude ore and concentrates. Mill stated to be treating 200 tons daily, running from 3 to 8% lead and 5 to 10 oz. silver.

Utah County

ETTA MAY (American Fork)—Tunnel in about 25 ft. reported to show 2½ ft. ore.

WISCONSIN

ZINC-LEAD DISTRICT

M. & A. (Platteville)—Churn drilling indicated good zinc orebody on Rundell land, at Rewey.

HARKER (Plattville)—Joseph Pickett and others are sinking shaft on this tract at Big Patch.

WISCONSIN ZINC (Platteville)—Construction of 200-ton mill and sinking of new shaft commenced at Shullsburg.

GREAT WESTERN (Galena, Ill.)—This property, dividend payer in 1914-15, opened up again. Robert Banes, manager.

CANADA

Ontario

ORE SHIPMENTS from Cobalt over Temiskaming & Northern Ontario Ry., as reported by Arthur A. Cole, mining engineer, for August were: Aladdin Cobalt, 78 tons; Beaver, 42; Buffalo, 62; Coniagas, 78; Crown Reserve, 20; Dominion Reduction Co., 214; Hudson Bay, 44; Kerr Lake, 150; La Rose, 131; Mining Corporation of Canada, 32; McKinley-Darragh, 129; National, 23; Nipissing, 656; O'Brien, 54; Temiskaming, 62; total 1777 tons from Cobalt proper; Miller-Lake-O'Brien (Elk Lake), 34 tons; Alexo mine (Porquis Junction) 520 tons nickel ore.

HAYDEN (Porcupine)—Arrangements being made for diamond-drilling.

DOME (South Porcupine))—Operations curtailed by labor shortage.

SCHUMACHER (Schumacher)—During last month treated approximately 3400 tons ore, recovering $23,000.

ROGNON (Dryden)—Nissen stamp mill installed and little gold bullion produced. Workings at depth of 70 ft.

KIRKLAND PORYPHYRY (Kirkland Lake)—Sinking at rate of 3 ft. per day encountering visible gold. Equipment arriving.

LE HEUP (Gowganda)—Acquired by interests identified with the McIntyre and Boston Creek mines. Mining plant is being sent in.

HURD (Kirkland Lake)—Taken over by New York men. Company being organized for $15,000,000, known as Ontario Kirkland Gold Mines.

NATIONAL (Cobalt)—Flotation plant treating average of 100 tons per day. Arrangements made for resumption of underground work, suspended since July 1.

CASEY COBALT—Work on new mill to replace that destroyed by fire delayed by labor shortage. Large quantity of low-grade on dump which can be handled profitably with mill.

TECK-HUGHES (Kirkland Lake)—Mill treating 80 tons per day. Winze sunk from 400-ft. level to 550 ft. Good-grade milling ore approximately 30 ft.; one shoot about 520 ft. long.

PROVINCIAL (Cobalt)—Work rapidly pushed on mill extension; mine inspected by Americans including John T. Milliken. St. Louis; Frank G. Logan and Joseph P. Griffin, of Chicago, George E. Pierce, Buffalo.

MEXICO

PARAFFIN DISCOVERY in Chihuahua near American line was announced in dispatches from Mexican Government acaccording to El Paso report. Said to be traceable on surface for six miles.

MEXICAN GOVERNMENT after Oct. 1 will refuse to accept American bills, silver coin or drafts on the United States in payment of Federal taxes and duties. Reason given is that American Government prohibited export of gold. American gold coin will be accepted at rate of two to one. If ore or concentrates are exported which contain more than six grams of gold per ton, exporters must import equal amount in refined form. If silver is exported in bars, or in ores and concentrates containing more than 50 grams per ton, the exporters must import 25% of value in gold bars or gold coin at price to be fixed by Treasury Department.

SOUTH AFRICA

MINERS UNION at meeting of special delegates, resolved, according to a Reuter dispatch, to accept minimum wage offer made by Chamber of Mines subject to agreement regarding certain passages. Also accepted 48½-hour week, "bank to bank" as from Jan. 1, 1918, and additional war bonus from Sept. 1. Offer to establish employment bureau was declined.

The Market Report

Metal Markets

SILVER AND STERLING EXCHANGE

Sept.	Sterling Exchange	Silver		Oct.	Sterling Exchange	Silver	
		New York, Cents	London, Pence			New York, Cents	London, Pence
27	4 7550	101¾	51½	1	4 7530	95¾	48½
28	4 7550	97¾	49½	2	4 7530	93¾	47½
29	4 7550	96¾	49	3	4 7530	93½	47½

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

DAILY PRICES OF METALS IN NEW YORK

Sept Oct.	Copper	Tin	Lead		Zinc
	Electrolytic	Spot.	N. Y.	St. L.	St L.
27	23½	61½	7¾ @8	7¾ @7 90	8⅛ @8¼
28	23½	61	7¾ @8	7¾ @7 90	8 05 @8 15
29	23½	61	8	7 80 @7 90	8⅛ @8¼
1	23½	60½	8	7 80 @7 90	8⅛ @8¼
2	23½	60½	8	7 80 @7 90	8⅛ @8¼
3	23½	60⅞	8	7 80 @7 90	8 @8⅛

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

The quotations for electrolytic copper are for cakes, ingots and wirebars. Beginning with Sept. 21, we quote the price fixed by the U. S. Government.

We quote electrolytic cathodes at 0.05 to 0 10c. below the price of wirebars, cakes and ingots.

Quotations for spelter are for ordinary Prime Western brands We quote New York price at 17c. per 100 lb. above St Louis.

Some current freight rates on metals per 100 lb. are: St Louis-New York 17c ; St. Louis-Chicago, 6 3c , St Louis-Pittsburgh, 13 1 cents.

LONDON

Sept Oct	Copper			Tin		Lead	Zinc
	Standard		Electrolytic				
	Spot	3 Mos.		Spot	3 Mos	Spot	Spot
27	110	110	130	246	243	30½	54
28	110	110	130	245½	242½	30½	54
29							
1	110	110	125	243½	241½	30½	54
2	110	110	125	243½	241½	30½	54
3	110	110	125	244½	242	30½	54

The above table gives the closing quotations on London Metal Exchange All prices are in pounds sterling per ton of 2,240 lb For convenience in comparison of London prices, in pounds sterling per 2,240 lb , with American prices in cents per pound the following approximate ratios are given, reckoning exchange at $4 75½ £30½ = 6 474c , £54 = 11 462c ; £120 = 25 473c , £137 = 29 082c , £240 = 50 946c Variations, £1 = 0 212277c

NEW YORK—Oct. 3

In copper there is, of course, no longer anything but the market arbitrarily established by the Government barring transactions in small lots that are in the hands of dealers The tin and zinc markets were very dull this week In lead, however, transactions attained a considerable volume

Copper—There is no longer any free market in copper the situation being practically in the hands of the Government, which has arbitrarily established the price During this week requisitions for copper were made However producers do not yet have any idea about the aggregate that is going to be demanded, and meanwhile they are refusing to supply domestic consumers at all and are resisting all importunities. Producers will not even consider business for delivery after next January, although consumers have made overtures for such business.

On Sept. 28, the producers held a meeting in New York, at which all were represented, and formed a new Copper Producers' Committee, whereof Mr. Clendennin was elected chairman, and the other members are Messrs. McLean, Agassiz and Wolfson, while Hamilton Brush is secretary This committee has taken an office at No 60 Broadway. The committee will collect the necessary statistical information and will attend to the distribution of copper with the object of giving preference to governmental requirements

On Oct. 2, the principal copper consumers held a meeting in New York and formed a committee to represent them, Mr. Brooker, of the American Brass Co , being elected chairman, and Mr Howard, of the National Conduit and Cable Co , secretary. The producers' committee met the consumers and explained to the latter the situation that exists in respect to shortage of copper, and informed the consumers that they will have to get along with a curtailed supply and stated that it would be an object of the producers' committee to treat all consumers fairly.

Eugene Meyer, Jr., who has been attending to details of the purchase of copper, lead and zinc under Mr. Baruch, of the War Industries Board, has left that place in order to assist Mr. Vanderlip in the financial work that he has undertaken. No successor to Mr Meyer, on the War Industries Board, has yet been appointed, so far as we know.

Copper Sheets are quoted at 35c. per lb. for hot rolled, and 1c. higher for cold rolled. Wire is quoted nominally at 31c. per lb., f.o.b. mill.

Tin—This market was very narrow and there was but little change in prices At the close, Straits tin was quoted at 60⅞c and Banka at 59⅞c

Deliveries of Banka tin in Holland are reported by Messrs. De Monchy & Havelaar of Rotterdam at 645 tons; for the seven months ended July 31 at 5735 tons. Stocks in the hands of the Netherlands Trading Co. July 31 were 1030 tons.

Lead—After a little weakness early in the week, when prices were shaded, a large volume of business was done at the full price The domestic transactions reported to us were upward of 3000 tons Besides these, there was sold a large tonnage for export, orders being taken for many parts of the world The nature of the business of the week tends to confirm previous conjectures that the lead market has temporarily come into equilibrium around 8c However, there is no doubt that unsold stocks are beginning to accumulate That is a matter for congratulation, for it indicates a return of the lead market to natural conditions, which cannot be said to exist in any market in the absence of a reasonable stock Since the recent labor troubles were overcome, production has been increasing, while on the other hand consumption has been decreasing right along by virtue of strangulation, owing to high prices

Zinc—This market continued to be dull and sluggish, with but little change in price

Zinc Sheets—Price of zinc sheets has not been changed Market is still at $19 per 100 lb f o b Peru, Ill , less 8% discount

Other Metals

Aluminum—The dullness in this metal continued, No 1 ingots at New York being quoted at 40@42c per pound

Antimony—This market continued dull and was a shade easier We quote 15½c for spot and 15½@15¾c for futures, c i f , in bond

Cadmium—This metal is quoted at $1 40@1 50 per pound

Bismuth—Unchanged at $3.50 per pound.

Nickel—Steady at 50c. per lb., premium of 5c. per lb. for electrolytic.

Quicksilver—This market was quiet and lower. We quote $105. San Francisco reports, by telegraph, $104, market easy.

Gold, Silver and Platinum

Gold—The government of India has prohibited the importation of gold except by special license. The government will itself take possession of all gold imported, paying therefor at the standard rate.

Silver—Owing to cessation of China buying and liquidation of speculative holdings silver has had a sharp reaction, but is more steady at today's London quotation, 47½d.

Mexican dollars were quoted in New York, Sept. 26 at 84c. ; Sept. 27 at 79c. ; Sept. 28 at 75c. ; Sept. 29 at 75c. ; Oct. 1 at 73c. ; Oct. 2 at 71 cents.

Platinum—The market is variously characterized as fair to good. We quote it unchanged at $103@105.

Palladium—There was a brisk demand for this metal at $125, which was paid, and which we quote, but large users are averse to paying so high a price and are offering to give only $110, hoping that the market will come down to their figure.

Zinc and Lead Ore Markets

Joplin, Mo. Sept. 29—Blende, per ton, high $77 60 ; basis 60% Zn, premium $75 ; medium to low $70@65 ; calamine per ton basis 40% Zn, $38@30 ; average selling price, all grades of zinc, $63.33 per ton, all grades of lead $86 22 per ton.

Shipments the week: Blende 8048 tons, calamine 460 tons, lead 858 tons. Shipments 9 months: Blende 350,750 tons, calamine 31,240 tons, lead 58,664 tons. Value, all ores the week, $612,810. Value, all ores 9 months, $33,955,820 Increase over nine months last year Blende 97,537 tons, calamine 11,402 tons, lead 14,316 tons.

Sellers were more prompt to accept price offerings this week, and a larger tonnage was purchased for next week's delivery The car shortage keeps ore from moving in a southern direction just now Shortage of help in the mines becomes more noticeable as drafted men are withdrawn, and electric power trouble is cutting out some mines

Corrected prices of lead ore for week ended Sept 22 are sent by our Joplin correspondents as follows. Lead, high $93 ; basis 80% Pb, $90 , average selling price, all grades of lead, $82 48 per ton.

Platteville, Wis., Sept. 29—Blende, basis 60% Zn, reduced to $67 50 base for premium ore down to $63 base for medium grade Lead ore, basis 80% Pb, $80 per ton Shipments reported for the week are 3017 tons of zinc ore, and 450 tons of sulphur ore For the year to date the figures are 107,267 tons of zinc ore, 5016 tons of lead ore, and 20,890 tons of sulphur ore Net zinc shipment from the district increased 13,331 tons over figures for the corresponding period of 1916, the gross zinc shipment delivered from mines increased 22 752 tons , lead ore increased 1741 tons , sulphur ore decreased 2112 tons Shipped during week to separating plants, 3572 tons

Other Ores

Manganese Ore—Unchanged at $1 per unit on the basis of 48% manganese.

Molybdenum Ore—Unchanged at $2 20 per lb on the basis of 90% molybdenum sulphide

Tungsten Ore—Considerable business was done We quote high-grade wolframite unchanged at $23@25 and scheelite at $26 Low-grade wolframite was reported offered at $19

Pyrites—Spanish lump quoted at 16c per unit on basis of 10s. ocean freight, buyer to pay war risk, excess freight and any duty. Ocean freights are 35s. for northern ports, 40s. for south Atlantic and 40s. also offered for Pensacola, Fla.—slightly lower than previous Gulf charters.

Iron Trade Review

PITTSBURGH—Oct. 2

Scarcely any business has been done in the iron and steel commodities for which prices were fixed a week ago yesterday. There have been efforts to buy for early deliveries, but as producers are well sold up they are indisposed to entertain such inquiries, and as for forward deliveries, there is no disposition to buy as no delivery promise could possibly be made. All shipments of steel are under the jurisdiction of the Priority Board, so that even those who have already bought do not know when shipment will occur.

A series of meetings starts today for the purpose of developing a schedule of prices on billets, sheet bars, wire products, tubular goods, sheets, etc., for submission to the War Industries Board. In accordance with the understanding reached, these prices are to be in harmony with the prices already fixed, basic and foundry pig iron at $33, valley, and bars at 2.90c., shapes at 3c. and plates at 3.25c., Pittsburgh and Chicago. Such prices as are approved will be announced at Washington under authority of the War Industries Board, but no additional prices need be expected in less than a week. This will not complete the program by any means, since it has been announced at Washington that prices are to be fixed on about 150 articles in steel.

Pig Iron—There is some inquiry in the market for foundry iron, both for the fourth quarter of this year and for the fore part of next year, but as furnaces are well sold up they are indisposed to quote. Higher prices would be bid for small prompt lots than those now fixed, but merchants and consumers who might be able to spare some iron are indisposed to quote as while technically they are not bound by the agreement between the Government and the producers they feel that the proper thing is not to sell except at the fixed price and naturally they would not part with iron on that basis. We quote basic, No. 2 foundry and malleable at $33, valley, the price fixed, and bessemer tentatively at $36.30. Messrs. W. P. Snyder & Co. report their computations of average prices realized on all shipments of valley iron in September at $45.45 for bessemer and $41.34 for basic, or $7.77 decline for bessemer and $8.08 decline for basic from the August averages. The average quoted price of foundry iron in September was $47.68, this including the fixed price of $33 beginning Sept. 25. All averages are at valley furnaces, prices delivered Pittsburgh being 95c. higher.

Steel—A sale is reported of 1000 tons of billets for prompt shipment at $60. The fixed price is not out yet, but will probably be about $50. As offerings would doubtless be light at the fixed price, it is significant that consumers are not making an effort to buy at the higher prices producers would be justified in charging in the interim. There is some talk of setting sheet bars at $5 above billets instead of the old spread of $1.

Ferroalloys

Ferromanganese—The market has been extremely quiet. There are prospects that the Government will endeavor to fix a price on ferromanganese, and if so it will probably be lower than prices lately quoted, and at which there has been scarcely any demand. We quote prompt at $375 and first half on contract at $350, freight allowed.

Coke

Connellsville—There is nothing new in the matter of Government regulations, there being simply the $6 price set yesterday week. A differential for foundry coke will doubtless be established, but it seems improbable that dealers or brokers will be allowed to charge an extra price, being expected to get their commission, if any, from the producer. A little spot business has been put through, but not much, as producers have been shipping heavily on their contracts, at prices above the fixed level, and have also been shipping heavily on some short term sales. Offerings are expected to be much larger in the near future. There will be much more free coke to the end of the year than in 1918, as many 1918 contracts were made recently for the year without providing for the interim period. We quote furnace and foundry coke, spot or contract, at $6 per net ton at ovens.

STOCK QUOTATIONS

N. Y. EXCH.†	Oct.
Alaska Gold M	4½
Alaska Juneau	3
Am.Sm.& Ref.,com.	97
Am. Sm. & Ref., pf.	107
Am. Sm. Sec., pf., A	95
Am. Sm. Sec., pf. B.	‡93
Am. Zinc	17½
Am. Zinc, pf	54
Anaconda	71
Batopilas Min	1¼
Bethlehem Steel	95
Bethlehem Steel, pf.	91
Butte & Superior	24¼
Cerro de Pasco	32¼
Chile Cop	17½
Chino	50
Colo. Fuel & Iron	43¼
Crucible Steel	73½
Dome Mines	8½
Federal M. & S.	18
Federal M. & S., pf.	44
Great Nor., ore ctf.	33¾
Greene Cananea	41
Gulf States Steel	97
Homestake	102
Inspiration Con.	49¾
International Nickel	32½
Kennecott	38½
Lackawanna Steel	81¾
Miami Copper	33¼
Nat'l Lead, com.	50¼
National Lead, pf.	104
Nev. Consol	20
Ontario Min	5¾
Quicksilver	1¼
Quicksilver, pf.	1½
Ray Con	24½
Republic I.&S.,com.	82½
Republic I. & S., pf.	100½
Sloss-Sheffield	45
Tennessee C. & C.	14¼
U. S. Steel, com	110½
U. S. Steel, pf	117
Utah Copper	91
Va. Iron C. & C.	59

N. Y. CURB†	Oct. 2
Big Ledge	1½
Butte & N. Y.	1
Butte C. & Z.	8¼
Caledonia	64
Calumet & Jerome	2¼
Can. Cop. Corpn	2
Carlisle	4
Cashboy	.07
Con. Ariz. Sm.	1 11/16
Con. Coppermines	9¼
Con. Nev.-Utah	½
Emma Con	.75
First Nat. Cop	2½
Goldfield Con.	.39
Goldfield Merger	.05
Greenmonster	½
Hecla Min	8½
Howe Sound	5
Jerome Verde	1 1/16
Kerr Lake	5½
Louisiana	½
Magma	48
Majestic	.38
McKinley-Dar-Sa	.58
Milford	1 11/16
Mohican	¼
Mother Lode	35
N. Y. & Hond	13
Nipissing Mines	8½
Ohio Cop	1½
Ray Hercules	3½
Richmond	.58
Rochester Mines	.52
St. Joseph Lead	17½
Standard S. L.	3/16
Stewart	3/16
Success	.19
Tonopah	6½
Tonopah Ex	1 11/16
Tribullion	.15
Troy Arizona	.16
United Cop	.68¾
United Verde Ext.	36
United Zinc	3¾
Utica Mines	.21
White Knob, pf.	‡1½
Yukon Gold	2

SAN FRAN.*	Oct. 2
Alta	.03
Andes	.10
Best & Belcher	.02
Bullion	.01
Caledonia	.10
Challenge Con	.01
Confidence	.05
Con. Virginia	.16
Gould & Curry	‡.01
Hale & Norcross	.03
Jacket-Cr. Pt.	.08
Mexican	.05
Occidental	.60
Ophir	‡.09
Overman	.05
Savage	.03
Seg Belcher	‡.02
Sierra Nevada	.15
Union Con.	.61
Utah Con.	.01
Belmont	4.50
Jim Butler	.87
MacNamara	.27
Midway	.11
Mont.-Tonopah	.18
North Star	.09
Rescue Eula	.17
West End Con.	.68
Atlanta	.08
Booth	.05
Comb. Frac	.03
D'field Daisy	.02
Florence	.14
Jumbo Extension	.18
Kewanas	.06
Nevada Hills	.12
Nevada Packard	.22
Round Mountain	.25
Silver Pick	.13
White Caps	1.35
Big Jim	.62½
United Eastern	4.20

BOSTON EXCH.*	Oct. 2
Adventure	1½
Ahmeek	97
Algomah	.45
Allouez	62½
Ariz. Com., ctfs	11
Arnold	.25
Bonanza	.21
Butte-Balaklava	.40
Calumet & Ariz	75
Calumet & Hecla	525
Centennial	15½
Copper Range	54½
Daly West	1 11/16
Davis-Daly	5
East Butte	11½
Franklin	5¼
Granby	78
Hancock	12
Hedley	‡17
Helvetia	‡.25
Indiana	‡1½
Isle Royale	30
Keweenaw	‡1½
Lake	‡10
La Salle	‡3
Mason Valley	‡6½
Mass	9½
Mayflower	2
Michigan	2
Mohawk	80½
New Arcadian	2½
New Idria	11
North Butte	16
North Lake	‡.95
Ojibway	‡1½
Old Dominion	46
Osceola	‡88
Quincy	84
St. Mary's M. L.	70
Santa Fe	1 1/16
Seneca	‡7
Shannon	6½
Shattuck-Ariz.	‡24
So. Lake	‡3
So. Utah	.22
Superior	8
Superior & Bost.	‡3¾
Trinity	6
Tuolumne	1½
U. S. Smelting	61
U. S. Smelt'g, pf.	49½
Utah Apex	3¾
Utah Con	15
Utah Metal	3⅜
Victoria	3
Winona	2½
Wolverine	40
Wyandot	‡.80

BOSTON CURB*	Oct. 2
Alaska Mines Corp.	.37
Bingham Mines	11½
Boston Ely	.70
Boston & Mont.	.61
Butte & Lon'n Dev.	.14
Calaveras	2½
Calumet-Corbin	.01
Chief Con	2½
Cortez	.10
Crown Reserve	26
Crystal Cop	.78
Eagle & Blue Bell	2¼
Houghton Copper	.75
Intermountain	1¼
Iron Cap, Com	15¾
Iron Cap Cop., pf.	15½
Mexican Metals	.27
Mines of America	1½
Mojave Tungsten	.50
Nat. Zinc & Lead	.35
Nevada-Douglas	1½
New Baltic	1½
New Cornelia	16¾
Oneco	.40
Pacific Mines	.35
Rex Cons	.15

SALT LAKE*	Oct. 2
Bannack	.26
Big Four	.00½
Cardiff	3.00
Colorado Mining	.15
Daly	1.70
Daly-Judge	8.45
Empire Copper	1.27½
Gold Chain	.16
Grand Central	.55
Iron Blossom	.89
Lower Mammoth	.03
May Day	.03½
Moscow	.11
Prince Con	.90
Silver-King Coal'n	3.10
Silver King Con	3.97½
Sioux Con	.06
So. Hecla	.97
Tintic Standard	1.47½
Uncle Sam	.04
Wilbert	.25
Yankee	.06½

TORONTO*	Oct. 1
Adanac	.17
Bailey	.05
Beaver Con	.38
Chambers Ferland	.12
Coniagas	3.80
Hargraves	.11
La Rose	.50
Peterson Lake	.11½
Right of Way	‡.05
Temiskaming	.34½
Wettlaufer-Lor	.07
Dome Exten	.13
Dome Lake	.14
Foley O'Brien	‡.60
Hollinger	5.10
McIntyre	1.40
Newray	.68
Porcu. Crown	.40
Schumacher	‡.42
Teck-Hughes	.40
Vipond	.25
West Dome	.16

STOCK QUOTATIONS—Continued

COLO. SPRINGS	Oct. 2
Cresson Con.	5.50
Doctor Jack Pot	.03½
Elkton Con.	.04½
El Paso	.20
Gold Sovereign	.03½
Golden Cycle	1.98
Granite	.40
Isabella	.09½
Mary McKinney	.06½
Portland	1.44
United Gold M	.16
Vindicator	.50

LONDON	Sept. 13		
Alaska Mexican	£0	5s	0d
Alaska Tre'dwell	1	0	0
Burma Corp.	4	0	0
Cam & Motor	0	11	0
Camp Bird	0	8	0
El Oro	0	10	9
Esperanza	0	10	3
Mexican Mines	6	0	0
Nechi, pfd.	0	13	3
Oroville	0	17	0
Santa Gert'dis.	0	12	3
Tomboy	0	18	6

* Bid prices. † Closing prices. ‡ Last Quotations.

MONTHLY AVERAGE PRICES OF METALS

Silver	New York			London		
	1915	1916	1917	1915	1916	1917
January	48.855	56.775	75.630	22.731	26.960	36.682
February	48.477	56.755	77.585	22.753	26.975	37.742
March	50.241	57.935	73.861	23.708	27.597	36.410
April	50.250	64.415	73.875	23.709	30.662	36.963
May	49.915	74.269	74.745	23.570	35.477	37.940
June	49.034	65.024	76.971	23.267	31.060	39.065
July	47.519	62.940	79.010	22.597	30.000	40.110
August	47.163	66.083	85.407	22.780	31.498	43.418
September	48.680	68.515	100.74	23.591	32.584	50.920
October	49.385	67.855	......	23.925	32.361	......
November	51.714	71.604	......	25.094	34.192	......
December	54.971	75.765	......	26.373	36.410	......
Year	49.684	65.661	......	23.675	31.315	......

New York quotations cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Copper	New York		London			
	Electrolytic		Standard		Electrolytic	
	1916	1917	1916	1917	1916	1917
Jan.	24.008	28.673	88.083	131.921	116.167	142.895
Feb.	26.440	31.750	102.667	137.895	133.167	148.100
Mar.	26.310	31.481	107.714	136.750	136.000	151.000
April	27.895	27.935	124.319	133.842	137.389	147.158
May	28.625	28.788	135.457	130.000	152.522	142.000
June	26.601	29.962	112.432	130.000	137.455	142.000
July	23.865	26.620	95.119	128.409	125.500	140.409
Aug.	26.120	25.380	110.283	122.391	126.304	137.000
Sept.	26.855	25.073	113.905	117.500	134.071	135.250
Oct.	27.193	......	122.750	......	142.523	......
Nov.	30.625	......	134.659	......	155.432	......
Dec.	31.890	......	145.316	......	162.842	......
Year	27.202	......	116.059	......	138.281	......

Tin	New York		London	
	1916	1917	1916	1917
January	41.825	44.175	175.548	185.813
February	42.717	51.420	181.107	198.974
March	50.741	54.388	193.609	207.443
April	51.230	55.910	199.736	220.171
May	49.125	63.173	196.511	245.114
June	42.231	62.053	179.466	242.083
July	38.510	62.570	168.357	242.181
August	38.565	62.681	169.870	243.978
September	38.830	61.542	171.345	244.038
October	41.241	......	179.307	......
November	44.109	......	186.932	......
December	42.635	......	183.368	......
Av. year	43.480	......	182.096	......

Lead	New York		St. Louis		London	
	1916	1917	1916	1917	1916	1917
January	5.921	7.626	5.826	7.530	31.167	30.500
February	6.246	8.636	6.164	8.595	31.988	30.500
March	7.136	9.199	7.375	9.120	34.440	30.500
April	7.630	9.288	7.655	9.158	34.368	30.500
May	7.463	10.207	7.332	10.202	32.967	30.500
June	6.936	11.171	6.749	11.123	31.011	30.500
July	6.352	10.710	6.185	10.644	28.137	30.500
August	6.244	10.594	6.088	10.518	29.734	30.500
September	6.810	8.680	6.699	8.611	30.786	30.500
October	7.000	......	6.898	......	30.716	......
November	7.042	......	6.945	......	30.500	......
December	7.513	......	7.405	......	30.500	......
Year	6.853	......	6.777	......	31.359	......

Spelter	New York		St. Louis		London	
	1916	1917	1916	1917	1916	1917
Jan.	16.915	9.619	16.745	9.449	89.810	48.329
Feb.	18.420	10.045	18.260	9.875	97.762	47.000
Mar.	16.846	10.300	16.676	10.130	95.048	47.000
April	16.695	9.459	16.525	9.289	99.056	54.632
May	14.276	9.362	14.106	9.192	94.217	54.000
June	11.752	9.371	11.582	9.201	68.591	54.000
July	8.925	8.643	8.755	8.473	50.750	54.000
Aug.	8.730	8.360	8.560	8.190	51.587	54.000
Sept.	8.990	8.136	8.820	7.966	52.095	54.000
Oct.	9.829	......	9.659	......	54.159	......
Nov.	11.592	......	11.422	......	56.023	......
Dec.	10.665	......	10.495	......	55.842	......
Year	12.804	......	12.634	......	72.071	......

New York and St. Louis quotations, cents per pound, London, pounds sterling per long ton.

Pig Iron, Pitts.	Bessemer‡		Basic‡		No. 2 Foundry	
	1916	1917	1916	1917	1916	1917
January	$21.60	35.95	$18.78	$30.95	$19.70	$30.95
February	21.16	36.37	18.93	30.95	19.51	30.95
March	21.81	37.37	19.20	33.49	19.45	35.91
April	21.65	42.23	18.95	38.90	19.45	40.06
May	21.78	46.94	19.11	42.84	19.58	43.60
June	21.95	54.22	18.95	50.05	19.34	50.14
July	21.95	57.45	18.95	53.80	19.20	53.95
August	21.95	54.17	18.95	50.37	19.22	53.95
September	22.88	46.40	19.58	42.24	19.53	48.58
October	24.61	....	21.26	....	21.51	....
November	30.07	....	28.18	....	26.55	....
December	35.16	....	30.95	....	30.79	....
Year	$23.88	....	$20.98	....	$21.15	....

‡ As reported by W. P. Snyder & Co.

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The Granby Mine at Anyox, B. C.*

BY WAKELY A. WILLIAMS†

The Hidden Creek low-grade copper deposits in northwestern British Columbia have been developed on a large scale by the Granby company. Five separate orebodies have been outlined by diamond drilling and tunnel levels and are being mined by open-stope, milling and shrinkage methods. An attractive town site has been built and the organization is up to date in every respect.

THE MOST important events in the history of the mining industry of northern British Columbia to date have been the acquisition and development of the Hidden Creek copper mines, the erection of a smeltery to treat the ores, and the building of a town by the Granby Consolidated Mining, Smelting and Power Co., Ltd. This undertaking has had a stimulating effect both on prospecting activity and mining development along the whole northern coast.

SOME VIEWS OF THE GRANBY CONSOLIDATED OPERATIONS NEAR ANYOX, B. C.

Mine office mess house and change house, Hidden Creek mines

Granby Bay Hotel at Anyox, B. C.; a modern and attractive haven for visitors

Granby Bay, upon the northwest shore of which lies the town of Anyox, with its mines and smeltery, is a deep-water landlocked bay about 4½ miles long by three-quarters of a mile wide and is on the western shore of Observatory Inlet, 35 miles from its entrance. The distance from Prince Rupert is 110 miles and from Vancouver 550 miles. The surrounding mountains are steep and rugged and covered with timber. The mountains have been heavily glaciated and on the crests many glaciers can be seen at all seasons of the year. The Burniston range of mountains lies to the west, rising to an elevation of 5700 ft. and separating Observatory Inlet from the Portland Canal. Four creeks flow into the bay, having their source in this range of mountains, namely, Hidden Creek, Falls Creek, Bonanza Creek and Glacier Creek. The average weather conditions by months, as noted over a four-year period, are shown in Table I.

TABLE I. AVERAGE WEATHER CONDITIONS AT ANYOX, B. C.

	Average Temp. Deg. F	Rain In.	Snow In.
January	24.2	4.00	33.13
February	30.3	3.35	34.22
March	36.5	3.53	31.25
April	43.4	6.23	0.90
May	51.5	1.46	
June	57.1	1.84	
July	58.4	7.68	
August	58.5	3.73	
September	52.7	6.75	
October	46.3	14.63	2.25
November	35.3	8.47	32.89
December	29.1	4.65	47.79
Yearly	43.6	66.32	182.43

Standing on the deck of the steamer as it enters the bay and pulls alongside the docks, one is confronted with a busy scene. The docks are built parallel to the shore on account of the deep water. The depth of water is such that ocean-going vessels can dock at low tide. The tide has a maximum rise and fall of 23 ft. 4 in. The main dock, which is 800 ft. long by 50 ft. wide, is double-tracked and has three sets of traveling ore bunkers and unloaders. A 50-ton derrick is also installed for the handling of heavy machinery. Dock No. 2 is specially constructed with receiving bins, and belt conveyors convey the material from the outer or unloading wharf to these bins. A suitable track system upon which switch engines operate is arranged to handle the tonnage easily and connects all bunkers and wharves with the main line. The tonnage handled over the wharves during 1916 was 316,915 tons, consisting of coke, ore, limerock and merchandise. At present there is under construction Dock No. 3 which is a continuation of Dock No. 1 and will be 590 ft. long and have two sets of traveling ore bunkers. In the construction of the docks creosoted piling has been used throughout, spaced 7 x 7 ft., heavily braced and with 12 x 12-in. caps, 4-in. stringers and 4-in. decking. The Granby company is affiliated with the Coastwise Steamship and Barge Co., of Seattle, to facilitate the handling of the large volume of freight and to have a reliable and regular means for transportation of supplies. In this service there are engaged a fleet of three cargo steamers, two tugs, eight barges and two scows of 1200 tons' capacity, carrying coke from Tacoma and Vancouver Island, general freight from Seattle and Vancouver, ore from outside properties of the Granby company and custom shippers, limerock from Swamp Point and quartz from Maple Bay on the Portland Canal. In addition the Granby company owns a number of smaller tugs and launches for local work. Apart from this service Anyox is the northern terminal for the three main coast steamship lines, namely, the Grand Trunk Pacific Steamship Co., the Canadian Pacific Railway, the Pacific Coast Steamship Co. and the Union Steamship Co. The companies each operate a weekly mail and passenger steamship service on a 40- to 50-hour schedule with Vancouver and Victoria, thus furnishing mail service three times a week.

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*The first of a series of three articles describing the Granby Consolidated Mining, Smelting and Power Co.'s operations at Anyox, B. C. Succeeding installments will discuss the metallurgical problems at Anyox and the power plant and mechanical shops.

†Superintendent of smelters, Granby Consolidated Mining, Smelting and Power Co., Anyox, B. C.

The town of Anyox is built on the ground lying between the wharves, the smeltery and the mine. The streets are laid out to conform to the contour of the ground and at night are well lighted by electricity. The company maintains a modern 45-room hotel with steam heat, hot and cold water and telephone service in every room.

A completely equipped hospital with the latest X-ray apparatus is in charge of three physicians and a staff of nurses, so that every provision is made for taking care of the sick and injured. Moving-picture theater, dance hall, pool and billiard rooms are available for the recreation of the inhabitants. The company has a complete department store with grocery, dry goods, men's furnishings, hardware, furniture, drugs and meat departments, a modern refrigerating plant, and an up-to-date café. The prices charged are reasonable and about on a par with the prevailing prices of commodities in Vancouver. There are two schools in charge of three teachers to provide for the education of the employees' children, while three churches minister to the spiritual welfare of the community. For the accommodation of the single men the company has built two 2-story concrete fireproof rooming houses, illustrated on another page. In these rooming houses there are no hallways, every room having an outside door. The buildings are modern in every respect, having bathrooms, shower baths and lavatories; and each room has hot and cold water, steam heat and electric light. The boarding house, which seats 216 men, is a concrete building with all the latest improvements, such as cold storage, bake shops and laundry. A high standard of food is maintained and board is charged for at the rate of $1 pe day and rooms at $5 per month.

GENERAL VIEW OF THE HIDDEN CREEK MINES OF THE GI

Since starting active operations in 1912, a new min town has been built, and no money has been spared t provide the most modern conveniences for the comfor of employees. This consists essentially of a chang house, mess house, bunk house and 50 cottages, show in the accompanying halftone engravings. The chang house is a three-story, frame building with concret floors on the first and second stories. The first floo is occupied by a locker room containing 300 steel sanitary lockers, a wash room where 50 men can wash a one time, a water-closet and urinal room, 24 showe baths, four porcelain tubs and a drying closet for clea clothes. The second floor consists of a pool room, a l brary and reading room, a shift-boss' office, an emergenc hospital with four beds and a doctor's office. The thir story consists of a dance hall with the necessary cloak rooms. This building is heated by an Arco sectional hot-water heater. A hot-water tank holding 1500 gal. attached to a separate heater provides hot water for the shower baths.

The mess house is similar to the one near the smelting works except that it is of wooden-frame construction. The bunk house consists of three wings and is capable of holding 400 men. The heating plant is similar to the one in the change house. The cottages are all of modern construction, and each is equipped with porcelain bath, washbasin and water-closet. They also have hot- and cold-water connections and electric lights. The importance of the sanitary arrangements of the town, including sewer system, incinerators for garbage disposal and an adequate water system, is evidenced by the fact that sickness caused by the lack of these things is unknown.

The Hidden Creek mine is a mile from tidewater and at the highest elevation is 900 ft. above sea level. The rocks in which the Hidden Creek orebodies occur consist of highly altered sedimentaries, including slates, schists and limestones. These rocks have been steeply tilted and in general lie at angles varying from 45° to 90° from the horizontal, and dip to the north. In the vicinity of the orebodies there is evidence of intense folding accompanied by faulting, both of which probably played a part during the period of deposition that formed the various orebodies. This sedimentary area is cut by a great variety of dikes, offshoots of the granitic ntrusion flanking the area to the west and south. Some of these dikes show no evidence of having been the source of an enrichment of the ores through which hey cut, whereas others show decided evidence of their nfluence in ore enrichment.

In the mineral-zone area slates are found on the southern and eastern sides more or less in contact with orebody No. 1. North and west of the slate is a zone 100 to 400 ft. wide, consisting of beds of siliceous material interbedded with occasional bands of limestone. In this zone are found orebodies Nos. 1, 4 and 5. To the northwest of this siliceous zone is an area of highly altered schist showing some epidote and chlorite, and in this area orebodies Nos. 2 and 3 occur.

Orebody No. 1, lying directly to the north of and in contact with the slate area, has a width varying from 100 to 250 ft., with an established length of about 1500 ft. The general dip of this orebody is about 75° NW, although in places, in following down the slate wall, the dip is reversed. This orebody outcrops at an average elevation of 900 ft., and ore is proved to extend to sea level.

Orebody No. 5, in the same general zone as that containing orebody No. 1, is a lenticular shoot which was discovered by the diamond drill and does not outcrop. It has a north-south strike and pitches steeply to the north.

Orebody No. 4 lies between orebodies Nos. 5 and 2 and is also included in the siliceous and limebed area. This orebody does not outcrop and like orebody No. 5, was found with the diamond drill.

Orebodies Nos. 2 and 3 occur in the schist area and both have an extensive outcrop. The average elevation of the outcrop of these orebodies is 800 ft., and their continuity is established down to an elevation of 350 ft. Orebody No. 2 is a lenticular body about 400 ft. wide, 300 ft. thick and 700 ft. long, outcropping at the southern end and pitching to the north at about 45°. Orebody No. 3 is much smaller and is situated northwest of No. 2 and geologically in the same area.

The ore constituting orebodies Nos. 1, 4 and 5 is essentially a massive sulphide although in some parts of these orebodies siliceous zones with disseminated sulphides are found. Orebodies Nos. 2 and 3 have disseminated sulphides in a schistose gangue, with an occasional small lens of massive sulphide ore. There is little evidence of

LIDATED MINING, SMELTING AND POWER CO., AT ANYOX, B. C.

oxidation or surface enrichment in the orebodies and unaltered sulphides appear at the surface. In Table II is shown a general analysis of the orebodies established by underground development work and diamond drilling. In mining, calculated proportions from each orebody are taken to make a mixture most desirable for smelting.

The Hidden Creek mine in its initial development was opened up by six tunnels, namely, the 150, 230, 385, 530, 630 and 700, which numbers are identical with the respective elevation of each tunnel level above sea level. Fifty thousand feet of diamond drilling was done prior to and contemporaneously with this first tunnel work. The diamond-drill cores established the general outlines of the orebodies and the tunnels served to develop them for mining at the most advantageous points. The haulage tunnels are the 530, 385 and 150. The 630 and 700 were driven to prospect the orebody No. 2 and are now used only as stope manways. The 230 level is used as a crusher level only. On this level ore from the upper levels is crushed and dropped directly into pockets extending to the 150 level, where it is drawn into railway cars for shipment to the smeltery.

Mining consists of open-stope or milling methods underground, and "gloryhole" or opencut work near the surface. Stoping was started first on the 530 level, extended to the 630 and 700 levels, and thence to the surface. These first stopes served as pockets from which the ore broken above was drawn. By extending several stopes to the surface and widening them at the top, two gloryholes of considerable size have been formed and are now being worked in orebody No. 2. An equal number has been developed in orebody No. 1.

TABLE II. GENERAL ANALYSIS OF HIDDEN CREEK ORES

	Cu.	Insol.	SiO_2	Fe	CaO	S	Al_2O_3	MgO
No. 1...	2.37	25.8	22.4	29.6	4.7	30.0	5.1	1.3
No. 2	2.24	40.7	33.2	25.6	3.0	18.0	10.8	4.0
No. 3	1.82	48.8	40.8	21.6	1.5	7.9	11.5	6.6
No. 4 ...	1.52	12.2	9.2	37.0	9.8	30.5	3.0	0.8
No. 5 ...	3.02	16.1	14.8	34.0	5.9	33.3	1.6	0.0

The ore drawn from chutes on the 530 level is transferred to pockets extending to the 385, from which it is delivered to the crusher bins. Several raises have recently been completed from the 385 level, into which all of the ore from the gloryholes in orebody No. 2 runs direct, thus eliminating the transfer on the 530 level.

A departure from the general mining methods is being made below the 385 level and in those portions of the orebodies above the 385 level which do not outcrop and have a heavy overburden of rock to carry. In such places a system of shrinkage stopes is being developed which will give more support to the back and walls and make working conditions safer. The method adopted in a section now under way consists of shrinkage stopes 125 ft. wide, with a length equal to that of the orebody. Vertical pillars, 40 to 50 ft. wide, also across the orebody, are left between stopes.

A manway raise is driven through the center of each pillar to the surface, or to other workings opening to the surface. These manways serve for ventilation purposes and as entrances to the stopes. Manway drifts are driven from the pillar raises into the stopes at vertical intervals of about 30 ft. progressively as the raises are advanced upward. Drifts are driven under the stopes, and chutes are distributed so as to draw evenly the ore broken in excess of requirements for head room in the stopes. Each chute is equipped with a bulldozing chamber cut in the solid and without timber, as shown in an accompanying illustration. The manway to this chamber is equipped with an air line for use in drilling boulders.

Electric Haulage in Granby-Type Mine Cars

The present haulage system is equipped with 75-cu.ft., 24-in. gage, Granby-type cars, of which there are 54 in use, and five 6-ton, 500-volt Westinghouse bar-frame locomotives. On account of the recent increase in smelting capacity a change is being made in the haulage system on the 385 level which handles the total output to the crusher bins. Thirty cars of 140-cu.ft. capacity and 36-in. gage, and also two 12-ton Westinghouse locomotives of the bar-frame type, for pulling trains on the main line, are being installed; and two of the 6-ton locomotives are being altered to fit the wide gage for switching purposes underground. The rails used with the light equipment weigh 30 lb. per yd., while the new track is being laid with 45-lb. rails.

A duplicate crushing plant has been provided, so that either plant can take care of the maximum output. Crushing plant No. 1 is installed underground on the 230 level. Three crude-ore pockets extend from this level to the 385 and receive the run-of-mine ore from that point. This ore feeds directly into the crusher from which it can be diverted into either of two pockets extending to the 150 level. The Bacon-Farrell crusher used in this installation has a solid-cast frame and a crusher opening 36 x 42 in. The crusher is belted to a line shaft direct connected to a 150-hp., 2000-volt, Westinghouse alternating-current motor. Crusher No. 2 is installed at the surface below two ore bins of a capacity each of 250 tons. The ore from these bins is fed directly into the crusher from which it goes into pockets also extending to the 150 level. The crusher at this point has a cast-steel sectional frame with a 30 x 42-in. jaw opening, and it has a drive similar to that of the No. 1 crusher. The ore is crushed to 8 in. which is the size required by the smelting works.

Safety Committee Organizations

The mine and the smelting-and-mechanical departments have separate safety organizations all working along the same lines. The safety-first committee appointed to promote safety held its first meeting, Apr. 3, 1916, and has been followed by regular monthly meetings since. The committee is composed of the heads of the various departments, the superintendent acting as chairman. Each department head appoints a subcommittee of the men to act under him. Meetings are held every month, the personnel of these committees being changed every two months. Recommendations of the subcommittee are referred to the executive committee for approval. All workmen are urged to point out dangerous practices or unsafe equipment, and to offer suggestions for their rectification, which can be made direct to any committeeman, safety engineer, department head, or written out and placed in the "suggestion box," provided for that purpose. Subcommittees since the inception of the campaign have made 334 suggestions, 54 being placed in the boxes, and a great many made t the safety engineer.

First-aid instructions have been given to 65 men 17 of whom have been awarded the class A. St. John's

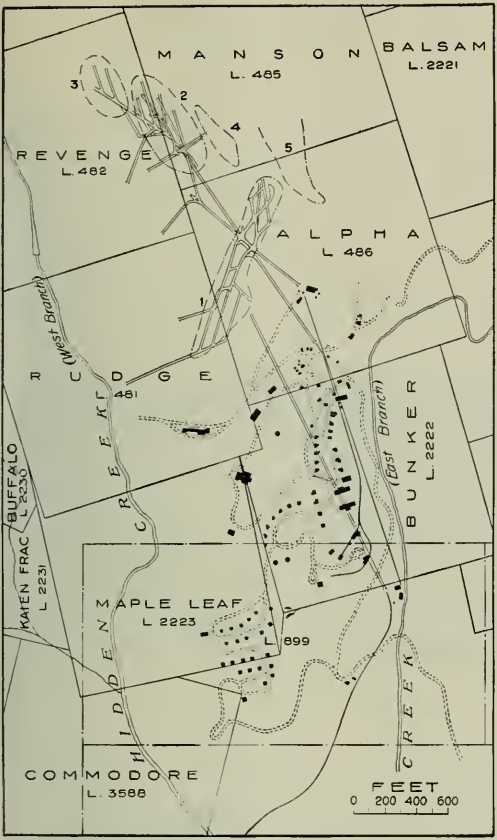


FIG. 1. COMPOSITE MAP OF HIDDEN CREEK MINES SHOWING RELATION OF OREBODIES NOS. 1 TO 5

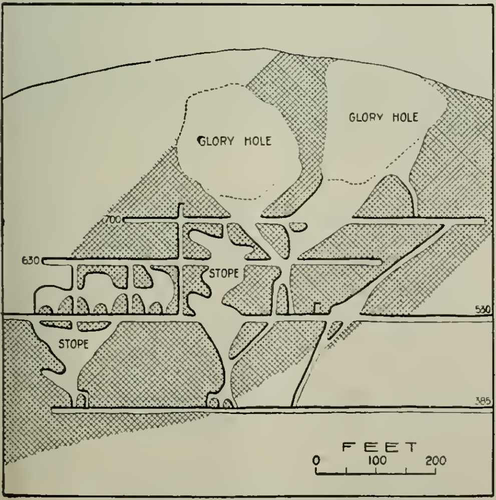


FIG. 2. TRANSVERSE SECTION OF OREBODY NO. 2

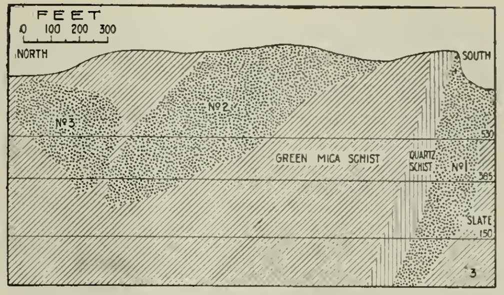


FIG. 3. GENERAL NORTH-SOUTH SECTION OF HIDDEN CREEK OREBODIES

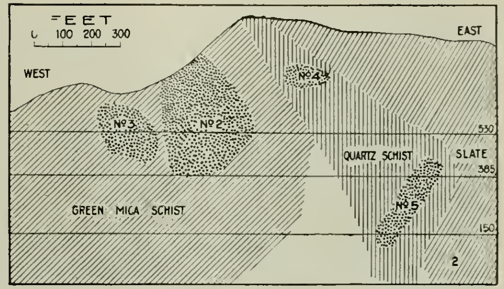


FIG. 4. EAST-WEST SECTION, HIDDEN CREEK OREBODIES

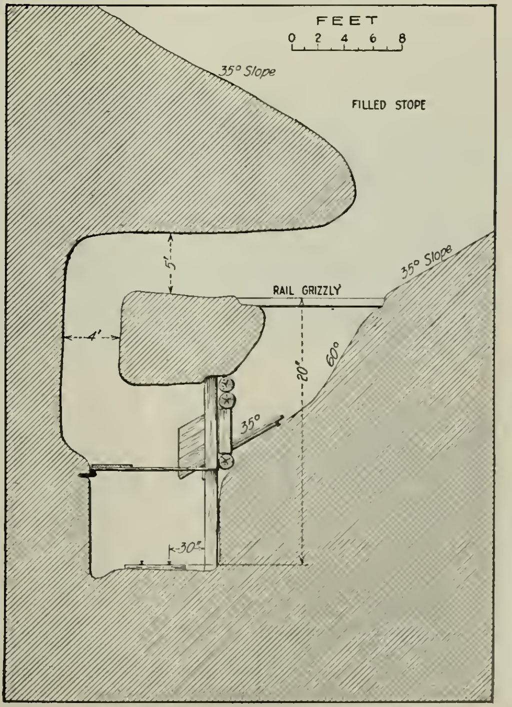


FIG. 5. SHRINKAGE-STOPE BULLDOZING CHAMBER

ambulance certificate. There are seven first-aid stations fitted up with all the necessary equipment, including stretcher, blankets, etc., and at the smeltery there is a type B pulmotor. It is aimed to render first aid to the injured men before they are sent to the hospital. A man gets only one dressing at the first-aid station, and must go to the doctor for future dressings.

Safety bulletins have been used extensively in educating the men, 14 boards being located in conspicuous places, and the literature posted being changed every two days. Letters on safety have been sent to the homes of all married employees every month or six weeks. Subforemen and straw bosses receive letters once in two months, aiming to impress them with the important part they are able to play in safety-first work. Danger signs are placed at dangerous places, such as railway crossings, powder houses, oil tanks and on all high-voltage wires, transformers, etc. Rules have been compiled and are enforced wherever possible. There was a 33% reduction in time lost per accident over that of the previous year. The three months of January, February and March, 1917, showed a reduction in accident cases, minor and major, reported for treatment at the hospital, of 64% over the same period of 1916. The periods compared are the most fair that could be taken, conditions being practically identical.

GRANBY MESS HOUSE

COMPANY HOSPITAL AT ANYOX, B. C.

GRANBY COMPANY FAMILY COTTAGES

GRANBY BACHELOR ROOMING HOUSES

Fire prevention receives the attention of the safety organization also. Warnings are posted freely throughout the town and works and a large number of fire dangers have been eliminated. Pyrene protection has been installed in every building in the camp. A volunteer fire department has been organized. The general results of the campaign are undoubtedly good and the ensuing years promise a further large reduction in the number and severity of the accidents.

The head offices for the Western organization of the Granby Consolidated Mining, Smelting and Power Co., are at 813 Birks Bldg., Vancouver, B. C. The general manager and managing director, F. M. Sylvester, has his office at Vancouver, as has G. W. Wooster, treasurer of the company, who is also head of all accounting departments. In these offices are also the purchasing departments of the mines, smelting works and stores. Directly under the general manager is the superintendent of mines, O. B. Smith, who has charge of all mines and mining works of the company, and W. A. Williams, superintendent of smelters, who has charge of the two smelting plants and all metallurgical work. In direct charge of the smeltery at Anyox is A. J. Bone, to whom I am indebted for the major part of the metallurgical data in this article. I am also indebted to E. E. Campbell, who is in direct charge of the Hidden Creek mine and who has kindly furnished me with the foregoing interesting data relating to his department.

The smelting, converting and mining departments are each in direct charge of a general foreman, under whom are the shift bosses. All other departments are in charge of a general foreman, assistant and sub-bosses. There are about 1000 men employed at the Anyox unit, 450 at the mine and 550 in all other departments. Labor of all nationalities is employed, the majority of the men being British subjects.

Mexico's Tendency Toward Confiscation

Recent legislation affecting particularly American mining interests in Mexico has been enacted by the Mexican Congress. On September 8, a bill was passed which provided for the temporary confiscation of industries not being operated. Prior to the passage of this bill, a communication, in the form of a circular signed by Aguirre Berlanga, assistant secretary in charge of the Department of the Interior, was sent to the governors of the Mexican states.

The circular reviews the situation, beginning with a statement of the right of the government to regulate industries affecting society, public power and national wealth. To the end that society may not suffer, it is asserted that the government must intervene to prevent interruption of work and suspension of various industries, by taking charge of enterprises where owners refuse to work them. The governors are ordered to report to the president enterprises within their states that have ceased to operate, in order that the Department of Finance may proceed to conduct operations with the understanding that the taking over by the government will last only while the owners are unwilling to resume operations.

The following translation of the circular of the Department of the Interior was sent to the *Journal* by a well-known mining company in Mexico.

Art. 27 of the Political Constitution of the United States of Mexico fixes the right of the nation to impose on private property such limitations as the public interest may demand, and in a special manner grants the authorities the right to regulate the useful employment of the natural elements, such as water, minerals and petroleum deposits. To such a principle must be subject the operation of the industries and all kinds of "negotiations" that create public necessities the satisfaction of which cannot be interrupted by the absolute liberty of the owners, as it is not lawful for any one to arbitrarily diminish the entire production of the social wealth, and much less when that production is not sufficient to supply the demand.

The enterprises that, by their nature, pass from the rank of a simple private interest to that of interests that affect society, the public power and the national wealth—such as the enterprises that have for their object the supply of water, railroad, telegraphic and telephonic communications, undertaking and light services, manufacturing concerns, mining enterprises and many others of a similar character, do not depend on the exclusive will of the proprietor because they are necessary for the satisfaction of collective necessities, and the activity or abandonment of these enterprises appertain to the common interest.

The conduct of the owners who close down their negotiations, or keep them idle, with the purpose of compelling the workmen to desist from a certain attitude, or with any other purpose not in accord with the general welfare, is openingly contrary to the sense of the chapter of the Constitution entitled "Of Labor and Social Welfare" and is manifestly in conflict with Fraction XIX of Art. 123 of the same Constitution, which prescribes that lockouts shall be lawful only when the excess of production makes it necessary to suspend work in order to maintain prices reasonably above the cost of production.

When the lockout injures the rights of society, diminishing wealth or stirring up difficulties to the public power, the temporary or definite shutdown violates the spirit and the letter of Art. 27 of the Constitution, which gives the government eminent dominion over property and control in its direct ownership, for the benefit of the community.

Recently, on account of the exemption of import duties on cloths granted by decree of July 19, for the relief of the poorer classes and in the exercise of the right vested in the sovereignty of the nation, several cloth factories, to the manifest detriment of society, of public order and of the working classes, have closed down in spite of the legal precepts that govern in the matter and notwithstanding that, by decree of Aug. 15, there was granted an exemption of duties on foreign cotton and that other manufacturers have already made use of this privilege to import the raw material mentioned and to push the work of their industries.

In order to prevent the lockouts of the negotiations, or to have those that have suspended resume work, to the end that society may not suffer disturbances by the stagnation of business and by not being able to fulfill its wants, the public power must intervene in an equitable manner. With this object, and with the object also of removing any chance of disturbance of the peace that may follow the interruption of work, the government sees itself in the inevitable position of being bound to take charge of the enterprises in those cases where the owners refuse to work. This official intervention, justified by public interest, does not in any manner tend to constitute a source of revenue for the government, to the detriment of private interests, so the proprietors, continuing in ownership, are to receive a profit from their negotiations.

The state of war in the country during the last years brought about the closing of many enterprises which have continued suspended, thereby increasing the difficulties that the government encounters to consummate the work of national reconstruction; and the recent lockouts of negotiations that were in operation, besides counteracting the work of reorganizing the country, with the economic curtailments that result from the stagnation of business, damage considerably the reserves of national capital.

Moreover, the owners, by frequently applying the lockout as a weapon against the workmen and an expedient to cause difficulties to the public power, incur in the grave offense against the public peace that has already been mentioned.

Therefore, the president of the republic has seen fit to resolve that I tell you, as I have the honor to do, to please advise this department with all opportunity in regard to the negotiations of public utility mentioned, within the state under your charge, and also of the enterprises that have already ceased to work, to the end that the Department of Finance may proceed at once to administer said negotiations that have already suspended, or may in the future suspend, their operations; with the understanding that the taking over by the government will last only while the owners are unwilling to resume operations.

I protest to you the assurance of my attentive consideration.

Constitution and Reforms, Mexico, Sept. 5, 1917.

The Asistant Secretary in charge of the Department of the Interior. (Signed) Aguirre Berlanga.

Fractions XIX and XX of Art. 123 of the constitution read as follows:

XIX—Lockouts shall be lawful only when the excess of production shall render it necessary to shut down in order to maintain prices reasonably above the cost of production, subject to the previous approval of the board of conciliation and arbitration.

XX—Differences or disputes between capital and labor shall be submitted for settlement to a board of conciliation and arbitration to consists of an equal number of representatives of the workmen and of the employers and one representative of the government.

The following is a translation of the bill enacted by the Mexican Congress, Sept. 8, 1917:

Art. 1. The Executive Power of the Union is empowered so that, by means of the authority he may designate and until the Organic Law of Art. 123 of the Constitution is enacted, he may exercise the faculties to which Fraction XX of the same article refers.

Art. 2. The same Executive Power of the Union is authorized to take over the industrial establishments, and to administer them, in case of temporary or absolute shutdown of same that is not authorized by the constitution, with the understanding that this power will be exercised only for the time that the owners are unwilling to resume their interrupted operations.

Art. 3. The state legislatures are invited to issue a law similar to the present.

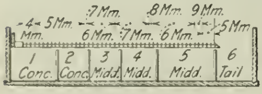
Battelle Furnace, at Battelle, Ala., has been sold by W. S. Rowe, of Cincinnati, to the Tata Iron and Steel Co. The furnace will be dismantled, the machinery and ironwork shipped to India and there set up on the company's property at Sakchi. The stack has been idle for 11 years. It is 85 x 19 ft. and has four Whitwell stoves for heating the blast. It was built to work the red hematite ore of the neighborhood, but was in blast less than three years.

Improving the Work of a Hancock Jig in Concentrating Lead Ore*

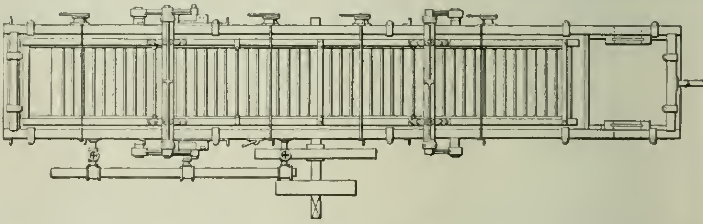
Experiments revealed that, with the overcrowding of a Hancock jig at Bonne Terre, Mo., an unnecessarily large amount of free gangue was passing through the jig screens. Tests were therefore made in an attempt to throw this excess gangue into the tails without raising the grade of the latter. A system of screens was finally adopted which, with careful adjustment of speed and stroke, gave the desired result.

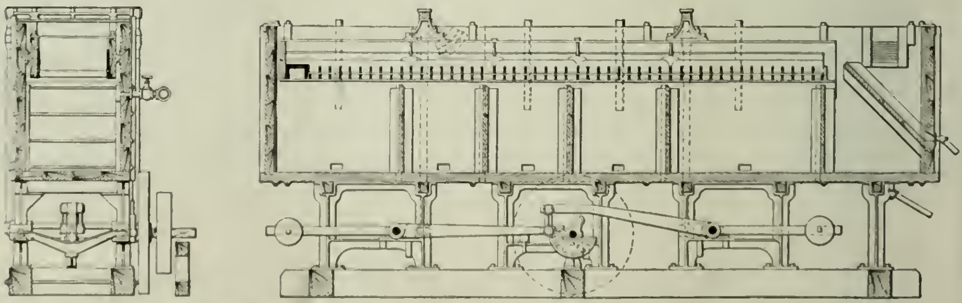
THE following notes are taken from results obtained on a standard 25-ft. Hancock jig[1] during regular operation in the Bonne Terre mill of the St. Joseph Lead Co. in southeastern Missouri. The object of the tests was to determine the conditions for most effective work, and the nature of products that could be made.

The material treated was sized between 9-mm. and 2-mm. round-hole screens, and was constant throughout the experiments. Three products were made: Concentrates from the first three hutches, middlings from the fourth and fifth, and tailings from the sixth. The middlings were crushed in one pair of Allis-Chalmers, Style B, 30 x 14-in. rolls, and elevated with the original ore to the 2-mm. screens, the oversize forming the jig feed.



System of Screens





HANCOCK JIG AS USED AT BONNE TERRE MILL, MISSOURI

While this arrangement was simple, it gave rise to undesirable crowding of the circuit. Table I shows tonnage and lead content of the jig feed and products at the beginning of the experiments, and brings out the excessively large amount of middlings, comprising 63.3% of the total material fed to the jig. The rolls, being heavily overloaded, did little crushing, a screen analysis of the product showing that only 27%, or 128 tons, was crushed fine enough to pass to the tables. The remaining 347 tons was returned to the jig with 400 tons of original ore. At times this overcrowding became much worse, and the tonnage in circuit grew to enormous proportions. It became imperative either to decrease the amount of middlings or to provide more crushing capacity, and experiments were begun along both lines. This paper deals only with the attempt to improve the work of the jig as then equipped.

TABLE 1 WORK OF HANCOCK JIG AT BEGINNING OF TESTS

Material	Tons per 24 Hours	Lead %	Lead Tons per 24 Hours
Feed	750 0	4 06	30 500
Concentrates	16 5	70 00	11 550
Middlings	475 0	3 50	16 625
Tailings	258 5	0 90	2 325

Before commencing the experiments a combined sizing and sorting test was made on an average sample of the jig feed. Tyler standard screens were used for the sizing test and all sorting was done by hand. Figs. 2 and 3 represent the result of this test graphically. The horizontal divisions in the diagrams represent the percentages of material in each size, and the vertical divisions the percentages of free galena, middlings, and free gangue as obtained by sorting. Areas, therefore, represent percentages of the total weight of sample. For instance, in Fig. 2 the length AB is 26% of the total length of the diagram and represents the amount of material between 6- and 8-mesh. The length AD is

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*Excerpts from a paper entitled "Hancock Jig in the Concentration of Lead Ores," by Harold Rabling, to be presented at the St. Louis meeting of the American Institute of Mining Engineers, October 8-13, 1917.

[1] For description of Hancock Jig, see Transactions, A. I. M. E., Vol. 4, 213.

76.65% of the total height of the diagram and represents the percentage of the 6- to 8-mesh material, which occurs as free gangue. The area *ABCD*, therefore, shows the percentage of the total sample occurring as free gangue between 6- and 8-mesh and is equal to 19.927% of the total area of the diagram, while the area *EFGH* shows the total amount of free gangue in the sample, or 76.44 per cent.

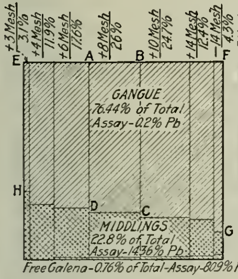

FIG. 2

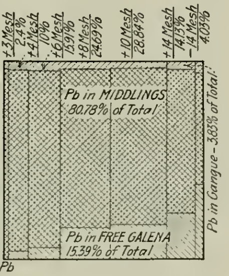

FIG. 3

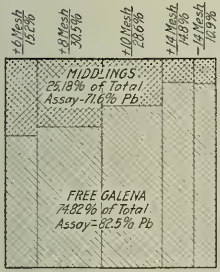

FIG. 5

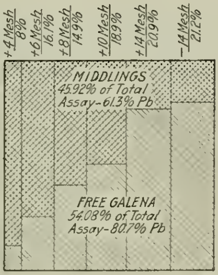

FIG. 6

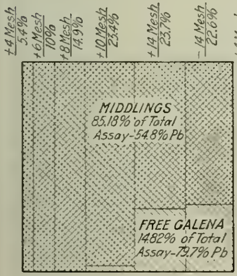

FIG. 7

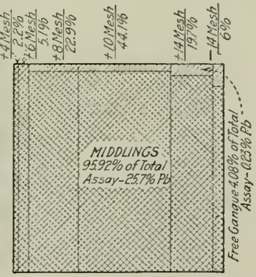

FIG. 8

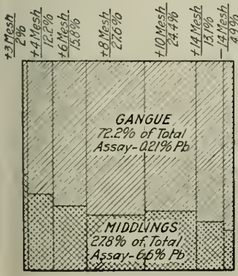

FIG. 9

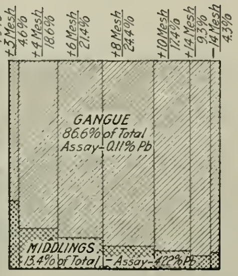

FIG. 10

GRAPHIC REPRESENTATION OF SCREEN ANALYSES

Fig. 2—Jig feed. Fig. 3—Lead in jig feed. Figs. 5 to 9—Products of first to fifth hutches respectively. Fig. 10—Jig tailing

The results obtained by this test led to the belief that it was possible greatly to reduce the tonnage of hutched product without affecting the grade of tailings. Table II, worked out from the results of the sorting, shows the work that might be expected from a theoretically perfect concentrating machine, and differs considerably from the record of the actual work obtained (Table I). An unnecessarily large amount of free gangue seemed to be passing through the jig screens, and a sorting test on the jig products confirmed this, the fifth hutch containing almost as much free gangue as the tailings. In the investigations following the above work special attention was given to the possibility of decreasing the amount of gangue being hutched with the middlings.

TABLE 2. THEORETICALLY PERFECT WORK OBTAINABLE ON MATERIAL FED TO JIG

Material	Tons per 24 Hours	Lead %	Lead Tons per 24 Hours
Feed	750.00	4.06	30.500
Concentrates . . .	5.70	80.90	4.753
Middlings ..	171.00	14.36	24.600
Tailings	573.30	0.20	1.147

FACTORS AFFECTING OPERATION OF JIG

The following factors may be taken as having most effect on the work of the Hancock jig: (1) The speed of the jig. (2) Length of vertical stroke. (3) Length of horizontal stroke. (4) Depth of bed. (5) The size of the grains forming the bed. (6) The specific gravity of the grains forming the bed.

The speed of the jig was varied between wide limits—from 170 to 210 strokes per minute. The high speeds gave increased tonnage of hutch product and were objectionable from a mechanical standpoint. At the slow speed of 170, difficulty was experienced in keeping the bed moving freely, it having a tendency to pack and lose its quicksand effect. A speed of 190 to 195 strokes per minute was finally decided on as the most desirable.

The length of vertical stroke, by affecting the pulsion and suction velocities, affects the tonnage of hutched product, increased length causing more material to be hutched, and vice versa. It varies between $\frac{3}{8}$ and $\frac{3}{4}$ in., the adjustment being made by the operator according to the lead content of the material treated.

The horizontal stroke should be as long as possible, in order to have, above the bedding, a thin layer of ore. In treating large tonnages the long stroke is particularly desirable, the improved separation in a thin layer more than compensating for the shorter time the material is under treatment. A minimum horizontal stroke of $\frac{3}{4}$ in. is used at Bonne Terre, and it is probable that greater capacity could be had by making the stroke much longer.

The depth of bed on the Hancock jig is determined by the height of the slats above the screen. No experiments were made with variations of this distance, all the jigs being operated with 3 in. of bed depth. The size and specific gravity of the grains forming the bed are determined entirely by the size of the jig screens. No artificial bedding was supplied at any time, as experiments have shown that with a carefully designed system of screens any desired bed can be produced and held, relying on the ore to supply all the material necessary. The nature of the bed being the most important factor influencing the work of the jig, the main part of the investigation was taken up by the effort to work out a system of screens that would give satisfactory work under average conditions and be flexible enough to take care of extreme variations in the grade and nature of the material treated.

The system that was finally evolved is given in Table III, and, while it would probably be applicable only to the Bonne Terre ore, the principles of its evolution may be found useful in the solution of similar problems elsewhere.

TABLE III. SYSTEM OF SCREENS USED ON HANCOCK JIG

4-mm. round hole to	rib 3 (3 ribs)
5-mm. round hole to	rib 15 (12 ribs)
7-mm. round hole to	rib 16 (1 rib)
6-mm. round hole to	rib 22 (6 ribs)
7-mm. round hole to	rib 30 (8 ribs)
8-mm. round hole to	rib 31 (1 rib)
6-mm. round hole to	rib 41 (10 ribs)
9-mm. round hole to	rib 43 (2 ribs)
5-mm. round hole to	rib end (3 ribs)

Close examination of the jigs brings out the following points:

1. Stratification of the material into layers of varying richness takes place almost immediately after it reaches the tray. This is helped by the strong pulsion effect on the first hutch, where suction is minimized by the fineness of the bed of free galena which lies in a heavy mass on the screen.

2. In order to remove all the material containing lead, both as free galena and middlings, a bed is required that gradually decreases in specific gravity with increasing size of grains. This was found to be most effectively obtained by arranging the tray with an occasional row of large holes to take out the bedding in steps.

3. The bed may be likened to a screen having holes of different sizes, the size depending on the size of the grains. Any section should be just long enough to give a good "screening efficiency" on such material as will pass through it. For instance, a bed composed of grains of specific gravity 4.0 will hutch a product assaying about 40% lead. If it be found that all the 40% material present will pass through in a length of 2 ft., there is a loss of efficiency by extending this particular bed any farther than 2 ft. A row of large holes at this point will allow the heavier particles to pass through, leaving a bed of lighter specific gravity for the next section of tray. A bed which changes rapidly in character will therefore allow all parts of the jig to do equal work, and give maximum efficiency.

4. There are two distinct operations to be considered. First, the making of clean concentrates, and, second, the making of clean tailings. These are justly considered apart, and of the two the latter is by far the more difficult. The specific gravity of galena is 7.40 and of gangue 2.80, and while the separation of these two minerals is easy, the material received on the jig is made up of grains ranging from one extreme to the other. By sorting the products of the jig it was found that concentrates are made up of grains of free galena of grade 82.3% Pb, and middlings of 60.4% Pb. Specific gravities are 7.00 and 5.20 respectively: a difference of 1.80; tailings are made up of middlings of grade 4.91%, or specific gravity 2.95, and gangue of grade 0.14%, or specific gravity 2.82, a difference of 0.13. These figures illustrate the wider range of specific gravity permissible in concentrates, and therefore the relative ease of separation of the high-grade material.

5. The small amount of free galena present helped to simplify its separation, and it would appear to be good practice to hutch the free galena in as short a distance as possible, reserving the greater length of the tray for the more difficult work of separating middlings from tailings. An attempt to do this was successful, and concentrates are now made on only two hutches, occupying 80 in. of screen length. The larger part is caught in the first hutch, the second acting as a safeguard to prevent free galena being carried over into the middlings hutches. As a general rule the tonnage of product from the second hutch is small.

6. The separation on the final section of the tray, or the part over the fifth hutch, must necessarily be rough, owing to the low grade of the middlings remaining, and the small difference in specific gravity between it and the free gangue. The bed consists of large-size grains of low-grade middlings, and the heaviest tonnage of hutched product is made here. At the end of the fifth hutch two ribs of holes, large enough to take out all the remaining bedding, are used.

7. Variations in grade of the feed introduce complications that must be allowed for in the screen layout. An excess of bedding material, due to higher-grade ore than usual, causes an accumulation of heavy grains that cannot pass through the screens, while low-grade ore will allow the bed to become too light and the hutched product will contain too much gangue. By arranging the screen to take out the bedding in steps, as mentioned before, such an accumulation cannot extend very far, but extreme variations are best taken care of by the operator who shovels off excess bed and plugs the large holes in the screen when bedding material is scarce.

8. Wire cloth and punched plate were both tried for the jig screens, with a final decision in favor of the latter. While it is sometimes claimed that wire cloth gives less trouble by blinding, it was found in these tests that there was little difference in this respect, while punched plate had the advantage of being more easily cleaned.

The nature of the products obtained with the screen system given in Table IV is shown in Figs. 5 to 10. The first two hutches produce good concentrates, the third and fourth a rich middlings, and the fifth a low-grade middlings containing a large proportion of free gangue. Analysis of the tailings shows some middlings present hardly worth recovering. Table IV shows results of a tonnage test on the jig, equipped with the screen system given in Table III.

TABLE IV. WORK OF HANCOCK JIG UNDER PRESENT CONDITIONS

Material	Tons per 24 Hours	Lead %	Lead Tons per 24 Hours
Feed	505.0	4.74	23.95
Concentrates	7.7	75.00	5.79
Middlings	195.0	8.16	15.91
Tailings	302.3	0.74	2.25

The rolls in this section of the mill have a feed of 195 tons per 24 hours, of which 58%, or 113 tons, is crushed fine enough to pass through 2-mm. screens. The remaining 82 tons is returned to the jig with 423 tons of original ore. The lighter load on the jig enables it to do better separation, and cleaner concentrates and lower tailings are possible. Subsequently the tonnage of ore treated in the mill was raised from 1800 to 2200 tons per day without extra jig equipment, and with lower tailings than previously, the gain being almost entirely due to the more efficient work done by the jigs.

Alaska Juneau 1520-Ft. Raise

By C. K. White*

A two-compartment raise, inclined at 56°, was driven from one level, and without intermediate connections, 1520 ft. in 363 days at the Alaska Juneau mine. Ventilation was secured by means of an exhaust fan assisted by compressed-air jets set inside a 15-in. pipe. Cost of the raise was $26.33 per ft., including overhead.

The No. 2 main raise in the Alaska Juneau mine was started at a point on the No. 4 level, the elevation of which is 450 ft. above the sea, and 80 ft. south of the intersection of the Nugget Gulch and the Silver Bow faults. These faults have been found to be the southern and western limits of the orebody which was to be developed. The Nugget Gulch fault strikes N 37° W and dips 60° to the northeast; the Silver Bow fault strikes N 80° E, and dips 70° to the northwest. The line of intersection of both planes bears S 48° 30′ W, making an angle with the horizontal of 56°. The raise was driven on a 56° pitch parallel to this line, the purpose being to keep the raise in the foot wall at a uniform distance from the orebody at all times. Levels were provided at intervals of 250 ft. measured vertically, the topmost level being No. 00 at an elevation of 1700 ft. On this level a drift 350 ft. in length was connected to the surface, thereby completing the ventilation circuit for the mine.

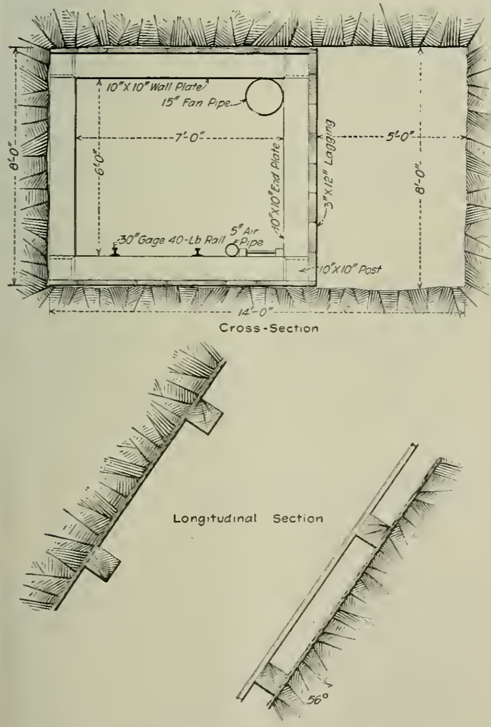

FIG. 1. SECTIONS OF 1520-FT. INCLINE RAISE

The raise, which is 8 x 14 ft. outside dimensions, is divided into two compartments, a chute compartment 5 x 8 ft., untimbered, and a skip compartment, 6 x 7 ft., inside of timbers. Fig. 1 shows a cross section of the raise and Fig. 2 the details of the timber set used.

Work started, with three shifts per day on Aug. 25, 1915. Squaring up for the start and driving the chute raise occupied nearly one month, and the start on actual raising was made on Sept. 26. The work was performed continuously and completed on Nov. 12, 1916. A total of 1520 ft. was driven and at intervals of 250 ft. vertically, or 300 ft. on the slope, chute raises and stations for four working levels were made. On Dec. 23, 1915, the working schedule was changed to two shifts but on Sept. 3, 1916, returned to three shifts. The change to two shifts was made in the interest of economy but necessity for ventilation in the mine made speed the important factor and three-shift schedule was resumed. The best month's progress was made within a month from completion, when a distance of 169 ft. was driven.

The crew employed in driving the raise consisted of five machinemen on each shift and one timberman, the latter working only when the raise crew were placing timbers in the raise. He was called upon at any time, regardless of shift time, when the raise men were ready to place a set. This arrangement worked out satisfactorily. The wages paid the men in the raise were: Leader, $4 and $4.50; machinemen, $3.50 and $4; timbermen, $4 and $4.50. The increase was given when the raise became exceedingly wet, as it was for part of the time. The raise work came under the supervision of the shift boss on duty in that section of the mine.

GENERAL CYCLE OF OPERATION

The general cycle of operations as practiced was as follows: Starting with the face one round ahead of the bulkhead, in medium hard ground, the next round was drilled with four Ingersoll-Rand CC 11 Stopehammer machines in operation and one man packing steel, etc. A round consisted of from 28 to 34 holes, the number drilled depending on the hardness of the ground. Tools, etc., were placed below the bulkhead and the cut holes, which were placed directly over the chute compartment, loaded and blasted. The rest of the round was then loaded and blasted. This would advance the face to about 12 ft. above the bulkhead. Staging was then built, the next round drilled and only the cut holes blasted. The muck was then removed from the bulkhead, the latter taken away and two sets of timber placed, thereby raising the bulkhead to within perhaps 2 or 3 ft. from the face. The rest of the round was then blasted, completing one cycle of operations for the advancement of the raise a distance of two sets. The practice of shooting the cuts and the round separately was far more satisfactory and economical than shooting all holes at once. Occasions occurred when the cuts did not break on the first shooting. Had this occurred when shooting the whole round at once, the round would have been lost. The bulkhead consisted of 8 x 8-in. timbers placed side by side on the top of the last set of timbers. When the ground was soft, a set would be placed after each round, or as soon as there was room.

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*Alaska Juneau Gold Mining Co., Juneau, Alaska.

Air was supplied at 90-lb. pressure and was delivered to the top of the raise through a 5-in. pipe line. Ventilation was secured by means of a 15-in. fan pipe, carried in the upper right-hand corner of the skipway compartment, with ¼-in. air jets inserted at intervals. These jets, supplied with compressed air from the line, were inclined downward inside the ventilation pipe, thereby creating a suction at the face. Only two jets were necessary in the entire length of the raise. After blasting, the jets were aided by placing the air hose, with valve partly open, in the top of the pipe, allowing air to blow downward. The top of the pipe was kept as close to the bulkhead as was possible, using 25-ft. joints of pipe. At no time was the work interrupted with powder-gas troubles, the men being able to return to the face within 30 min. after blasting. The powder smoke was discharged into the main tunnel, which is ordinarily well ventilated and only 60 ft. from the bottom of the raise.

MONTHLY COSTS AND STATISTICS OF No. 2 RAISE

Month	Feet Driven	Total Cost	Cost per Ft	Machine Shifts	Feet per Machine Shift	Days Driving	Interruptions Chute Raises Days	Interruptions Chute Raises Feet	Interruptions Stations Days	Interruptions Stations Feet
1915										
Aug	25	$333	$13 32	24	1 04	5	2	15	0	0
Sept	35	853	24 36	50	0 70	9	2	16	20	
Oct	159	3,305	20 78	160½	0 99	31	0		0	
Nov	102	2,695	26 42	105½	0 97	20	3	35	7	61
Dec.	150	2,781	18 54	199½	0 75	31	0		0	
1916										
Jan.	85	1,970	23 18	116	0 73	27	4	21	0	
Feb	71	1,471	20 72	78	0 91	13	1	10	14	65
Mar	130	2,576	19 81	162	0 80	31	0		0	
Apr	116	2,562	22 09	161	0 72	30	0		0	
May	30	1,210	40 36	58	0 52	13	6	35	12	41
June	86	2,662	30 95	168	0 46	30	0		0	
July	96	2,828	29 46	148	0 65	31	0		0	
Aug	105	2,821	26 87	152	0 69	27	4	35		
Sept	113	2,604	23 04	181	0 62	22	0		8	34
Oct	169	2,978	17 62	228	0 74	31	0		0	
Nov	48	1,965	40 95	56	0 85	12	0		0	
Totals	1,520	$35,622	$23.43	2,047½	0 75	363	22	167	61	
Survey		652								
Insurance		382								
Timber		3,368								
Total cost		$40,024	$26 33							

Average holes drilled per machine-drill shift, 4 72.
Average feet drilled per machine-drill shift, 32 74.

COST SEGREGATION OF COMPLETED No. 2 RAISE

Account	Total Cost	Cost per per Ft.	Per Cent. of Total
Labor	$19,150	$12 74	48 40
Powder	4,936	3 25	12 34
Fuse and caps	656	43	1 63
Compressed air	3,561	2 34	8 89
Drill steel	408	27	1 02
Machine-drill supplies	649	43	1 63
Mine supplies	918	60	2 28
Timbers	2,925	1 92	7 29
Miscellaneous lumber	156	10	38
Ladders	286	19	72
Sharpening drill steel	1,338	88	3 24
Train service	744	49	1 86
Hauling men	337	22	84
Shiftbosses, foreman, surveying, etc	652	43	1 63
Insurance	382	25	95
Superintendence and general expense	2,717	1 79	6 80
	$40,024	$26 33	100 00

The work was started by using a small air-driven hoist with 5 x 8-in. cylinders and a 14-in. drum capable of holding 1100 ft. of ⅝-in. cable. On Aug. 6, 1916, when the raise was near the 1100-ft. mark, this was displaced by a Vulcan D-143 (Hendrie & Bolthoff) air-driven hoist, with 9 x 10-in. cylinders and 35-in. drum capable of holding 1600 ft. of ¾-in. cable. The sheave was placed across bolted timbers, supported by the hanging-wall and foot-wall plates. After an advance of from four to six sets in the raise the sheave was moved up to the top set but one, making it necessary for the men to walk not over 40 ft. in getting to the face. In moving the sheave, after extending the track to the bulkhead, the cable was first removed from the sheave, blocking the skip in the raise and signaling for loose brakes on the hoist. The bight was then pulled by means of block and tackle to the top set. The sheave was likewise pulled to its new position and the cable placed upon it. A Little Tugger hoist, mounted on a column, was used for hoisting this sheave and cable, when the cable became long.

In connection with the accompanying tables of cost it is pertinent to note that labor was not scarce at any time during the job, and that the length of shift was eight hours. Powder used throughout was No. 2 Dupont 40% ammonia dynamite. The total amount used was 37,977 lb., or 25 lb. per ft. of raise driven. No. 8 California blasting caps with 1½-in., 40% Dupont Nitro Primer powder, and No. 6 caps with 70% Nitro Primer powder, were used with equal success, so far as could be noted. The Bear brand of fuse was used.

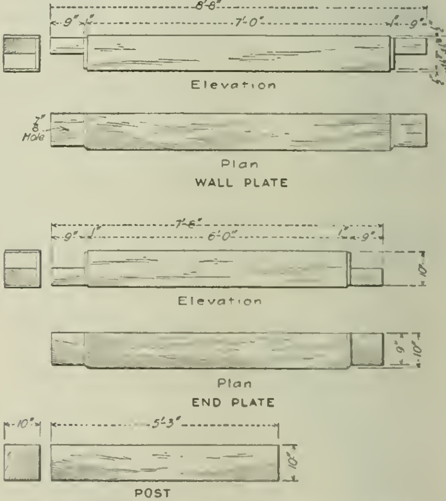


FIG. 2 DETAILS OF TIMBER SET IN RAISE

The proper proportion of the cost of operating the mine compressor, a 4000-cu.ft. type P.R.B. Ingersoll-Rand was charged to the raise, the basis of the charge being the unit cost per machine-drill shift. A smaller 800-cu.ft. compressor (Ingersoll-Rand, Imperial type) was run between shifts during the two-shift period in the raise, for the purpose of clearing the mine of powder smoke. During the period of driving the raise there were about 30 machine drills in use. The various mine and general expenses were distributed in the usual manner. Insurance charge was 2.75% of payroll.

Some Observations on Arizona Strikes

By CHARLES F. WILLIS
Director, Arizona State Bureau of Mines, Tucson, Ariz.

Suggestions for the solution of the existing unrest among mining communities are discussed. The providing of satisfactory conditions, recreation and education are all considerations worthy of study by the mine operator.

DURING the last few weeks I have had the opportunity of studying the situation in various mining camps of Arizona where strikes have occurred. Although the strikes in the various camps have been conducted differently, it was very interesting to note the common factors, the methods of handling the strikes taken by the strikers and the companies and the results as we have them today.

At Bisbee, Ariz., the strike was distinctly an I. W. W. disturbance. At no time were the mines completely shut down, although after alleged intimidation the low point was reached two days after the strike was called, when but 30% of the men reported for work. From that time on there was a continual gain in the percentage working. On July 12, by one sudden swoop, the sheriff, Harry C. Wheeler, and 1200 deputies deported an equal number of I. W. W.'s and sympathizers. Since that time the district has been closed to men with the red card. Production has been steadily increased; men are being put on as fast as possible, although the shortage of labor all over the country is also having its effect upon the mines, and it will probably be some time before they regain their normal capacity. Everything is quiet, however, and while there has been a certain tenseness in the air that is gradually disappearing.

Conditions at Jerome were similar in many ways, although when I. W. W.'s were being sought for deportation, there were found to be less than one hundred. One hundred men had faced a strike in a camp of six thousand, and with the deportation of these men the camp was at peace again.

MONTHS OF TROUBLE AT CLIFTON-MORENCI

The situation at Clifton-Morenci was more like a real strike than at any other place. Almost two years ago a four months' strike occurred in the district, which was finally settled by concessions on the part of the mine operators. In the 17 months following the settlement there were 17 other strikes, all of which were small, involving but a few men, but they were so constant and so regular that it became necessary to have a definite understanding and settle the policies once and for all. At this camp the labor is largely Spanish and Mexican; they are striking for Miami scale of wages and Miami conditions.

In the Globe-Miami district, shortly after the strike was called, which was a combination I. W. W. and American Federation of Labor strike, the feeling was so tense that it would have taken but little to have caused bloodshed. Fortunately the governor of Arizona, Thomas E. Campbell, witnessed some of the demonstrations, and soon afterward troops were sent into the district. From that time on public gatherings were prohibited, and while the district was not under martial law, it was certainly under martial police. After a considerable period of occupation by the troops it was announced that those who wished to return to work could do so and be assured of ample protection. Many returned although none but American citizens are being given employment. In all of these camps the sliding scale of wages, based on the price of copper, has been maintained and, in fact, all other conditions that existed previous to the strike.

CHANGING DEMANDS OF STRIKERS

The demands of the strikers in the various districts of Arizona are varied and long, including $6 a day, irrespective of the price of copper, a six-hour day, grievance committees, hospital control, recognition of the union, and numerous other things. It is remarkable to notice, however, that during the agitation preliminary to the strikes these things were not in particular evidence but rather were excess profits, anti-Government agitation, the draft, the high cost of living, the war of capital and such things. It has been wondered by many if the high price of copper and the urgent need of the Government for it did not lead the strikers to believe that they could force a settlement in which they would gain their demands. This may have been the case but it is considered by many others to be doubtful.

It is no secret that it has been believed that an industrial war, a war of capital and labor, was coming. For many years unrest has been growing—a feeling of lack of security. Few thought that this war of capital and labor, which in reality means strikes, would come at this time, it being generally believed that it would come at the conclusion of the world war with the lower price of copper and the consequently lower wages. It was precipitated earlier than was anticipated, however, by I. W. W. propaganda, anti-Government demonstrations, and the fact that so many of the workers in the mines are citizens of the countries with whom the United States is at war.

The questions that should be studied are not the justice of the demands, whether or not a six-hour day would make for more efficiency than an eight-hour day, or a $6 daily wage should be paid, for these are obviously not the real trouble. I doubt if anyone could put his finger on the real trouble. The question in which we are interested is: What is back of it all? Why the start and growth of the feeling of unrest? What is the condition of the man's brain that makes him listen to the chatter of the agitator, and why the receptive state of that brain? These are the real issues at hand—the questions that will have to be solved before we can secure the desired goal of coöperation between labor and capital—before we can secure industrial peace.

It is particularly noticeable that industrial unrest has increased as the number of hours of labor has decreased. This is the problem of the leisure hour—probably one of the biggest sociological problems of the day. Eight hours for work, eight hours for sleep and eight hours to spend in some form not yet well defined. We call it recreation, recreation being the balancing influence of our lives. To be correctly applied, recreation must necessarily consist of those things that tend to develop the faculties that are not developed during the other 16 hours. In mining camps, particularly, there is not available sufficient recreation of the proper kind to make an adequate use of eight hours. What is the result? A man will probably spend three or four hours in the recreation provided and will spend the balance of the time wondering what to do or convincing himself that he is dissatisfied with conditions; probably the latter. It is no wonder, then, that agitators can use to their own profit a part of these eight hours and, talking to restless men, can easily stir up more unrest. The first problem for the mining camps, then, as I see it, is the proper and efficient use of the leisure hours.

It is also noticeable that with the increase in reforms, reform laws, etc., there has been an increase in unrest. Probably the most prominent reform in Arizona has been the abolishment of the saloon. It would be folly to say that this has been at all responsible for the unrest of today but it is nevertheless a factor to be considered not from the point of view of a saloon but from the point of view that its removal has taken something from the life of the men and has not replaced it. Prohibition has been a wonderful thing for Arizona. It has emptied her jails; it has multiplied her bank accounts and has emptied her poorhouses but, considered only from the point of removing the saloon, it has not been a complete success. A reform that takes off the top only, leaving the foundation standing, is not complete: the real problem is to remove the cause. Prohibition will undoubtedly eventually remove the cause, but not for a generation or two, and something must be provided now to replace the saloon.

NO SATISFACTORY SUBSTITUTE FOR SALOONS

Considering the matter as it relates to unrest, it takes no stretch of the imagination to see that the saloon provided something for the occupation of the leisure hours. It provided a place where there were bright lights, where a man could sit around and chat with his friends, taking the occasional drink perhaps, and there is no doubt about it that after a man has taken a few drinks he is not in the mood to magnify his troubles. It is argued by some that the "movies" replace the saloon to some extent, but if one observes the attendance at the moving-picture theaters at the mining camps, he will observe how few miners are included. Few men who work underground in silence and in semi-darkness all day will select the same conditions for recreation hours. It is unnatural.

This criticism is not intended for a moment to discourage prohibition but it is intended to show that one of the great problems of the camps today is to make a study of what constitutes a satisfactory recreation for the miner and how to provide that recreation. It is also intended to show that when one removes something from the life of a man, there should be substituted an equivalent or something better.

Noticeable again is the fact that with the diversity of nationalities represented in a mining camp there has been an increase in unrest. This is perfectly natural, for with the increase in the number of nationalities there must come an increase in the number of recreational pursuits available for and appealing to the various classes represented. Many of these peoples are clannish; they do not care to mix with others, this characteristic serving to no other purpose than to increase the difficulties of the occupation of the other eight hours. Then, too, there has been for several years a growing feeling of suspicion of our Government—that it is for the rich—this suspicion having come largely from the foreigners in our mining camps who have come from governments of this nature.

DECLINE OF LOYALTY WITH LARGE ORGANIZATIONS

Probably the most important factor in industrial unrest has been the increase in the size of individual organizations. Many of us have to look back but a few years to recall the days of the old-style mining camp, which consisted of five or six, eight or ten mines, employing 100 to 200 men, practically all American labor, each mine with its men in close association with the "boss"; each with its baseball team or athletic club, rivaling the other teams of the district, and each man loyal to the organization for which he was working. In those days it was not such a long jump from the man at the bottom to the one at the top, but today, when thousands instead of hundreds are employed. an organization where the workman is even in indirect communication with the head is virtually impossible. The impossibility of the man at the head keeping in intimate association with the workmen is evident; the lack of this, however, is regarded by many of the workmen as snobbery, and it is certainly one of the factors that tends to develop disloyalty.

It is argued on many sides that extreme prosperity is at the base of our industrial unrest, but it is difficult to find any evidence of this. Unrest is as prevalent in districts that are not so prosperous as in the more highly paid camps. The problem seems to be sociological and educational—sociological in the sense of providing the proper social influences in the communities that have leisure hours, reforms, and large organizations, and educational in the sense of giving the workman a knowledge of how to use the things provided for him for recreational purposes. The problem is one of camp welfare, every camp being a distinct problem in itself. It is impossible to say whether or not music would provide recreational desires to the workmen of any one camp; whether there should be parks, clubs, or Y. M. C. A.s. Camp welfare is the problem, and this in itself, brings up its own individual problems.

DISLIKE OF PATRONAGE

Probably the most difficult of solution of these is whether these forms of recreation should be company owned and controlled, company owned and community controlled, or community owned and controlled. There are arguments for and against all of these methods. American workmen resent anything that savors of patronage, to such an extent that they will not use the things provided for them if there is a semblance of patronage connected with them. Foreign labor i not so discerning, although it must be remembered that many of the immigrants to this country have come here to avoid this patronage. In most of our mining camps there are clubs, parks and organizations of many kinds that are company owned. This is undoubtedly the better way, for it is generally difficult in any community to obtain the same things community owned, and if it were left to the community, these improvements probably would not be there. It is with the best of intentions that one finds the heads of departments of mining companies on the boards of directors of local community affairs. They are doing it because they feel a desire to do something for the community and because they feel that their presence on these boards and their work will make these organizations more valuable to the community. There is no doubt about the truth of this. Yet the fact that must be considered is the light in which the workmen receive it. Do they regard it as patronage or do they take it in the spirit in which it is given?

Antagonism Toward Company Ownership

Perhaps one of the principal reasons for antagonism toward the company is when the workman has to rent a company house, buy at a company store, or eat at the company boarding house, play pool in the company club house, swim in the company swimming pool and finally be buried in a company coffin in the company cemetery. Although all of these things are provided by the company far better than they could ever be provided by the workmen, grouped or individually, and although it seems to be for the best interests of the community that they be company owned and controlled, it is not difficult to see the resentment. Many camps have company stores which far surpass those of towns many times their size, but it is often true that the company store is regarded as one of the methods of the company for getting its money back.

I have often wondered if the agitator, should he open his heart to those in charge of company affairs, could give them a solution of their problems. It seems doubtful. In the first place, he has not been talking their real problems, but rather has been stirring up hatred and antagonism in a group of workmen already imbued with it. Moreover, the agitator, preaching the same thing all of the time, becomes what Mark Twain has called a "chronic liar"—one who has told the same lie so many times that he has come to believe it himself. This is true not only of the agitators but also of the local leaders—their judgment has become warped and it is impossible to reason with them. The big problem of the mining camps today is the development of loyalty, in the sense of loyalty between friends. It is doubtful if this exists in most of our camps. It is doubtful if loyalty between an animate object, the workman, and an inanimate object, the corporation, can exist.

Community Interest and Loyalty

If one were to search for the loyal men of the strike districts, he would probably find them to be the business men of the community, the home owners, the engineers and office men and the bosses, all of whom have a distinct interest in the community. Loyalty, then, as we know it, might be defined as community interest.

The problem then seems to be the development of community interest—whether it be interest in a home, a good school system by which the miner desires his children to profit, membership in some club, athletic association or other organization. The object of interest is of no consequence. It may be financial, social or education investment but it is, nevertheless, a community interest and it is this interest that makes for loyalty. There is no doubt that at this particular time patriotism and love of country furnished the interest of many to be loyal, as did also the knowledge that the products of the mines were needed by the nation, and resentment against anti-Government and anti-draft agitation. This, however, in its broader sense, is community interest.

To summarize, it becomes the problem of the mining companies to educate the workman to lead a satisfied life, to have the satisfaction that comes from well-spent recreational hours and not from the size of the pay check. The solution of this problem lies in the development of loyalty or community interest for the accomplishment of which the community must be provided with those things in which the workman would become interested and of which he would be a part.

High Potash-Bearing Slates in Georgia

By S. W. McCallie
State Geologist of Georgia

A slate deposit has recently been discovered in Georgia by the State Geological Survey, which seems to be an excellent raw material for the extraction of potash. The deposit here referred to, occurs on the Louisville & Nashville R.R., near Whites Station, Bartow County, 10 miles north of Cartersville, where it forms a belt at least six miles long, a quarter of a mile or more wide, and fully 300 ft. thick.

The remarkable feature of this slate is its high potash content. A large number of samples taken from different points along the outcropping, show more than 9% potash, which is from two to four times the amount found in common slate. Mr. Shearer, assistant state geologist, who has recently made a microscopic study of this slate, finds that it is made up almost entirely of sericite and feldspar, two of our most common potash-bearing minerals. The slate is of a light gray color, comparatively free from iron, has an excellent cleavage, and otherwise possesses all of the qualities of a first-class roofing slate.

The unusually high potash content of this slate, together with the proximity to transportation, uniformity of composition, and extent of the deposit, seems to offer favorable conditions for the extraction of potash.

The chemical composition of this slate is shown by the following analysis made in the laboratory of the State Geological Survey of a sample of slate from the Yancey property:

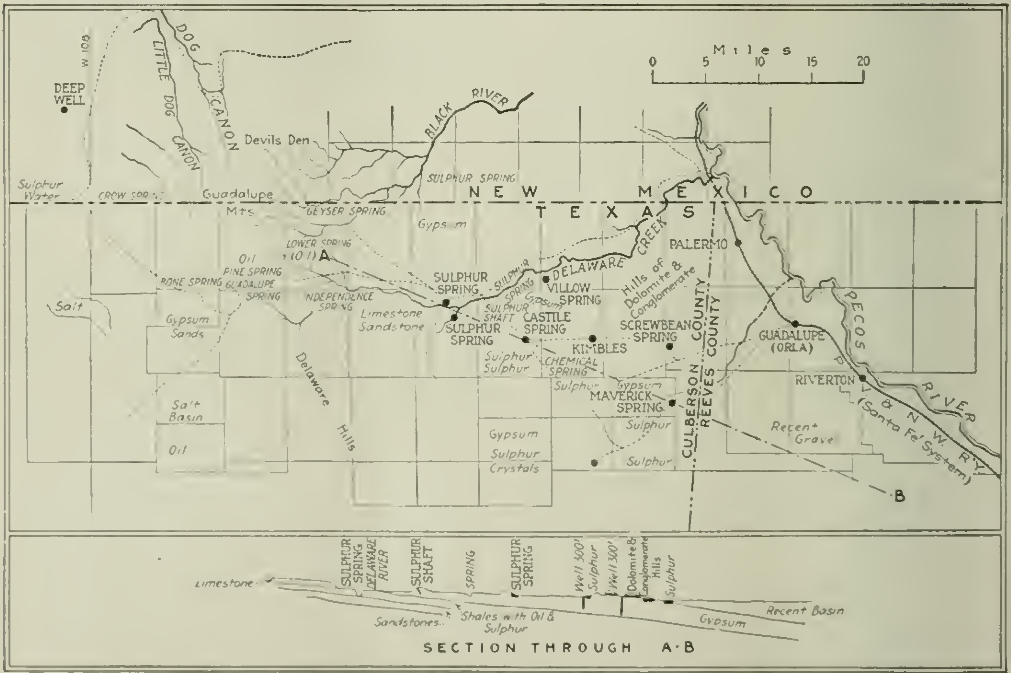
Silica, 54.68%; alumina, 20.14; ferric oxide, 3.28; ferrous oxide, 3.17; magnesia, 3.09; lime, nil; soda, 1.08; potash, 9.39; ignition, 3.51; moisture, 0.14; carbon dioxide, nil; titanium dioxide, 1.01; phosphorus pentoxide, nil; sulphur trioxide, nil; sulphur, 0.10; manganous oxide, nil; barium oxide, nil; total, 99.57 per cent.

Sulphur Deposits of Western Texas*

Existence of sulphur in western Texas has been long known, though deposits were first mined about 20 years ago. Principal developments now about 15 to 20 miles from railroad. Climate is arid and fuel scarce. Average content of workable material estimated as 30% sulphur.

THE existence of sulphur in western Texas was noted by William P. Blake in reporting the geology of one division of the 1853-1854 Government survey for a railroad route to the Pacific Ocean. Various accounts have since been published regarding different sulphur deposits in that locality. The mention of El Paso County in early references is explained by the fact that not until 1913 was the eastern portion of the old El Paso County organized into Culberson County.

The principal sulphur districts are in Culberson County, from 35 to 40 miles north of the town of Toyah, and a little farther from Pecos, the county seat of Reeves County. The principal development has been in the Maverick Springs district, from 15 to 20 mi. west of the Santa Fe lines at Orla, Reeves County, 40 mi. north of Pecos.



MAP AND SECTION SHOWING SITUATION AND OUTLINE GEOLOGY OF THE SULPHUR DEPOSITS OF CULBERSON COUNTY, TEXAS

The first mining work on any of these deposits was done about 20 years ago on the Cooksey property in Sections 10 and 15, Block 114. A Mr. Choteau of St. Louis, Mo., installed a vertical extractor using steam, and it is said that two carloads of sulphur were shipped to St. Louis. Most of the recent prospecting and development work has been in the Maverick Springs district, about 15 mi. southeast of the Cooksey property. On the old Kyle property, within a mile of the springs, was a sort of extractor and the building of a *calcarone* was attemped. The Dot property is 3 mi. to the southwest of the old Kyle. The West Texas Sulphur Co. controls the old Kyle, and the Toyah Valley Sulphur Co. owns land near that property and also near the Dot property. The holdings of the United States Sulphur Co. and of the Michigan Sulphur and Oil Co. are toward the head of Virginia Draw, about 5 mi. southwest of the springs. Prospecting and development work have been undertaken on the properties of the above-named companies and of the Sun Sulphur Co., all within an area 5 mi. southwest of Maverick Springs. The American Sulphur Co. has produced a little sulphur from a property near Rustler Springs.

The other principal localities in Culberson county where discoveries have been made and prospecting done are: Block 42, Sections 7, 8 and 9, the Pat, Lone Wolf and Golson claims; Block 60, Sections 15 and 16; Block 61, Sections 8, 16, 17 and 18, Grant mines, etc.; Block

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*Abstract of a paper entitled "The Sulphur Deposits in Culberson County, Texas," by William B. Phillips, to be read at the St. Louis meeting of the American Institute of Mining Engineers, Oct. 8-13, 1917.

109, Sections 4, 5, 9, 10 and 24, Nelson claims, etc.; Block 113, Section 14, the Hicks claims; Block 114, Sections 10 and 15, the Cooksey property; Block 115, Sections 10, 11, 18, 19, 22 and 23. In Reeves County, sulphur occurs in Block 59, Section 17 or 9, near the old Huling-Ross oil wells and within a short distance of the oil well bored to a depth of 4100 ft. by The Texas Co.

The Guadalupe Mountains, 45 mi. northwest of Maverick Springs, form the chief topographic feature of the region; El Capitan, with an elevation of 8690 ft., being the highest point in the state. The Rustler Hills, 30 mi. to the southeast, are much lower. From these to the Pecos river the slope is gradual but constant. The Guadalupe Mountains are regarded as Carboniferous, though some geologists consider them as Permian. The Rustler Hills have been classed with the Castile gypsum, questionably Permian series of the Carboniferous. Overlying these beds of gypsum, from the vicinity of Maverick Springs to the eastward, are the deposits classed as Quaternary or Cretaceous and the Recent and Pleistocene. They are characterized by gypsum, outcrops of "Red Beds" and remains of dolomite hills. In places the "Red Beds" cover considerable areas, as in Sections 13, 14 and 24, Block 113, and in Section 1, Block 111. At a point a little to the northeast of the latter, core drilling in an outcrop of "Red Beds" showed red sandstone to 47.5 ft. and then 2.5 ft. of massive white gypsum in which were scattered crystals of sulphur. Two wells, bored by The Texas Petroleum Co. in 1914 and 1915, near the south line of Survey 24, Block 110, gave opportunity for a more extended study of the underlying rocks. No deposits of sulphur were found, but the deeper well was bored to a depth of 2265 ft. and at 2018 to 2020 ft. several barrels of oil were reported. A detailed account of the log of this well is given, from 85 to 2236 ft. Varying amounts of pyrite were noted at intervals from 150 ft. to 2138 ft., usually with limestone or dolomite and frequently in exceedingly fine particles, impregnating anhydrite. Wherever elemental sulphur was noted, it appears to have been accompanied by anhydrite.

Climate, Water Supply and Fuel

The climate of this part of Texas is arid, the mean annual rainfall being 8 to 10 inches. For long intervals there is no rain, and what little snow or sleet falls during the winter does not remain on the ground.

Shallow wells in the region usually yield plenty of water, highly impregnated with mineral matter. A table of 12 analyses of water from different sources shows a range of total solids from 183.627 to 1831.202 (presumably grains per U. S. gallon), the maximum carrying 1309.011 parts of NaCl, or common salt. In many places the water carries much H_2S, or sulphureted hydrogen gas, when issuing from the ground. Running water is comparatively free from the gas, as it escapes or is oxidized with a consequent deposition of sulphur. One sample of water contained 79.08 grains of free sulphuric acid per gallon. It is expected that, if any considerable development work is undertaken in the district, a large quantity of water from the best sources may be impounded by constructing earth dams.

The local fuel is juniper, or mountain (scrub) cedar, hauled from points 5 to 10 miles distant. It makes a quick and hot fire but has no lasting qualities, and the supply is sufficient only for ordinary household use. Twenty miles southeast of the Maverick Springs district, Section 16, Block 59, Reeves County, are shallow oil wells on the Huling-White-Ross ranch that have been known for some time. The oil comes from a depth of about 230 ft. and is an excellent lubricant but has thus far been used only for lubricating windmills and so forth. Fuel for industrial purposes would probably have to be hauled in some manner from Orla, where best screened Texas lump coal can be laid down for $5.15 per ton. There has also been some talk about the possibilities of natural gas as a fuel for the district.

Origin of the Sulphur Deposits Not Yet Definitely Determined

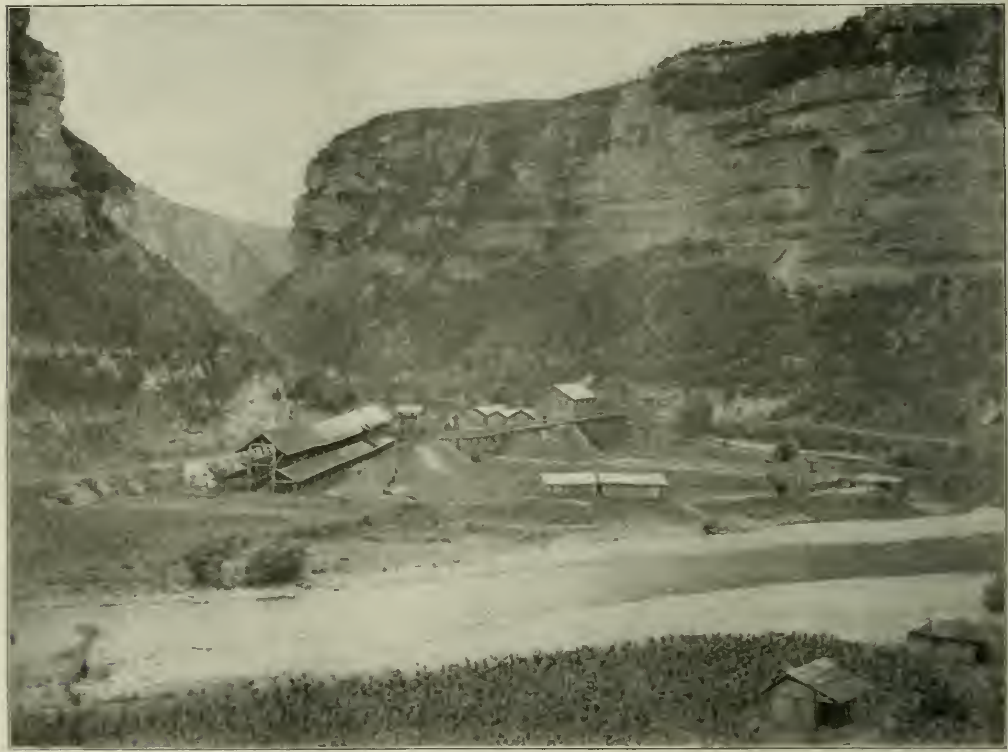
Various theories have been advanced regarding the origin of sulphur deposits in general and it is believed that the deposits in Culberson County may have arisen in one or more of the following ways: (1) Through the action of hydrogen sulphide on limestone or dolomite; (2) through the decomposition of waters carrying alkaline sulphides; (3) through the decomposition of gypsum impregnated with bituminous substances; (4) through the precipitation of sulphur from sulphur bearing gases, especially sulphureted hydrogen. It is deemed improbable that volcanic or seismic agencies are responsible for the deposition of the sulphur, though it is conceded that they may have caused dislocations of the strata and thus provided for the circulation of sulphur-bearing waters and gases.

Some Properties Seem Worthy of Systematic Prospecting

The principal factors entering into the utilization of these sulphur deposits are stated as: The nature and thickness of the overburden; the nature and thickness of the several bands of sulphur-bearing material that are within workable distances from the surface; the methods of extraction; the transportation of the product to available markets; and the sale of the product, inclusive of the capital required for carrying stocks of the product. The development work has not been sufficient to arrive at a general conclusion. The estimates of millions of tons of workable material have not been confirmed by regular sampling and analysis. Many statements that have been made were founded on a basis of hope.

The advantages of the district are that it is 700 miles nearer the western points of actual and possible consumption than the deposits at the mouth of the Brazos River in Texas, and that the initial investment would be comparatively small with respect both to prospecting and development. The operations have been conducted on so small a scale that no reliable data can be given on the cost of production or the quality of material obtainable. However, some of the sulphur properties at and near Maverick Springs and toward the upper part of Virginia Draw seem to be worthy of systematic prospecting. There is a considerable amount of sulphur within 50 ft. of the surface and it can be mined cheaply. The average content of native sulphur in the material is estimated as about 30%; but it is not known today how much of the area involved will yield material of this class, nor what is the average thickness of the overburden that will have to be removed.

Views from Tchiatouri, Caucasus, Russia



WASHING PLANT IN THE TCHIATOURI MANGANESE DISTRICT, RUSSIA

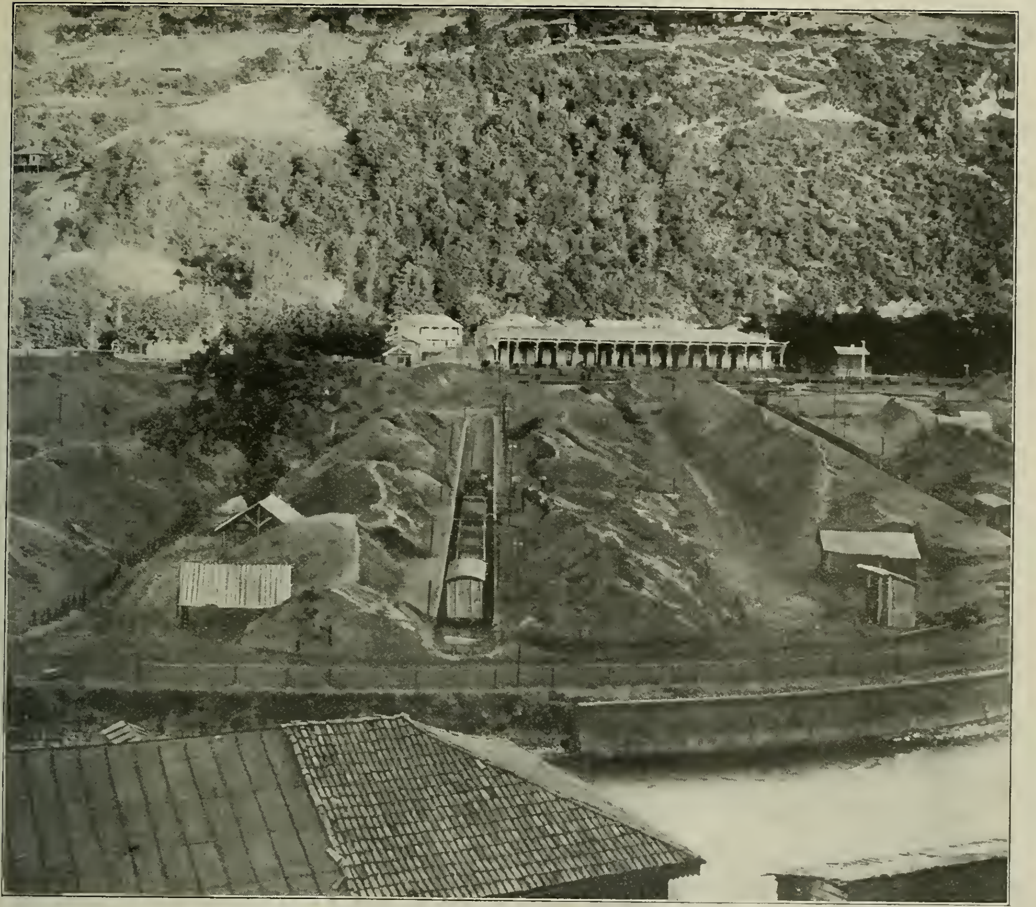
The Krivlile River and its tributaries have cut deeply into the sandstones of the Tchiatouri (sometimes spelled Chiatouri) district exposing extensive bedded deposit of manganese ore on and near the tops of the hills, 500 to 600 ft. above the river

TOWN OF TCHIATOURI, CAUCASUS, RUSSIA

The outcrop of manganese can be traced near the summit of the cliffs in the background. The deposit is interbedded in the sandstone strata and has an average dip of only about 3°. In places the capping is only a few feet thick and nowhere is the thickness great

GRAVITY TRAM FROM MINES TO WASHERY

The manganese ore is mined in seams of an average stoping thickness of 7 to 8 ft. The ore is soft pyrolusite, easily broken from place by pick and contains 40% Mn. It is hand sorted at this mine and transported to the river by gravity tram



TCHIATOURI RAILWAY STATION AND MANGANESE STOCKPILES

After washing the concentrates are stockpiled close to the railroad. Stockpiles of concentrates are accumulated by the various producers who cannot obtain railway cars until they can show a certain tonnage ready for shipment. Tchiatouri is reached by a 25-mile narrow-gage road from the main line of the Trans-Caucasian Railway

TYPICAL WASHING PLANT IN THE CAUCASUS

The Tchiatouri district produced in 1913 over 1,000,000 tons of manganese concentrates, or nearly half the world's output. The output could be greatly expanded, in normal times, but the lands are owned by peasants and small groups of individuals making organization on a large scale difficult

INTERIOR OF A TCHIATOURI WASHING PLANT

The ore requires little or no crushing. Treatment is simple, consisting merely of screening out the siliceous gangue, followed by rough water concentration on tables or jigs. The concentrate runs from 55 to 60% manganese and about 0.15% phosphorus

Chronology of Mining for September

Sept. 5—Minerals Separation won its suit in U. S. District Court in Montana for infringement of flotation patents by Butte & Superior, which continues to operate under special agreement.

Sept. 5—I. W. W. headquarters throughout the United States were raided on orders from Attorney General Gregory.

Sept. 8—Decree granted by U. S. District Court of Delaware in favor of Minerals Separation company in the flotation suit against the Miami Copper Co., which is continuing to operate under bond—Mexican House of Congress passes bill providing for the temporary taking over and management by the Government of industries not being operated.

Sept. 10—Embargo on exportation of gold proclaimed by President Wilson.

Sept. 13—Shasta County, Calif., copper miners and smeltermen returned to work.

Sept. 17—Resumption of operations in mines and smelteries of the Anaconda Copper Mining Co. in Montana.

Sept. 20—American Federation of Labor requests President Wilson to appoint committee to investigate Arizona labor conditions.

Sept. 20—Price of silver advanced to $1.08½ per ounce.

Sept. 21—Copper price of 23½c. per lb. f.o.b. New York to Government, Allies and the public, was fixed by voluntary agreement between the Government and leading copper producers, effective for four months, producers agreeing not to reduce wages and to maintain maximum output—Potash bill passed providing for leasing of Government's potash lands to citizens of United States.

Sept. 24—War Industries Board and steel producers agree to reduction in price of pig iron, steel products and coke, effective for four months, $33 for pig iron and $6 for coke.

Sept. 28—Carranza decrees embargo, effective Oct. 1, on exports of gold and silver.

Mineral Production of New York

Statistics of mineral production in 1916, compiled by the State Geologist's office in coöperation with the U. S. Geological Survey, show the following items, arranged in the order of descending value: Portland cement, 5,603,477 bbl.; iron ore, 1,464,917 long tons; salt, 14,087,750 bbl.; sand and gravel, including molding sand, 8,098,097 short tons; natural gas, 8,594,187,000 cu.ft.; petroleum, 874,097 bbl.; gypsum, 579,827 short tons; talc, 93,236 short tons; mineral waters, 7,746,490 gal.; garnet, 5840 short tons; emery, 15,282 short tons; feldspar and quartz, 20,379 short tons; sand-lime brick, 15,851 M; natural cement, 104,415 bbl.; crude clay, 11,158 short tons; metallic paint (iron ore sold for paint manufacture), 14,572 short tons; slate, 2727 squares.

In addition to the above items zinc ore, apatite, diatomaceous earth, marl, mica, pyrite and graphite were produced, the quantities of which are not given separately, but their value was $2,011,666. Also, the following products are reported by value instead of by quantity: Granite, $368,119; limestone, $3,672,454; marble, $268,391; sandstone and trap, $1,670,658. The total value of the mineral products was $45,654,770, which represented an increase of approximately $10,000,000 over the figure for 1915.

Report of Copper Production

This table is compiled from reports received from the respective companies (except in the cases noted by asterisk as estimated), together with the reports of the United States Department of Commerce as to imported material, and in the main represents the crude-copper content of blister copper, in pounds.

	May	June	July	Aug
Alaska shipments	7,146,824	7,714,928	8,116,538	3,891,621
Arizona:				
Arizona Copper	5,200,000	4,800,000	nil	nil
Cons. Ariz. Smelting	1,650,000	1,600,000	1,550,000	1,450,000
Inspiration	11,900,000	11,150,000	nil	nil
Miami	5,112,000	5,349,000	nil	260,000
Old Dominion	4,430,000	3,965,000	nil	875,000
Ray	8,815,281	7,614,114	7,808,766	7,749,509
Shannon	964,000	956,000	nil	nil
Other Arizona	25,954,310	24,232,675	20,032,410	22,829,806
California:				
Mammoth	2,000,000	1,800,000	1,750,000	1,725,000
Michigan:				
Calumet & Hecla	14,450,011	13,347,525	11,933,433	12,338,735
Other Lake Superior *	8,500,000	8,000,000	8,000,000	8,000,000
Montana:				
Anaconda	28,400,000	20,400,000	12,400,000	11,175,000
East Butte	2,008,060	1,519,240	nil	1,676,360
Nevada:				
Mason Valley	1,528,813	1,465,000	1,316,725	1,417,717
Nevada Cons	7,239,978	6,850,186	7,253,337	6,439,984
New Mexico:				
Chino	6,984,457	7,193,262	7,343,757	6,824,127
Utah:				
Utah Copper	19,262,856	19,909,097	18,127,154	18,796,012
Eastern smelters *	2,521,800	2,200,000	2,000,000	2,000,000
Total reported	163,068,390	150,066,027	107,632,120	107,448,871
Others, estimated	24,682,420	22,182,000	20,000,000	20,000,000
Total United States	187,750,810	172,248,027	127,632,120	127,448,871
Imports, ore and concentrates	16,820,020	15,607,586	9,484,116	.. .
Imports in blister, etc	32,026,855	45,100,414	10,179,095	
Grand total	236,597,685	232,956,027	147,295,331	. .
British Columbia:				
Canada Copper Corpn	270,816	178,976	nil	212,772
Granby Cons	3,159,284	3,030,929	3,147,886	3,836,770
Mexico:				
Boleo	1,929,088	1,740,500	1,411,290	1,413,040
Cananea	4,370,000	3,210,000	nil	nil
Other Foreign:				
Braden	6,750,000	5,002,000	6,015,000	4,512,000
Cerro de Pasco	4,670,000	5,032,000	6,262,000	6,036,000
Chile	8,250,000	6,114,000	6,250,000	8,036,000
Cape Copper	396,825	359,350	361,759	178,573
Kyshtim	1,176,000	*1,379,000	752,640	
Katanga	5,641,775	5,246,950	4,850,120	5,445,360

* Estimated

The grand total, which in the case of May was 236,597,685 lb., includes, under "Imports in ore and blister copper" the production of such companies as Canada Copper, Granby, Cananea, Braden, Cerro de Pasco and Chile. As a matter of record, however, the individual figures are given after the total. We also report the production of the Boleo, Cape Copper, Kyshtim and Katanga companies, whose copper does not come here.

The item "Alaska shipments" gives the official figure of the United States Department of Commerce. Kennecott production May to August was 7,208,000; 5,848,000; 3,580,000; and 7,048,000 lb., respectively.

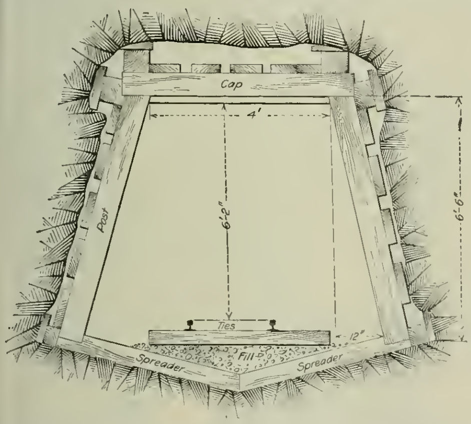
The total production of the United States for the first eight months of 1917 was as follows:

January	174,658,603
February	183,859,588
March	192,211,648
April	188,685,898
May	187,750,810
June	172,248,027
July	127,632,120
August	127,448,871
Total	1,354,495,565

Details of Practical Mining

Spreader for Drift Set in Swelling Ground

The practice of standing drift timber sets on sills in welling ground has been to a large extent discontinued n account of the effect of bowing that is difficult to reair. In many cases the posts are simply stood on foot locks but where side pressure, as well as swelling from elow, occurs, spreaders, such as are shown in the drawng, have proved effective. They are in two pieces, each ramed with a tenon on one end to catch the post, as hown in drawing, and with a bevel where they meet at he center of the drift. Any pressure from below would tend to raise them and push the bottom of the posts outward against the blocks; likewise any pressure rom the sides would tend to force them downward against the solid bottom and an equilibrium is mainained until the timbers either fail or are relieved. Such preaders have the advantage of being conveniently eplaced under a track without interfering with tramning.



A DRIFT-POST SPREADER FOR SWELLING GROUND

A Hint on Grading a Sidehill Road

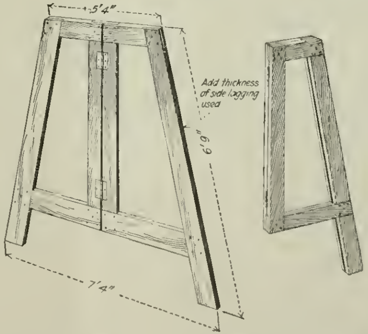
There are relatively few road builders who know how o grade a road on a steep sidehill in the most economical manner. According to *Engineering and Contracting*, Sept. 5, 1917, if the hill is so steep that a team of horses cannot travel along it, one ordinarily sees a gang of pick and shovel men excavating the roadway, and not infrequently the men carry the excavation to grade without the assistance of horses or machinery. A road builder experienced in mountain work may first atack a steep sidehill by handwork, but he does so only to build a narrow path along which a single horse can walk. Thereafter there is no more picking and shoveling.

A pioneer path, as it may be called, is first graded by hand on the sidehill along the upper slope stakes. Then a one-horse, sidehill plow starts plowing and widening the path to about 3 ft. by casting the earth down hill. The next step is to use a light single-horse V. The V should be shod and have a sharp cutting edge at the front, and should be so attached to the singletree as to tend to crowd into the side of the hill. After grading a width of about 5 ft. a two-horse plow can be used, followed by a two-horse V to shove the earth down hill. The next step is to use a light road grader drawn by two to four horses. The foregoing applies to roadways up to, say, 12 ft. wide. If the road is wider and fairly long a steam shovel or a power scraper is usually more economical than team work.

Template for Measuring Drift

By C. A. Hutchinson

Whenever a drift or crosscut is driven on contract, there is likely to be an argument on "measuring-up" day as to where the end of the tape should be held at the breast in order to give full distance for the work done and yet not pay for more. In Mexico the miners have to be watched in order to make them keep the drift bottoms down to grade and the backs high enough and, in fact, to deter them from "finishing" a drift by "running it up to a point." Each time a measurement is made for *cuele* there is an argument, so the "cuele board" or template was constructed.



FOLDING TEMPLATE FOR CONTRACT DRIFTS

The cuele board is a folding, wooden frame made according to the contracted size of a drift. If, for example, the drift is to be 4 x 6 ft. in the clear, 8-in. timbers to be placed in sets each 4 ft. between the posts at the cap with a 12-in. batter to the posts, the template would correspond in size to the outside dimensions shown in the accompanying sketch, plus the thickness of lagging used. If no timber is to be used, the template would be made to approximate the proper drift dimensions and shape.

The center of this template, when stood in a vertical position at the farthest point ahead in a drift to which it can be made to pass continuously in this position, is the *cuele* or distance upon which payment is to be made. A "bump" in the back or wall may stop the passage of the template 10 ft. back from the breast, but "*quien tiene la culpa*"? That's the distance the contractor has completed ready for payment.

Mounting Blueprints on Muslin

Maps and plans on paper frequently fail by tearing or wearing due to hard usage. Sensitized cloth has been employed more or less successfully, but it has its disadvantages due to the fact that the cloth is generally of poor quality and tears easily. Furthermore, if allowed to stand for some time before being used, the sensitizing solution causes the cloth to rot. A much better and not too difficult method is to mount the paper print upon cloth, says Milton Harris in *Engineering News-Record*, Sept. 27. Large wall maps hang better and are much less liable to be harmed when mounted in this way than when left unmounted.

The print should be made upon "medium" weight paper unless an extra strong sheet is desired. While the printing is going on, a helper can prepare the cloth backing. Unbleached muslin that sells at about 10c. per yd. is ordinarily used. Select a smooth board, larger than the size of the print to be mounted, and clean it thoroughly. A drafting board or the top of a drafting table is excellent for this purpose—provided it is not cedar, for cedar will stain the prints. Fasten the cloth on this board with 4-oz. carpet tacks spaced about 2 in. apart,, and driven only partially home, so as to be easily pulled. Tack one edge of the cloth down, stretching is smooth but not too tightly, for the paper contracts on dryingout and will crack if there is not enough "give" to the cloth. Follow around the edge of the cloth until it is completely tacked down. It should now present a smooth surface and is ready for the mount. If many prints are to be mounted it may be an advantage to set several boards, end to end, and tack the cloth over their entire length. In this manner considerable cloth can be saved.

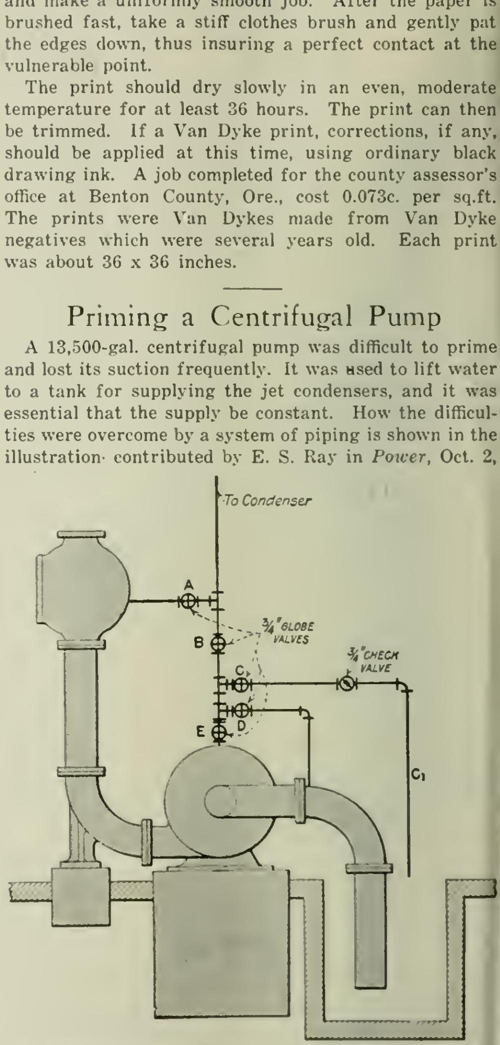
After washing the prints they should be taken from the final bath and the excess water blotted from both sides with a dry towel or cloth. If the print has been made some time previously and is dry, immerse it in water for two or three minutes—or until it is thoroughly wet—then remove it and proceed as above. Lay the print carefully down on a clean table top or board and apply a thin but even coating of paste, making sure that the edges and corners have received their share. The paste should be a fresh, stiff corn-starch paste or fresh wall-paper paste. "Kodak adhesive," a trade compound, has been found to be an excellent paste when made according to directions. Glue or library paste is unsatisfactory and should not be used.

Pick the paper up carefully and while one man holds an edge above the cloth, the other, on the opposite side of the table, should take the lowered edge and paste it down—using a stiff kalsomine or large, flat paint brush. Brush the paper down, working away from the body with short strokes, the helper slowly lowering his end. In this manner the brush will drive out all air bubbles and make a uniformly smooth job. After the paper is brushed fast, take a stiff clothes brush and gently pat the edges down, thus insuring a perfect contact at the vulnerable point.

The print should dry slowly in an even, moderate temperature for at least 36 hours. The print can then be trimmed. If a Van Dyke print, corrections, if any, should be applied at this time, using ordinary black drawing ink. A job completed for the county assessor's office at Benton County, Ore., cost 0.073c. per sq.ft. The prints were Van Dykes made from Van Dyke negatives which were several years old. Each print was about 36 x 36 inches.

Priming a Centrifugal Pump

A 13,500-gal. centrifugal pump was difficult to prime and lost its suction frequently. It was used to lift water to a tank for supplying the jet condensers, and it was essential that the supply be constant. How the difficulties were overcome by a system of piping is shown in the illustration contributed by E. S. Ray in *Power*, Oct. 2, 1917. The pipe so marked was connected to the condenser, which was always working before this pump was required. Before starting, all the valves were opened for a short time to exhaust the air, but when the pump was working up to speed valves *A* and *D* were closed and *B* left about one-quarter turn open and *C* and *E* left wide open. With the pump working properly, water discharged from pipe C_1, but if it failed no water discharged from this pipe, so it acted as a telltale. The check valve prevented any back flow of air into the pump or piping.



VACUUM FOR PRIMING DERIVED FROM LIVE CONDENSER

In Relining Timber Sets "longitudinal" caps may be used effectively. Placed parallel to the drift under the old set and supported by posts every 6 or 8 ft., a better distribution of the weight is obtained.

Events and Economics of the War

The adjournment of Congress on Oct. 6 was preceded by a dramatic debate on the question of expelling Senator La Follette for disloyalty; his conduct is to be investigated by a special committee; the soldiers' and sailors' civil rights bill passed the House. The embargo against neutrals has been tightened and no coal will be allowed those suspected of supplying Germany. Hoover is to be aided by the Secret Service in enforcing the provisions of the Food bill. The navy has opened the most powerful radio station in the world in Hawaii; an American destroyer accidentally fired on an Italian submarine. Jesus Martinez, the Mexican vice-consul at New York, was arrested for refusing to comply with the requirements of the draft law.

England has prohibited exports to northern neutrals; the cruiser "Drake" was torpedoed off the Irish coast; further important gains were made by Haig near Ypres on the Passchendaele-Gheluvelt Ridge. In France, Malvy, the minister of the interior, has been accused of being a German spy; Bolo Pasha has been charged with attempting to bring about a separate peace through corrupting the press. Kerensky has formed a coalition cabinet in defiance of the Russian Congress who wish certain elements ignored. The Kaiser has been warned by Pope Benedict against an extension of air raiding; a German wireless station has been opened in Willemstad, Curaçao, and now handles the oversea service from Nauen, Germany. Uruguay and Peru have broken with Germany and Guatemala has evicted German editors.

Recommendation of War Convention of Business Men

The recent War Convention of business men held at Atlantic City, N. J., went on record in favor of payment of war taxes in quarterly instalments and in favor of giving opportunity to producers to present the facts of production costs in the process of Federal price fixing. It advocated the adoption, by Congress, of the proposed legislation authorizing the suspension of the Federal shipping laws so that foreign vessels may be admitted to our coastwise trade, thus releasing American vessels for transport service; it strongly urged the immediate construction of more ships; it condemned profiteering; it proposed the creation of a Federal arbitration board to settle industrial disputes during the war; it extended sympathy and support to Russia.

A resolution to maintain existing industrial conditions, as advocated by the Secretary of Labor, was indorsed; the convention reiterated the National Chamber's conviction that universal military training is essential to the future safety and success of the nation; it urged coöperation for the naturalization of resident aliens; it advocated the creation of committees to represent each trade and industry in dealing with the Federal authorities. Extension of the Federal employment service in the Department of Labor was recommended, as was also the adoption of the summer "daylight-saving" plan. It was urged that the Government take such steps as may be necessary to maintain the parity of the American dollar.

Passage by Congress of the Webb bill was asked to permit Americans to coöperate for export trade. Greater economy in the retail distribution of commodities was advocated; highway improvement as a war measure was recommended, and the creation of a commission to study conditions abroad was suggested. The convention urged the calling of war meetings of organizations which are members of the United States Chamber of Commerce and expressed the hope that the International Congress of Chambers of Commerce might be held in the near future.

World Embargo Against Germany

Exportation of all articles to Sweden, Norway, Denmark and Netherlands has been absolutely prohibited by Great Britain. The only thing excepted is printed matter, this doubtless to insure that Germany may keep posted on what the rest of the world thinks of her. This British step, following the similar action taken by this country upon July 15 last, is looked upon as the opening of an Anglo-American campaign to guarantee the complete stoppage of Germany's supplies. It is still possible that some goods will reach the northern neutrals from South America. To guard against this, the Exports Administrative Board announces that not only will bunker coal be refused to vessels bound for European neutral ports with cargoes of goods which might find their way to Germany, but vessels bound for South American ports will likewise be refused coal if the commander does not agree on his return to have on board a cargo which may be approved by the board, or which is destined for a country other than one of the border neutrals.

Embargo List Revised

The Exports Administrative Board has announced that brass, bronze and caustic soda have been added to the list of commodities requiring licenses before being exported to any country of the world. It has further published a list of over 600 articles which it has decided do not require an export license under the President's proclamation of Aug. 27, 1917, except when shipped to Germany, her allies or neutral countries of Europe. Included in this list are the following:

Acetic acid, acetic anhydrine, acetate of lead, acetate of cobalt, acetate of lime, acetate of soda, acid (tartaric or hydrofluoric), air compressor and parts, aluminum paint, ammonia condensers, ammonia valves and pipe fittings, amorphous phosphorus, antimony (black), asphalt, arsenic, asbestos, asbestos paper and pulp, balata sheets, bauxite ore, bismuth subgallic, bichromate of soda, borax, boric acid, bromide (soda), calcium carbide, calcium chloride, chrome alum, copper paint, creosote, dredging buckets (iron), elevator machinery and repair parts, fire clay, german silver, gilsonite, glacial acetic acid, glauber salts, gold enamel, hydrogen peroxide, hydrated lime, hyposulphite of soda, iodine, iron bands, bars and castings, iron pipe and pipe fittings, iron hose fittings, iron plates or sheets under ⅛ in. thick, iron rivets, valves and wire, jacks, magnesia, machinery (concrete), metal valves, oxalic acid, oxide-of-iron paint, phenolphthalein, phosphorus, phosphate (sodium), pipe (galvanized), precision tools (hand), pyrometers, rails (steel), railroad cars, railroad picks, rubber, rubber cement, salammoniac, saw blades, silicate of soda, silex, silverware, soapstone slabs, soda ash, sodium fluoride, steam traps, steam locomotives, stocks and dies, steel hoists, steel plates or sheets under ⅛ in. thick, strontium bromide and carbonate, taps and dies (hand), yellow phosphorus, zinc white in oil, zinc oxide.

No licenses whatever will be granted to sailing vessels passing through the war zone [illegible] though the goods themselves may already have been licensed.

State Fuel Administrators Appointed

The following appointments of state fuel administrators are announced by Dr. Garfield:

S. P. Kennedy, Anniston, Ala.; Thomas W. Russell, Hartford, Conn.; Dr. L. G. Hardman, Commerce, Ga.; Charles W. Webster, Waucoma, Iowa; Emerson T. Carey, Hutchinson, Kan.; J. H. Hamlen, Portland, Me.; James J. Storrow, Boston, Mass.; M. J. Swindlehurst, Helena, Mont.; Charles M. Floyd, Manchester, N. H.; A. W. McAllister, Greensboro, N. C.; Harry R. Conn, Van Wert, Ohio; P. A. Norris, Ada, Okla.; George H. Holmes, Providence, R. I.; W. W. Armstrong, Salt Lake City, Utah; H. J. M. Jones, Montpelier, Vt.; W. N. Fitzgerald, Milwaukee, Wis.; E. H. Walker, Carson City, Nev., David Whitcomb, Seattle, Wash.; and Frank R. Gooding, Gooding, Idaho. The New England States will be under the general direction of James J. Storrow, who, with the several state representatives, will constitute the New England fuel committee.

Retail Coal Profits Defined

The recent order of the Fuel Administrator, Dr. Harry A. Garfield, defining the profits of retail coal and coke dealers throughout the country, is expected to effect an immediate decrease in the prices now charged the consumer. The text of the order follows:

> On and after the first day of October, 1917, in making prices and sales to consumers, the retail gross margin (as hereinafter defined) added by any retail dealer to the average cost (determined as hereinafter provided) of any size or grade of coal or coke for each class of business shall not exceed the average gross margin added by such dealer for the same size or grade for each class of business during the calendar year 1915, plus 30% of retail gross margin for the calendar year 1915; provided, however, that the retail gross margin added by any retail dealer shall in no case exceed the average added by such dealer for the same size, grade and class of business during July, 1917. By this order retailers are required to fix a retail gross margin which may be less than but shall not in any instance exceed the margin added by them in 1915, plus 30% thereof.
>
> The retail margin is the difference between the price charged by a retail coal or coke dealer to consumers and the average cost of coal or coke to such retailer, free on board railroad cars at his railroad siding, yard, pocket or trestle, when such coal or coke is received by him by rail.

A similar provision is made when the coal or coke is received by water. The order provides that the average cost of coal or coke to retail dealers shall be ascertained by them for each size and grade on the first and sixteenth days of each month, according to the following method: The tonnage and average cost of coal or coke on hand at the beginning of a period is to be combined with the tonnage and average cost of coal or coke received during the period.

Prosecution in the courts and seizure of their businesses by the Government face retail coal dealers who defy the provisions of this order. The penalty fixed by the Food bill for such offense is a fine of not more than $5000 or imprisonment for not more than two years, or both. "Each independent transaction," the bill continues, "shall constitute a separate offense."

Machinery Men in Liberty Loan Campaign

The following men prominent in the machinery world constitute the machinery- and machine-tool-trades division of the Greater New York Liberty Loan Committee:

> J. W. Lane, president E. W. Bliss Co., chairman; Henry Prentiss, president Prentiss Tool and Supply Co.; George Doubleday, president Ingersoll-Rand Co.; R. L. Patterson, president American Machine and Foundry Co.; C. I. Cornell, treasurer Pratt & Whitney Co.; Henry Fuller, vice president Fairbanks, Morse & Co.; John H. Lidgerwood, president Lidgerwood Manufacturing Co.; A. J. Babcock, president Manning, Maxwell & Moore; Norman Dodge, vice president Mergenthaler Linotype Co.; H. R. Swartz, president Intertype Corporation; George J. Low, F. M. Dyer & Co.; Charles A. Hirschberg, Ingersoll-Rand Company.

The bonds of the second issue are of two kinds, registered and coupon. The registered bonds will be registered at the Treasury in the names of their owners. Checks for the interest on these will be mailed from the Treasury to the owners each semiannual-interest date. The coupon bonds will be payable to bearer and will have coupons attached for the interest. The latter can be cashed like a Government check at any bank.

Bonds can be purchased by filling out an application blank made on the form prescribed by the Secretary of the Treasury, which can be obtained from any bank or Liberty Loan committee, and sending it or having it sent to the Treasury of the United States or any Federal Reserve Bank or branch accompanied by the payment of 2% of the amount of bonds applied for.

Wanted a National Junkman

"The nation needs a national 'junkman'," says James Keeley, the editor of the *Chicago Herald*, "although I suppose the kingdom over which he would rule would be described as the 'National Salvage Department.'

"The psychological effect of the creation of such a department at this time, contemporaneous with the floating of the second Liberty Loan, would be of inestimable value. It would be the Government's guarantee that, in so far as it is humanly possible, not one dollar of the millions that have been—and are to be—voted for materials necessary to the prosecution of the war will be wasted. It would be an official assurance that every dollar's worth of material not only will do 100 cents' worth of work but will be reëmployed until the vanishing point is reached.

"Of course, the army and navy have quartermasters' and inspectors' departments to look after the collection and disposal of material after it has been 'put out of action.' In peace times these departments have worked efficiently and according to regulations, but regulations of peace do not fit war conditions. This has been demonstrated on the other side of the Atlantic, where similar departments in all armies have given place to independent organizations, which were needed to prevent the vanishing into thin air of valuable material, disabled but not destroyed.

"The salvage and reclamation of every fragment of metal on the fighting line in the rear and at home is a vital factor of transatlantic governmental activity. We are a wasteful nation, and the sooner we learn that material of all kinds is so precious it must serve over and over again, the sooner we will be doing our full share in the great campaign outlined by President Wilson."

War Cost and Wealth

"If we say that the wealth of the United States is $250,000,000,000, and that our personal incomes aggregate $40,000,000,000 per year, and that Congress expects to mortgage this wealth and tax these incomes to the extent of perhaps $14,000,000,000 and $3,500,000,000, respectively, during the fiscal year 1917-18, our minds give the statement no rational reception," says the Alexander Hamilton Institute. "If we say, however, that the taxes will be 10% of our incomes and that the Government bond issues will be equal to a mortgage of 5.6% of our national wealth, it is easy to calculate whether or not each one of us personally is buying his share of bonds and paying his proportion of taxes to the Federal Government in addition to local taxes.

"On the basis of the foregoing estimates the national debt of the United States next June per inhabitant will be about $126, as compared with nearly $600 in England and France. Russia is facing a financial crisis because of lack of liquid wealth but, owing to a large population, her per capita debt is only about $125.

"The end of the first year of the war will find the United States Government with a relatively much smaller debt than England and France. Our taxes will amount to $31 per capita, which is nearly as heavy as in France though much less than in Great Britain. Since the American people enjoy a much larger income per person, however, the per cent. of taxes on our incomes is much less than in any European country."

Industrial Expansion in Austria

The chemical industry played a minor part in the economic life of Austria prior to the war, and undertakings in the line were few and small compared with those in Germany. "On the outbreak of war this condition was realized and the industry has since undergone a tremendous revival and expansion," to use the words of a translation from the German by the *Chemical Trade Journal.* The absence of certain raw materials, such as saltpeter, caused a search for a substitute. New plants were erected and existing ones enlarged. Nitric acid and nitrate of lime were made from air on a scale undreamed of in peace times. Sulphuric-acid production was enormously increased. Factories were built to make benzol, toluol, glycerine, acetone and for the production of sulphur and chlorine. The mineral wealth of the country was exploited to a much greater extent than before; the sulphuric-acid industry was rendered largely independent of foreign pyrites; and lead, copper and other metals were obtained. The Galician petroleum wells supplied the whole of the Central Powers with oil for light, power and lubrication.

Camouflage and War Risk at Sea

The art of camouflage is not confined to land. It is used at sea to dodge the submarine. It will be a factor in marine war-risk insurance. Deceptive painting of vessels is included with arming and smoke-box equipment in the instructions of the United States war-risk bureau. Shipowners who disregard these instructions will pay higher premiums on hulls and cargoes. It is said that painting of a "chameleon" sort has been tried in European waters with success. Instead of leaden hue, liners are painted in squares of red, green and brown with a sky-blue background so that at a distance the vessel blends with sky and sea. To reduce visibility heavy waves are painted along the sides. All is according to formula and with careful study of each ship's needs.

Waterways Must Help Railroads

"Business America," said Walter Parker, of the Department of Commerce, at the Atlantic City business convention, "must augment its transportation system and reduce it to a dependable, convenient and economic basis if domestic markets are to be kept in order and if the gate to foreign markets during the period of keen competition after the war is to be kept open. This means that the inland navigable waterways of the United States must be used as an adjunct to the railroads, and in coördination with the railroads, and that a system of transportation must be developed under which transportation lines of least natural resistance and cost of operation, in relation to the service required, will function without friction and without unnecessary restraint."

Germans Seek To Buy Minerals

"Germans are endeavoring to obtain supplies of materials for munitions and building from different parts of the world," said Dr. Christopher Addison, Great Britain's minister without portfolio in charge of reconstruction, in the course of a recent speech. "The Germans have been and still are making efforts to acquire control of great mineral deposits, even attempting to purchase them in England during the war."

British Steel Industry Expands

About $70,000,000 additional capital has been invested in the British steel industry since the war started, according to the report of the British Steel Smelters' Society. Production does not satisfy the needs of the Government, it is stated. The additional plant and the demands of the military authorities have caused a shortage of labor and many men have been brought back from the army to help supply the deficiency. Thousands of women have been employed in the steel plants, but there are many positions that they cannot fill.

Industrial News from Washington

By Paul Wooton, Special Correspondent

Sulphuric Acid in the West

Markets for sulphuric acid in the West are expanding on a scale which has greatly encouraged all operators of smelteries in that section, according to A. E. Wells, superintendent of the Salt Lake City station of the United States Bureau of Mines, who recently visited the principal plants in the Northwest. As all of these smelters have had to face complaints regarding smoke damage, he finds that they are ready to make larger investments in acid plants even when small profits are to be expected. Present market conditions have made it possible for domestic smelters to meet practically the entire demand of the Pacific coast.

The smelters in the intermountain states are finding an outlet for acid through the manufacture of high-grade superphosphates which are now being shipped into the Middle West. The increasing use of sulphuric acid in leaching the oxidized overburden at the Utah Copper Co.'s properties, as well as at other mines, and in the leaching of sand tailings are developments on which operators are pinning their hopes of greater consumption. Many are confident, according to Mr. Wells, that the direct application of sulphuric acid as a fertilizer is sure to come into general use on certain soils, thereby furnishing a larger Western market for the byproduct. If this market be provided, Mr. Wells believes that existing smelteries could produce 12,000 tons of 60° acid daily, after necessary equipment has been installed.

Lake Superior Station To Study Alloy Metals

Sufficient importance is attached to the manganese situation by the United States Bureau of Mines to cause it to set aside entirely its program for the Lake Superior station, which was prepared in peace times, to make way for a study of alloy metals. Although the work will pertain largely to manganese, much attention is to be given the study of substitutes for that metal in making steel. Edmund Newton, superintendent of the new station, has returned to his post at Minneapolis after extended conferences with Bureau officials, during which the wartime program of the Lake Superior station was formulated.

As the first step the Bureau has begun assembling all available information regarding the character and quantity of domestic manganese ores and their mining and concentration, as well as data on steel manufacture. Particular attention is to be given to a series of experiments on a basic pig iron having a high manganese content. It is hoped to demonstrate that the use of such pig iron will make possible the addition of less alloy on account of the large quantity of residual manganese in the bath metal. Thermochemical data relating to manganese and its compounds are to be determined. The equilibria of certain reactions between iron and manganese compounds will be the basis of important research. The greater part of the work will look to employing intermediate-grade alloys in making steel. Production of alloys in the electric furnace will also be studied.

Testing Chalcopyrite-Pyrrhotite Ores of Southern Oregon

Results of extensive experiments by Will H. Coghill on the flotation of chalcopyrite in the chalcopyrite-pyrrhotite ores of southern Oregon are to be announced in the near future by the United States Bureau of Mines. "Chalcopyrite is the copper-bearing mineral at many places in southern Oregon; often it is intimately associated with pyrrhotite and pyrite. In places these two gangue minerals form as much as 75% of the ore, so that the vein is almost wholly sulphides," says Mr. Coghill, discussing his work. Continuing, he says:

> Gravitation methods of concentrating the copper-bearing mineral cannot be applied because the gangue sulphides have practically the same density as chalcopyrite. Magnetic separation does not seem practicable—assuming that the gangue sulphides can be made to respond naturally or by a preliminary treatment to an electromagnet—because fine grinding is required to liberate the mineral grains. The methods of concentration now in vogue are hand sorting and jigging, which eliminate some of the siliceous gangue. An inspection of the smelter returns in the possession of mine operators gives the impression that the average grade of ore shipped runs 10% copper.
>
> The experiments on separating the chalcopyrite from the gangue by flotation have been carried through the preliminary laboratory stage with flattering results. As a mill is never considered complete and finished until the orebody is exhausted and the mill has served its purpose, so in this and in other ore-testing experiments there are still undetermined factors. However, in order that those who are interested in the separation of sulphides by flotation may have the results of the laboratory work before them, a preliminary report is to be made public soon.

Metal Statistics to be Furnished to War Industries Board

Arrangements have been completed whereby the principal producers of copper, lead and zinc will furnish each week, through the United States Geological Survey, confidential information for the use of the War Industries Board. As to this, Director George Otis Smith said: "Judging from personal interviews, as well as from correspondence on the subject, the metal industries are anxious to coöperate most heartily and most effectively with the Government at this time, when the national need for war materials is so urgent." C. E. Siebenthal will compile the weekly reports for lead and spelter. B. S. Butler will handle the copper figures.

A Conference on the Explosives Act has been called by Van H. Manning, director of the United States Bureau of Mines, to meet in Washington on Oct. 16 to draw up the details of administering the act. Representatives of all industries and organizations concerned have been invited to attend.

Editorials

What of Copper Supply?

A VALUED correspondent writes us expressing surprise at our article of last week in which we ventured the opinion that 23½c. for copper might fail to maintain the production that is needed. "Do not you know," says he, "that producers will exert themselves to their utmost? Do not you know that in 1916 producers realized stupendous profits on 25c. for copper; and, considering their magnitude, how can you think that a cut of only 1½c. per lb. will affect the situation materially?"

To these pertinent questions we reply that every producer with whom we have talked has expressed the intention of exerting all possible efforts. And, furthermore, we are convinced that at 23½c. there will be profits that will still be enormous, although not so large as in 1916. This answers the questions. However, what neither the questions nor answers have brought out is a feature in our economics that has not been adequately considered heretofore.

The imperfect view of the situation in copper is due to attention being centered upon the big producers while the miscellaneous production has been disregarded. Now it is quite true that the big producers are responsible for the major part of the production, perhaps 90% of it, but the output of the small producers is not inconsiderable and at any given time, when the market is in equilibrium, their output has a great deal to do with determining the price. It may be considered, moreover, that when the market is in equilibrium there are always some producers who are simply getting a new dollar for an old one.

Now it is, of course, impossible to say positively whether the market was in equilibrium previous to the Government's intervention. Ever since 1916, when copper began to be contracted in stupendous blocks for excessively long periods ahead, we have had an unbalanced market, i.e., a very large proportion of the supply was subtracted and quotations were subsequently established on relatively small transactions, which became higher than otherwise they would have been. This was to the advantage of the small producers, who dispose generally of their product on the quotational average. Thus, in comparing with 1916, while the big producers set 23½c. against 25c., the small producers set it against 27.2c. Just before the Government's announcement the price for copper had sunk to 24c. but had rallied to 26½c. on very small buying. Conditions for several months previous had been extraordinarily confused. There had been a prolonged absence of important buying, production had been seriously curtailed by the strikes, and the uncertainty respecting the policy of Washington overshadowed everything. It is probable that the market was not in a condition of equilibrium, for it did not exhibit the essential condition and infallible index, viz., an accumulation of unsold stock, but at the beginning of 1917 there were plenty of signs that it was on the way to regaining a normal state.

The prices for copper that prevailed in 1916 undoubtedly brought out a surplus production. This was manifest in the statistics of blister-copper production and also in the reports of accumulations of ore in the hands of smelters, so that the latter refused to take in more ore. Since then, however, there has been a change. The cost of production has increased, the supply of labor has decreased, the price for copper has shrunk, and smelters have reported that the supply of ore offered to them is less bountiful. This tends to indicate that under recent conditions the sundry supplies of copper have shown a tendency to contract.

Now, three years ago, even one year ago, any suggestion that a price around 25c. would be anything but a stimulus to unrestrained production would have been regarded as humorous. It is not so today. We are informed respecting at least one company of considerable output whose present cost is 23c. per lb., and it is not unlikely that one of our major districts, viz., Clifton-Morenci, is actually confronted with conditions that may make the present price an unprofitable one. The mines of that district are still idle, their labor troubles not yet having been settled.

Another direction in which contraction of copper supply may be feared is in the importation from South America. Some of that copper is high-cost copper and natural difficulties have been further enhanced by the depreciation in those countries of the American dollar. Quite aside from that, however, is the fact that our business in crude copper with those countries has been built up by dint of hard effort and by the creation of complicated market machinery. That machinery cannot be wrecked, as it has been, without interfering with the supply.

The feature in the economics of the situation that has been overlooked is this: The same inflation that affects price also affects costs and in doing so widens the spread among the costs of the several producers. Thus, if before the war one producer had a cost of 10c. and another a cost of 15c., their present costs might be 16 and 24c. respectively. The high-cost producer would be losing money at 23½c. just as formerly he lost money at 14½c., but the low-cost producer would be making 9c. per lb. profit against 4½c. formerly. This illustrates how such companies as Anaconda and Utah, and the other porphyries can properly regard 23½c. as a reasonable, even generous, price, and how they may continue to show earnings not very much short of their stupendous returns in 1916 when they got 25c. for their copper, while a small producer who got 27.2c. in 1916 and made a moderate profit may lose money at 23½c. and even may be compelled to suspend production.

If there were a free market for copper and if production had begun to exceed demand, with the result that prices were declining, small producers would begin to be extinguished and production trimmed down to fit the demand at figures that would still leave very fine margins for the big producers. We mean, of course, margins expressed in dollars and distributed as such in dividends, not losing sight of the fact that the stockholders receiving those dividends would not be able to buy with them any more than with the smaller dividends of yore.

It may be suggested that the big producers, who find 23½c. a satisfactory price, will produce all the copper that is needed, increasing their output if necessary. It is doubtful if they can. Early in this year it began to look as if they had reached the limit of their capacity. Their plants and personnels had both been strained to the utmost, and their ability was showing signs of deterioration. Nine months ago it was forecasted accurately that consumers had overbought, but the other forecast of a further increase in production was early known to be wrong. Whatever be the contributory causes, and they are most complex, the plain fact remains that at the present time we do not possess enough copper and domestic consumers have been officially told that during the next three months at least they must get along with a curtailed supply.

Bungling Legislation

THE House of Representatives enacted the most colossal revenue bill in the history of the United States, without giving any intelligent consideration to the subject and without knowing just what it was doing. This was admitted by the leaders of the House, who said that they were leaving it to the Senate to study the question and fix things up. The Senate did so and framed and enacted a bill that was admittedly a great improvement over what the House of Representatives had done blindly. Then came the question of reconciling the differences in the bills passed by the House and by the Senate, which, as usual, was attended to in a conference between delegates of the two bodies. These delegates, or conferees, rewrote the bill entirely with respect to its major chapter and made radical changes in other details. The revised bill, as drafted by the conferees, went back to the two legislative bodies, which adopted it unanimously and without any previous discussion except a few remarks of a perfunctory character. Members of both the Senate and the House said that there were provisions in the bill that were highly unjust, dangerous and, in brief, "perfectly rotten," but they said, "Let's pass them, enact them into law, and then repeal them when we meet again."

This is a curious side light, or should we rather say spot light, upon the fidelity of mentality of the legislative body of the Great Republic. Any person of decision and habit of clear thinking would say that if something is known to be bad, the logical thing to do would be to refuse to enact it. But to enact it with the avowed intention of repealing it a few months later is humorous. It is as if one had a glass vase on a table that it was desired to clear off and should say, "I will sweep off everything to the floor, the vase included. It is true that I do not desire to break the vase, but, nevertheless, I am going to do so, considering that I can pick up the pieces and stick them together again." Yet when similar exhibitions of thought are communicated to us from the Congress of Workmen's and Soldiers' Delegates in Petrograd, we find it highly humorous.

While the revenue bill was in conference an articl crept in that seems to require the professional man—th lawyer, surgeon or engineer—and the salaried man t pay a tax of 8% on professional or occupational incom in excess of $6000, this tax being in addition to the regular income tax on a graduated scale. Nobody—not eve the conferees—seems to know just how this article wa introduced and there is doubt respecting its meanin and application, wherefore there will probably be litigation regarding it.

The point to which we now call attention is this Here is a tax that may fall grievously and unfairly upon an important class of people. It was not originally introduced or debated in either house of Congress It was subsequently written in by a joint committe and when its revised bill was referred back to the tw houses they adopted it without knowing what it contained. One hundred and forty-two years ago we revolted on the grievance of taxation without representation. We now seem to have got taxation by star-chamber proceedings with our duly elected representatives mechanically assenting and not knowing what they are doing.

The Special Tax on Professional Men

WE HAVE above referred to the special tax on salaried and professional men that was slipped into the revenue bill by the conferees and adopted by Congress without debate. In behalf of a large class of professional men we protest against this tax. We feel sure that the spokesmen of all other professional men will unite with us in this. Professional and salaried men are as patriotic as any others and have no desire to evade or escape taxation necessary to carry on the war, but this tax is too unjust, too inequitable and was imposed in too surreptitious a way.

After this class has paid all the consumption taxes that fall on everybody, after it has paid its income tax and surtax, it is called upon to pay 8% of salary or earnings in excess of $6000. A man with a salary, or professional income, of $15,000 will be required to pay an income tax of $730 and then an occupational tax of $720. A man with an income of $15,000 from 3½% Liberty Bonds will pay nothing at all. The drone who does nothing but draw his income from investments pays only the regular income tax. The worker pays the income tax and then repeats. The slick gentlemen who concealed this joker in the revenue bill took precious good care to exempt congressmen, to exempt themselves from its terms.

This tax is practically a retroactive tax for it is collectible for the entire year of 1917, although it was no enacted until the year was three-fourths gone and then was enacted without any previous warning. There wil be found salaried and professional men, who live up t their means, or have already invested their surplu earnings for 1917, who have been putting somethin aside for payment of their income tax but will be unable to pay this extra tax except by liquidating such investments as they can or else by borrowing money fo the purpose.

The Hon. Claude Kitchin appears to be responsibl for this special tax. It appears under the title of "Wa Excess Profits Tax." This is another joke on profes sional men. Most of them have enjoyed no increased income due to the war but, on the contrary, have suffered increased expenses that have had to be paid out of a stationary income. The sneaking character of this occupational tax is exhibited by its not being stated explicitly in the revenue bill, being left to the inference of synthesis. Sec. 209 provides that "in the case of a trade or business having no invested capital" a tax shall be paid "equivalent to 8% of the net income of such trade or business in excess of" $6000 in the case of a domestic partnership, or a citizen, or a resident of the United States. Under Sec. 200 it is provided that "the terms 'trade' and 'business' include professions and occupations." Thus the trick was done. Elsewhere provision is made for the exempt class of Government employees and *members of Congress!*

Mexico's Tendency Toward Confiscation

THE Mexican congress has recently passed a bill—particulars of which will be found on another page—providing for the "temporary" taking over and management of all industrial properties whose owners refuse to operate them. In an accompanying circular the reasons for this action are set forth.

This is of particular interest to Americans, not so much in itself as in its possible significance. No one will be apt to quarrel with the Mexican government's concern over the dangerous idleness caused by non-operation of industrial properties. This is eminently right and proper, but the measure has served to give rise to certain disquieting speculations on the part of some observers.

What causes the sincerity of the law to be called in question is the fact that the companies affected refuse to operate only when conditions are intolerable; and these conditions—theoretically, at least—are under the control of the Mexican government. Another and still more practical view lies in the consideration that if these companies, with extensive experience and efficient management, cannot operate successfully, it may be safely assumed that the government, with a total lack of both advantages, cannot operate successfully either.

It would seem that if the Mexican government wants these companies to operate, it might be well to provide working conditions which would make successful operation possible. This being so, it would appear that the government is attacking an effect rather than a cause, and is mistaking the relative positions of the cart and the horse.

The main question is whether the law is merely an emergency measure, hastily constructed to remedy temporary conditions, or whether—as some affect to have discovered—it is a disquieting forecast of a definite policy of the Mexican government that will eventually eliminate foreign ownership of mines and industries.

This latter conclusion seems to be rather an alarmist view of the situation. If any intelligence is granted to the Mexican government, it must be assumed that it fully appreciates the vital necessity of foreign capital for the future development and welfare of the country. And it must be fairly obvious—even to a Mexican legislature—that the only available capital under present conditions is American.

BY THE WAY

The smelters of Miami, when they struck recently, exhibited their ideas of patriotism by abandoning their furnaces just as they were, without any preparation for a shutdown. As a consequence, the arches of the reverberatories fell in. Such an occurrence at a time when the country needs to keep its plant in the best of order and highest state of efficiency produces an uncomfortable feeling.

The striking miners in Arizona demanded $6 wages for a six-hour day, with the idea of securing ultimately a two-hour day with, of course, $6 pay. They had other grievances and demands. One of them was for abolition of the carbide lamp. Their objection to that useful, economical and sanitary means of illumination is mysterious and unknown. There is a suspicion that it has something to do with the old custom of taking home a pocketful of candles. When there are no candles in the mine, there are none to be purloined. Besides, the miner is required to put up a deposit of $1 for his carbide lamp, and if he loses the lamp he loses his deposit. We ourselves have to do the same thing with respect to several keys and other things. We think of interesting Miss Rankin in taking up this abuse of power by the corporations.

The red card carried by I. W. W. members appears on first thought to have no relation to railroad operations or dividends; yet on reconsideration it will be seen that it has an important bearing on railroad revenues. This red badge of membership has little in common with the "red badge of courage," made famous by Stephen Crane, except in the frequent loss of red blood. In this respect, it has considerable meaning in various mining and industrial centers. The I. W. W.'s red card, like its more respectable counterpart, the union card, passes current in many places as a franking privilege for a "touch," an occasional drink, or for a railroad ride in side-door pullmans. Owing to the taste for violence on the part of many I. W. W.'s, it is stated that railroad crews exhibit a particular apathy about putting off those carrying the "little red card." The franking privilege of the red card enables its holders to congregate at mining and industrial centers readily and thus precipitate strikes which may be much more important to the railroad than the loss of the passenger fares of I. W. W. members. Let us remember that the mines of the country are the best and greatest producers of tonnage for the railroads. The special work of the I. W. W. is the perpetual promotion of strikes. Strikes mean interruption of production, and, to the railroads, loss of tonnage. The recent idleness of the mines at Butte, at Miami and Globe, at Clifton and Morenci, and at Bisbee, all bear a more or less close relation to the influence of the I. W. W. propaganda. Wherever bearers of the "little red card" foregather, the strike "storm signal" may be hoisted and a red-ink entry looked for in the local books of mining and transportation companies. It behooves the railroads to look into the ravages of this "boll weevil" of the industrial field, and take some steps to restrict its migrations.

A. I. M. E. Meeting at St. Louis

The 115th meeting of the American Institute of Mining Engineers, held at St. Louis, Mo., on Oct. 8 and 9, was attended by over 300 Institute members and guests. A special train left the Pennsylvania station, New York, on Saturday afternoon, picking up *en route* many of the Eastern members at Philadelphia, Harrisburg, Pittsburgh, Columbus, Indianapolis, and arriving in St. Louis late Sunday afternoon.

The registration of visitors took place on the parlor floor of the Planters Hotel in St. Louis, and an unusually large number of members were in attendance from Mississippi Valley and Lake Superior regions. The Woman's Auxiliary of the Institute accompanied the party and was also well represented at St. Louis. The ladies were received by a special entertainment committee, headed by Mrs. P. N. Moore.

The committee on arrangements, of which H. A. Buehler was chairman, prepared an elaborate program of visits to outlying mining districts, accompanied by daily technical sessions and a number of social entertainments.

On Monday morning, two simultaneous sessions were held at the Planters Hotel at 10 a.m., at which were read and discussed papers on milling and on coal. O. M. Bilharz presided at the milling session and the papers presented were as follows:

The Hancock Jig in the Concentration of Lead Ores. By Harold Rabling.
The Concentration Practice in Southeast Missouri. By A. P. Watt.
The Milling Practice of the St. Joseph Lead Co. By L. A. Delano.
Ore-Dressing Practice in the Joplin District. By C. A. Wright.
A Standard Screen Scale for Testing Sieves.
A Uniform Sizing Diagram for Different Screen Standards. By John Randall.

A discussion as to the consumption of steel in ball and Marathon mills was engaged in by H. S. Cole, H. N. Spicer, L. A. Delano and A. P. Watt. It was claimed that in a 10,000-ton run the consumption was 0.9 lb. cast-iron balls and 0.25 lb. steel rods per ton. The rods were removed when worn to ½ in. and represent 10% original weight or 0.3 lb. discard. When grinding from 10 to 2 mm., the wear on liners was too little to remove in the time operated. At 400 tons per day distortion of rods occurred only when they were not removed when worn to ½ in. or when not placed parallel at start.

The session on coal was in charge of Thomas T. Brewster, and the papers read were:

The Effect of Anti-Friction Bearings on the Haulage of a Coal Mine. By P. B. Liebermann.
Coal Wastage. By Francis S. Peabody.
Steam Shovel Mining of Bituminous Coal. By H. H. Stoek.
Merit Rating of Coal Mines Under Workmen's Compensation Insurance. By E. C. Lee.
The Coal Industry of Illinois. By C. M. Young.

Luncheon followed the close of the first session, and a special patriotic meeting was held in the afternoon. On Tuesday morning simultaneous sessions on lead and petroleum were held at the Planters Hotel, presided over respectively by Arthur Thacher and A. F. Lucas. A meeting of the Woman's Auxiliary for organization was held simultaneously with these sessions. At the lead sessions the following metallurgical papers were presented:

Tredinnick Pattinson Process. By William E. Newnam.
Lead Mining and Smelting at Galetta, Ont. By William E. Newnam.
The Metallurgy of Lead Ores in the Lower Mississippi Valley. By Herman Garlichs.
The Media Mill, Webb City, Mo. By H. B. Pulsifer.
Salt in the Metallurgy of Lead. By Oliver C. Ralston, Clyde E. Williams, Marvin J. Udy and G. J. Holt.

At the petroleum session were presented papers on:

The Practical Value of Oil and Gas Bureaus. By W. G. Matteson.
A Review of the Exploration at Belle Isle, Louisiana. By A. F. Lucas.
A Feasible Plan for Gaging Individual Wells. By Roswell H. Johnson and W. E. Bernard.
Geosynclines and Petroliferous Deposits. By Marcel R. Daly.
Funnel and Anticlinal-Ring Structure Associated with Igneous Intrusions in the Mexican Oil Fields. By V. R. Garfias and H. J. Hawley.

In the afternoon a boat trip to the Herculaneum smeltery of the St. Joseph Lead Co. was attended by a large number of members. The party returned to St. Louis in the evening having supper, followed by dancing and by a technical session at 8 p.m. on board the boat. A number of interesting papers were presented at this meeting, namely:

Comparative Tests of Hammer Drill Bits. By C. R. Forbes and J. C. Barton.
Mine Models. By H. H. Stoek.
Mining Methods of the American Zinc Co. of Tennessee. By H. A. Coy and H. B. Henegar.
Increasing Dividends Through Personnel Work. By T. T. Read.
Methods of Determining the Capacities of Slime-Thickening Tanks. By R. T. Mishler.
Influence of Base Metals in Gold-Bullion Assaying. By Frederic P. Dewey.
Graphic Solutions of Some Compressed-Air Calculations. By C. W. Crispell.
Tests on the Hardinge Conical Mill. By Arthur F. Taggart.
The Enrichment and Segregation of Mill Tailings for Future Treatment. By F. E. Marcy.
Resistance of Artificial Mine-Roof Supports. By W. Griffith.
A Study of the Microstructure of Some Clays in Relation to Their Period of Firing. By H. Ries and Y. O. Oinouye.
The History and Legal Phases of the Smoke Problem. By Lugon Johnson.
Zinc Dust as a Precipitant in the Cyanide Process. By W. J. Sharwood.
Experiments in the Recovery of Tungsten and Gold in the Murray District, Idaho. By R. R. Goodrich and N. E. Holden.

A special session was held, at 2 p.m., of the War Minerals Committee, consisting of William Young Westervelt, chairman; Alfred G. White, secretary; W. O. Hotchkiss and David White. At the meeting of this committee, information on mineral resources of the United States as presented by various engineers from personal knowledge through examinations and reports made, was collected, condensed and classified for the purpose of determining the relative importance of different properties from the standpoint of mineral production.

On Wednesday an automobile trip was arranged by the Woman's Auxiliary, a visit by its members to the Art Museum and to private galleries, and a reception for all members at the residence of President and Mrs. P. N. Moore, at 3125 Lafayette Ave., St. Louis. An all-day trip of inspection to Illinois coal mines was planned for coal members, together with an optional visit to steel works, lead and zinc smelteries and other industrial plants in St. Louis and vicinity.

On Wednesday afternoon, simultaneous sessions on ore deposits and on iron and steel were held at the Planters Hotel, these papers being read:

Exploration of Metalliferous Deposits. By W. H. Emmons.

The Pyritic Deposits Near Röros, Norway. By H. Ries and R. E. Somers.

The Sulphur Deposits in Culberson County, Tex. By William B. Phillips.

Ore Deposits of the Boulder Batholith of Montana. By Paul Billingsley and J. A. Grimes.

A New Silicate of Lead and Zinc. By P. A. van der Meulen.

The Effects of Cross Faults on the Richness of Ore. By E. K. Soper.

The Replacement of Sulphides by Quartz. By H. N. Wolcott.

Geology and Mineral Deposits of the Ozark Region. By H. A. Buehler.

The Ferrous Iron Content and Magnetic Susceptibility of Some Artificial and Natural Oxides of Iron. By R. B. Sosman and J. C. Hostetter.

Zonal Growth in Hematite and Its Bearing on the Origin of Certain Iron Ores. By R. B. Sosman and J. C. Hostetter.

The Tayeh Iron Ore Deposits. By Chung Yu Wang.

Manganiferous Iron Ores of the Cuyuna District, Minn. By E. C. Harder.

The Supposed Reversal of Inheritance of Ferrite Grain Size from That of Austenite. By Henry M. Howe.

Some Unusual Features in the Microstructure of Wrought Iron. By Henry S. Rawdon.

The convention train left St. Louis Wednesday night to inspect the zinc mines of the Joplin district, the southeast Kansas coal field and the Oklahoma oil fields. For the Joplin and Tulsa technical sessions, the following papers were scheduled for the zinc and petroleum divisions:

The Zinc Ores of the Joplin District. By W. George Waring.

Development and Underground Mining Practice in the Joplin District. By H. I. Young.

Oxide of Zinc. By G. C. Stone.

Zinc Burning as a Metallurgical Process. By W. R. Ingalls.

Some Economic Factors in the Production of Electrolytic Zinc. By R. G. Hall.

Zinc Mining at Franklin, N. J. By C. M. Haight and B. F. Tillson.

Characteristics of Zinc Deposits in North America. By Frank L. Nason.

The New Jersey Zinc Co.'s Franklin Laboratory. By D. Jenkins.

Palmerton Zinc Refractories. By C. P. Fiske.

A Few Notes on the Future Work of the Petroleum Geologist in the Mid-Continental Field. By Dorsey Hager.

Geologic Structure in the Cushing Oil and Gas Field, Oklahoma. By Carl H. Beal.

Granite in Kansas Wells. By Park Wright.

Review of Present Knowledge Regarding the Petroleum Resources of South America. By F. G. Clapp.

The Estimation of Petroleum Reserves. By Robert W. Pack.

The Southern Extremity of the "Clinton" Gas Pools in Ohio. By L. S. Panyity.

Relation of Sulphur to Variation in the Gravity of California Petroleum. By G. Sherburne Rogers.

On Friday the Cosden oil refinery was to be visited and the final technical session held at 8 p.m. Saturday was to be devoted to a visit to the Cushing oil field, the convention party disbanding Saturday evening at Depew.

Mexican Embargo on Gold and Silver

A dispatch from the Treasury Department of the Mexican government to Ambassador Bonillas, at Washington, states that the President of the Republic has issued the following important decree:

Whereas, due to the rise in the price of silver, it becomes urgent to effect radical changes in our monetary system, restricting, as far as possible, the exportation of specie, and striving by all reasonable means to import the same; and

Whereas, at present the balance of trade in foreign business is in favor of Mexico, it is imperative that exporters, especially of precious metals, be enabled to collect at least a part of their shipments in gold coin or bullion, while permitting, if the country's need should exact it, to require the reimportation of specie in connection with sundry articles of export, I have deemed it proper to decree as follows:

Art. I—The general prohibition to export any gold or silver coin of Mexican mintage continues in full force.

Art. II—From the date of the present decree the exportation of gold bars is absolutely forbidden.

Art. III—Exporters of ores and concentrates of any kind containing gold of a value exceeding six grams per ton will be under obligation to reimport to Mexico in gold bars suitable to mintage, or in Mexican or foreign gold coin, a sum equivalent to the gold produced, according to respective assays, by the ores or concentrates which may have been exported.

Art. IV—Exporters of silver bars or ores and concentrates containing silver of a value exceeding 50 grams per ton shall be under the obligation to reimport in mintable gold bars, or in national or foreign gold coins, 25 per cent. of the value of the silver contained in the bars, ores or concentrates which may have been exported.

Art. V—For settlements of gold to be imported there will be taken as silver basic price the same which may have been fixed by the Treasury Department to collect taxes at the time of export of the corresponding metal.

Art. VI—Exporters of the metal in bars or of the ores and concentrates of gold or silver shall submit to the custom house through which they may export, or at the Treasury Department, a bond for the value of the gold which they are to reimport.

Art. VII—Gold imported shall be delivered for mintage at the National Mint within the 30 days following date of importation. The mint shall charge importers solely the minting charges.

Art. VIII—Reimportations shall be effected within the 10 days subsequent to exportations, after which nonfulfillment of the obligation to reimport shall be penalized by the cashing of the amount of the bond and crediting said sum to Government as befitting a fraudulent exportation.

The Assistant Secretary, R. Nieto.

Foreign Trade in Copper

Exports of copper from the United States in June, July, 1917, and the first seven months of the year, are reported by the Department of Commerce as follows:

	June Lb.	July Lb.	Jan.-July Lb.
Ore and concentrates, contents	587,357	293,200	3,504,388
Unrefined, in bars, pigs, etc		277,980	5,273,679
Refined, bars, etc	89,532,200	54,275,337	631,947,908
Old and scrap	46,974	2,240	865,835
Plates and sheets	700,932	2,302,153	19,490,032
Pipes and tubes	a	2,782,255	a2,782,255
Wire	1,961,517	1,773,447	17,110,110
Total	92,828,980	58,924,357	678,191,952

a First reported separately in July

The weight of ore exported in July was 3274 tons; no concentrates.

Imports of copper in June, July and the first seven months of 1917 were as follows:

	June Lb.	July Lb.	Jan.-July Lb.
Ore and concentrates, contents	14,466,518	8,686,134	86,559,636
Matte and regulus, etc	1,141,067	797,982	11,252,075
Unrefined, in bars, pigs, etc	44,779,479	10,122,230	215,207,353
Refined, in bars, etc	320,935	46,865	4,009,600
Old, etc., for manufacture	3,454,978	2,488,410	14,336,834
Composition metal, copper chief value	15,548	492,092	654,644
Total	64,178,525	22,633,713	332,020,090

Material imported in July was 27,758 tons ore, 10,330 tons concentrates and 963 tons matte and regulus, etc.

Victoria Mineral Output, 1916

The mineral output of Victoria, Australia, during 1916, according to the Secretary for Mines, was as follows: Gold, 256,643 fine oz., a decrease from 1915 of 72,425 oz.; silver, 8746 fine oz.; coal, 417,183 long tons; antimony ore, 12,382 (yielding 3259 tons concentrates); tin ore, 122 long tons; wolfram, ¾ long ton; gypsum, 1853; brown coal, 2915; magnesite, 100; kaolin, 810; manganese ore, 85 long tons.

Personals

J. S. Coupal has returned to New York from examination work in Arizona.

Louis E. Garbrecht is making examinations in the Pispis mining district of Nicaragua.

Chuang Yen has joined the engineering staff of the Winona Copper Co. in northern Michigan.

Maj. Reginald W. Brock is giving a course in a school for commanding officers in England.

W. B. Phelps is superintendent of mines for the Tom Reed Gold Mines Co., at Oatman, Arizona.

Herbert G. Thomson has been appointed general superintendent of the Nevada Packard Mines Company.

David W. Brunton, of Denver, Colo., is spending a few weeks in New York, making his headquarters at the Engineers' Club.

L. V. Rorke has been appointed by the Ontario government to the position of director of surveys, succeeding the late G. B. Kirkpatrick.

R. D. Park, of the engineering staff of the United Verde Copper Co., has received a commission in the Engineer Corps of the United States Army.

Henry Geisendorfer, manager of the Calavada mine in the Luning district, Nevada, has been in New York in conference with the officials of the company.

John H. Rodgers, formerly at Ishpeming, Mich., is now manager of the McComber mine on the Vermilion Range, between Tower and Ely, Minnesota.

Harold C. Cloudman, mining and civil engineer of San Francisco, has been commissioned captain in the Engineer Corps, U. S. A. He was but recently appointed as land classifier of the U. S. Geological Survey.

William C. Ralston, of New York, has been in Nevada where he has been preparing for the installation by the Unevida Gold Mining Co. of a plant for recovery of quicksilver and amalgam from the Carson River.

D. E. Charlton, for the last five years safety engineer for the Oliver Iron Mining Co. in the Virginia (Minnesota) district, has accepted a position on the editorial staff of the "Engineering and Mining Journal."

C. E. Staart, superintendent of the Bonanza unit of the American Smelting and Refining Co., in Zacatecas, Mexico, has been commissioned a captain in the Engineer Officers Reserve Corps and is now at Fort Leavenworth.

George E. Farish, of New York, sailed on Oct. 2, on the S.S. "Peru" for Salvador. He is accompanied by **R. R. Leslie** and **U. A. Fritschi,** and will examine the properties of the Butters Divisadero Co. in the interest of his New York clients.

N. W. Sweetser and **W. M. Stephen,** mining engineers representing the Granby Consolidated company, have examined some copper prospects in the Whitehorse district, Yukon, with a view to their being taken over by the company.

H. E. Linden, of the Beckman & Linden Engineering Corporation of San Francisco, is making an extended trip through the East in the interest of his own company and of the Pacific Electro-Metals Co., of which the corporation is the engineer and manager.

Gerald G. Dobbs, formerly superintendent of the Raimund mining division, Republic Iron and Steel Co., southern district, has resigned to accept the position of superintendent of the Goudreau mine, at Goudreau, Ont., for the General Chemical Co., New York.

H. C. Perring, who has been superintendent of construction of the Pacific Gold Dredging Co. for several years, has been appointed general superintendent, succeeding the late O. C. Perry. The Pacific Gold Dredging Co. is the California subsidiary of the Yukon Gold Company.

Capt. Gerard W. Williams, formerly general manager of the Mount Oxide mine, in Queensland, Australia, has been awarded the Military Cross for distinguished service on the Somme front. He was commissioned in the Royal Engineers, having enlisted soon after the outbreak of the war.

M. J. Falkenburg, of Falkenburg & Laucks, chemists and engineers of Seattle, Wash., has gone to Anchorage, Alaska, in the interests of the Alaskan Engineering Commission. Falkenburg & Laucks, through Hildreth & Co. of New York, are inspecting materials of all kinds used in the construction of the Government Railway in Alaska.

Associated Geological Engineers make the following announcement concerning members of their staff: **Ernest Marquardt,** now in Wyoming, has been drafted after passing his examination for the Officers' Reserve Corps; **David Elliot Day,** recently attached to the staff of M. L. Fuller in West Virginia, expects to sail for France soon on special work; **J. M. Callihan** enlisted in the Seventh (New York) Regiment and has gone to camp at Spartanburg, S. C.; **F. G. Clapp** is a corporal in the Veteran Corps of Artillery of the State of New York, and is called into service from time to time in the vicinity of New York.

Obituary

Norman Hall died at Sharon, Penn., Sept. 29, aged 88 years. He was born in Pennsylvania, graduated from Dickinson College at Carlisle, and was for over 50 years engaged in mining iron ore and making pig iron, at Marietta, O., in Berks County, Penn., and in Mahoning and Shenango Valleys. In 1886, he was elected to Congress.

Edward H. Rising, ex-president and director of the General Chemical Co., died Wednesday in Saugerties, N. Y., at the age of 59 years. He was connected with the chemical industry during nearly all his business life, and was the founder of the National Chemical Co. in 1893, which was later merged with the General Chemical Co. He was made president of the latter company in 1907, and retired from business in 1910.

Herbert E. Goodman, vice-president and general manager of the Goodman Manufacturing Co., died on Oct. 3 at his home in Chicago. He was born in Chicago and graduated from Chicago University. In 1888 he became secretary of the Sperry Electric Mining Machine Co. and in 1893 became associated with the Thompson-Houston interests which absorbed the former company. He was an organizer of the Independent Electric Co., later taken over by the Link-Belt Machinery Co., Mr. Goodman going with the latter company. In 1900 he organized the Goodman Manufacturing Co. and took over the mining machinery business of the Link-Belt company.

Cortlandt E. Palmer, for a number of years one of the most active operating and consulting engineers in the country, died at his summer home in Arlington, Vt., Sept. 21, 1917, in his sixtieth year. He was born in New York, and educated at Johns Hopkins University and the Columbia School of Mines. He was graduated from the latter in 1878, and entered the employ of the engineer corps of the Pennsylvania Co. of Pittsburgh in 1879. In 1884 he removed to Colorado where at various times he operated well-known properties in Aspen, Rico, Cripple Creek and in other districts. He was general manager and vice-president of the Mollie Gibson Consolidated Mining and Milling Co., at Aspen, Colo., during the time this property made its famous production. His consulting engagements, embracing most of the Western states, were many and varied, including properties in Mexico. In 1903 he was appointed general superintendent of mines of the Guggenheim Exploration Co. and of the American Smelters Securities Co., and later became consulting engineer of the latter company, which post he filled for several years. He retired in 1910 from active consulting work.

Societies

Coming Meetings

American Iron and Steel Association Cincinnati..Oct. 26-27
Electrical Exposition and Motor Show..New York..Oct. 10-20

American Foundrymen's Association—At the 22nd annual meeting held at Boston on Sept. 24-28, the following papers were among the many presented: "Micrometallography for the Foundry," Robert J. Anderson; "Theory of the Modern Waste Heat Boiler and Possible Application of Such Boilers to the Malleable Melting Furnace," A. D. Pratt; "Application of Pulverized Coal to the Air Furnace," W. R. Bean; "How Malleable Iron Has Improved," Enrique Touceda.

Southern Commercial Congress—Six of the bureaus of the Department of Commerce will have an exhibit at the Southern Commercial Congress, to be held in New York at the Hotel Astor on Oct. 15-17. Of chief interest to technical men will be the exhibit of the Coast and Geodetic Survey, which will consist largely of instruments used in surveying our coasts and placing of bench marks throughout the country. Some of these are a complete plane table alidade, and telemeter, chronographs, gimbal stand, geodetic level and rod, etc.

American Institute of Metals—At the recent meeting, held in Boston, the following officers were elected for the ensuing year: President, W. M. Corse, manager Titanium Bronze Co.; secretary and treasurer, Fred L. Wolf, manufacturing engineer, Ohio Brass Co., Mansfield, Ohio; vice-presidents, William B. Price, chief chemist Scovill Mfg. Co., senior vice-president; George K. Burgess, Bureau of Standards, Washington; H. J. Roast, James Robertson Co., Ltd., Montreal; J. P. Salter, Ohio Brass Co., Mansfield, Ohio; W. A. Cowan, National Lead Co., Brooklyn, N. Y.; H. S. Gulick, More-Jones Co., St. Louis; C. W. Johnson, Westinghouse Electric and Manufacturing Co.; H. A. Wentworth, American Zinc, Lead and Smelting Co., New York; F. L. Antisell, Raritan Copper Works, Perth Amboy, N. J.; G. M. Fritch, American Brass Co., Kenosha, Wis. The society has 282 active and 64 associate members, a total of 346 and an increase of 69 members. Twenty-eight corporations are now members, whereas last year only 19 were included. The society has adopted the plan of issuing a quarterly journal.

New Patents

United States patent specifications listed below may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

Alumina and Zirconia, Composition Containing. Lewis E. Saunders and Ray Hill White, Niagara Falls, N. Y., assignors to Norton Company, Worcester, Mass. (U. S. No. 1,240,490; Sept. 8, 1917.)

Alunite—Production of Aluminate from Alunite. Paul Ralph Hershman, Chicago, Ill., assignor to Armour Fertilizer Works, Chicago, Ill. (U. S. No. 1,240,570; Sept. 18, 1917.)

Corrosion—Composition for Protecting Metallic Surfaces Against Corrosion. Don C. Westerfield, Dayton, and Edward J. Rogers, Miamisburg, Ohio. (U. S. No 1,240,395; Sept. 18, 1917.)

Drill—Tool-Retainer for Hammer-Drills Lewis C. Bayles, Easton, Penn., assignor to Ingersoll-Rand Co., Jersey City, N. J (U. S. No. 1,240,649; Sept. 18, 1917.)

Electric Furnace. David R. Knapp, Pottsville, Penn., assignor to the Eastern Stee Co., Pottsville, Penn. (U. S. No. 1,240,460; Sept. 18, 1917.)

Filter. Ernest J. Sweetland, Montclair N. J (U. S. No. 1,240,385; Sept. 18 1917.)

Filtering Apparatus. George Sage Brook and Lawrence Grant Duncan, Depue, Ill. assignors to New Jersey Zinc Co., New York, N. Y., a corporation of New Jersey (U. S. No. 1,240,305; Sept. 18, 1917.)

Flotation of Minerals. Clement L. Perkins Pittsburgh, Penn., assignor to Metals Recovery Co., New York, N. Y. (U. S Nos 1,240,597, 1,240,598, 1,240,599, Sept 18, 1917.)

Gold-Saving Pan. Sherman L. Winchester Weiser, Idaho. (U. S. No. 1,240,396 Sept. 18, 1917.)

Grinding Device. Francis M. Henshaw Oklahoma, Okla. (U. S. No. 1,240,716 Sept. 18, 1917.)

Ingot Molds, Pouring-Head for. Charles I Huston, Coatesville, Penn. (U. S. No 1,240,722; Sept. 18, 1917.)

Mine Door. Charles W. Carman, Newburg W. Va., assignor of one-half to Christina Carman, Newburg, W. Va. (U. S. No 1,240,541, Sept. 18, 1917.)

Ore Bodies, Method and Apparatus for Locating. Reginald A. Fessenden, Brookline, Mass., assignor to Submarine Sign Co., Waterville, Maine. (U. S. No. 1,240,328; Sept. 18, 1917.)

Rotary Pump. Fletcher C. Rood, Portland, Ore. (U. S. No. 1,240,489; Sep 18, 1917.)

Rotary Pump. Jiles S. Shockley, Nashville, Tenn., assignor, by direct and mesn assignments, of ten one-hundredths t William L. Hanley and eighty one-hundredths to Louis F. Butler, Nashvill Tenn. (U. S. No. 1,240,261, Sept. 1 1917.)

Editorial Correspondence

SAN FRANCISCO—Oct. 6

State Railroad Commission Decision in ie case of the complaint of Thomas Cain gainst the Mono Lake Lumber Co. has een rendered. Cain claimed that the road as a public utility and abandonment of ie railroad would deprive him of facilities r transportation of ore. The decision endered stated that, though the lumber ompany is a common carrier and subject commission jurisdiction, the abandon-ient of the railroad between Bodie and ono Mill is authorized. The reason for ie decision was stated to be that though public utility, the lumber company was ie largest user and it is evident that the oad could not be supported by the public.

Comstock Mines continue development f new ore in the lower levels. The Union 1 the 2300-ft. level made a fine showing in ie last half of September, disclosing ore t various points showing favorable con-nts. On the 2400-ft. level, a vein six to ft. wide was encountered and showed e in commercial amount. In Ophir, the 100-ft. level ore averages $11 to $13. Andes ved ore assaying $8.20. In the Gold Hill strict, the Jacket is still getting low and edium-grade ore from the surface tunnel. other mines on the lode, development ork is being advanced and repairs are eing made. Mexican mill has resumed ork after being shut down for repairs and ie new installations at the Jacket mill are working order. Altogether the advance-ent on the Comstock during the last six onths has been especially encouraging.

BUTTE—Oct. 6

Strike of Miners in Butte is practically oken. The smeltermen at Anaconda, who ent on a strike to enforce a demand for flat rate of pay, regardless of the price copper, and also in sympathy with the utte strikers, have returned to work. In ct, there are now more applicants for ork at the smeltery than can be employed hile the ore supply from the Butte mines mains short. While a large number of iners are still on a strike, the force is adually breaking up. However, owing the fact that several thousand miners ve left the district, it will be many onths before a full normal force will be orking in the mines again.

Montana-Canadian Oil Co. has been taken er by Anaconda interests, represented C. F. Kelley, vice president and man-ing director. The gas and oil lands of e company, situated along the Canadian rder in Montana, in Hill and Toole Coun-s, are included. It is proposed to pipe e gas to Great Falls, Butte, Anaconda d other Montana communities, sell it r commercial and domestic purposes and e it as fuel at the smelteries of the Ana-nda company. The Montana-Canadian s already developed two large gas-pro-icing wells, and under the terms of the ansfer, Mr. Kelley and associates will, ithin 30 days, begin sinking two other ells. They have already spent about 0,000 in development work on the lands d results justified them in taking over ntrol of the property. It is estimated at it will require the expenditure of 14 15 millions of dollars to carry out the ans of the company and place it on a mmercial footing. The Montana-Cana-an company owns perpetual leases on 76,-0 acres of oil lands. The company is pitalized for $1,000,000. Under the deal th Mr. Kelley and his associates the tter will organize two new companies, e a domestic concern for the purpose of veloping and operating the land and ells, and the other, a foreign corporation, construct the pipe lines and commer-alize the products. What further capi-l will be required, aside from that real-d from stock sales, will be raised by e issue of bonds. The development work, hich is under way, will be continued and ished to a point of thoroughly developing e property, but it is likely that the con-ruction of the pipe lines will be delayed til after the war, as it is practically im-ssible to secure pipe now at any price. ie impossibility of raising capital to carry t the gigantic project undertaken by the ontana-Canadian company made the deal ith the Kelley interests advantageous and tisfactory to the stockholders of the Mon-a-Canadian company.

DENVER—Oct. 4

Leasing of Mineral Rights on state or school lands has been placed in the hands of the State Board of Land Commissioners. This board may lease any portion of the land of the state at a rental determined by it, and may collect the rental from the lessee and turn it over to the State Treasurer. In selling state lands for other purposes than mining, the board may reserve to the State of Colorado all rights to all minerals and ores, all coal, asphaltum, oil, gas or other like substances, for the purpose of mining, together with enough of the surface for the proper and convenient working of such minerals and substances.

Colorado School of Mines Alumni Association suit against Victor C. Alderson to prevent his election as president of the institution, was decided by Judge James Cooper, when he upheld defendant's demurrer upon the ground that the plaintiffs are not affected as taxpayers, and therefore have no capacity to sue. The order, however, restraining the trustees from proceeding on contract entered into with Alderson, making him president, remains in effect for 20 days in order to give attorneys for the plaintiff time to take case before the Supreme Court. Prior to entering of judgment, the court consented to the amendment making Alderson a party to the suit.

Rights of Way Across Claims are provided for by an act of the last general assembly as follows: All claims shall be subject to the right of way of any ditch, flume, pipe line for transporting water or air for mining purposes, or any tram, tramway or pack trail, provided the parties desiring the right of way shall make just compensation to the owners of the claims. When the parties cannot agree upon the right of way and the amount of compensation to be paid to the owners of the claims, the same shall be determined in manner as now provided by law for the exercise of the right of eminent domain. Any ditch or flume shall be so constructed that the water therefrom shall not injure vested rights by flooding.

WALLACE, IDAHO—Oct. 6

Washington Water Power Company has found it necessary to add another transmission line to supply the demand for electric energy in the Coeur d'Alene district. The company now has two lines, one from its Spokane and one from its Post Falls plant, and announcement has just been made that a third line will be constructed from Post Falls. The two lines now in operation supply 10,000 hp. and the wires of the company reach almost every gulch in the district. Extensions are continuously being made, for electric power is now used almost exclusively for all purposes at the mines and mills, and practically every development company of any pretentions has a compressor driven by electricity. The largest single consumer of electric power is the Bunker Hill smeltery and the present and future demands of this plant has made the addition of a new line necessary.

Price of Explosives Is Advanced about every 30 days or six weeks. Notice is frequently served on consumers by the manufacturers to this effect, the last notice having been served by the local agency in this district on Sept. 17. The price of Dupont and Giant powder is now more than double the price before the war. Up to a certain point the advances were unquestionably justified on the ground of increased cost of production, but beyond that point they appear to be purely arbitrary and for no other purpose than to swell the profits of the manufacturers, which have already reached fabulous sums. The high cost of powder has now become a most serious matter in western mining districts. In this district, scores of development companies, which are financed by periodical assessments, have been forced to suspend operations on account of the excessive cost of powder, coupled with the advance in wages and mining supplies generally. The development of new mines is quite as essential as the steady operation of the old ones. Now that the productive mines have been forced to submit to a reduction in the prices of their product, they should be given the benefit of a reduction in the price of the material of which they are such large consumers, and which would be of direct encouragement in the opening of new mines. This phase of fixing the price of materials is important, as explosives can be justly considered a necessity inasmuch as they are directly concerned with metal production.

Change Rooms, with bathing facilities, at all mines was one of the propositions submitted for conference by the local of the International Union of Mine, Mill and Smelter Workers to the mining companies of Coeur d'Alene district. In view of all that has been done in that respect by the mining companies of the district, one wonders what these advocates of better working conditions would have. The change house at the Bunker Hill & Sullivan is a model; so is that at the Interstate-Callahan, at the Hecla, at the Hercules, and at the Morning, even while this request was being framed, construction of a modern dry room at the mill was well under way and plans were almost completed for a large concrete building at the mine which will be the last word in dry-room construction and conveniences; the plans for the change rooms at the mill include individual enameled wash basins, shower baths, and 85 individual lockers. The house is steam heated. The mine change house, work on which is just about to begin, will duplicate all the conveniences embodied in the dry room at the mill and will have accommodations for about 500 employees. A club house is to be erected at once, the plans for which will follow in general such institutions conducted by the Y. M. C. A. An architect is now preparing the plans. The club house will include reading room, writing room, gymnasium, billiard hall, entertainment hall, bowling alley and probably a plunge. The building will be for the free use of employees and under their direct management. The Bunker Hill & Sullivan maintains a similar institution, managed by the Y. M. C. A. Other companies, in addition to modern change-room accommodations, have similar institutions for the recreation of their men. In view of all that has been done by the companies for the welfare of their employees, the formal demand for "bathing facilities" is ludicrous to say the least.

JOPLIN, MO.—Oct. 6

A. I. M. E. Members will have the opportunity to visit a rich lead cave which has been found on the property of the Laclede Lead and Zinc company, about half mile west of Picher, Okla. The cave was struck at a depth of 200 ft. in the mill shaft and has been kept intact for the visiting members of the Institute.

Probability of Water Troubles in the two leading camps of this district in the near future is looming up. Until recently the water in the Webb City-Carterville sheet ground section was well under control, while the water in the Oklahoma field has always been a big problem. Now so many of the mills of the Webb City field are being shut down and moved to Oklahoma that it promises to leave a heavy burden of water pumping on those that remain. On the other hand, the increasing number of plants in the Oklahoma field has not only drained the water from the upper level, but has also removed it as far down as 300 ft. at many of the plants. Operators there who plan working the upper levels are planning the sinking of deep wells to supply water for the mills and boilers.

Decade of Mining Operations at Commerce, Okla., is marked by the renewal of the leases on the Emma Gordon tract recently. Emma Gordon became of age Sept. 4, 1907, and at once received her allotment of 160 acres right at Commerce. A lease upon the tract for 10 years was obtained by G. W. Bingham, of Miami, and A. H. Hatton, of Webb City, and after a hard fight with water, the tract has been a steady producer. Miss Gordon subsequently married an employee of Mr. Hatton, and it is as Mrs. Hiram McBee that she regrants the leases to the active companies on the tract, which include the Miami Lead and Zinc; Standifer Brothers, who are operating the old Emma Gordon mill; the old Prairie mine, operated now by C. Dawson, trustee; Haynes Mining Co., with two mills; and Worley & Co., who operate a tailing mill. The new lease, which was signed Sept. 4, extends for another 10 years.

Waco-Lawton Field, northwest of Joplin, is being extensively developed. There are only two mills now operating in the new part of this field, about two miles north of Lawton, Kan., and a mile west of Waco, Mo., but two others are being built while mill sites have been drilled out for eight more, which will be erected in the near future. The exceptional richness of the ore and extent of the ore face at the Waco Mining Co.'s property, where the mill was only recently placed in operation, has served to stimulate interest in the field. It was announced that C. H. Plumb and Edward Wilkins of Joplin, together with Oklahoma investors who were interested in the now highly successful Welsh mines at Century, Okla., have secured leases on 560 acres in the Waco-Lawton field and will carry on the most extensive drilling campaign the camp has yet seen. Plumb drilled out a number of the richest of the Oklahoma mines, including the Montreal, in which he is part owner, the Bilharz, the Kitty and the Veilie properties. Leases in the Waco-Lawton field are at a premium and it is believed the section will rival the Oklahoma field to a degree at least. Some good ore recoveries are being made as shallow as 145 ft., but the best runs are at a depth of about 300 ft. There will be some water to beat, but it is not expected to be exceptionally bad.

Activity in Extensions of the Field continues despite the unattractive ore market. J. Frank Haley, of Joplin, has announced the sale of leases on 1000 acres south of Miami, Okla., and 2500 acres, four miles west of Picher, Okla., to Tulsa and Cherryvale oil men for $30,000. Both tracts are in "wildcat" territory, but a small amount of drilling has shown some ore. An effort is to be made to develop a new field about five miles southwest of Joplin and extending almost to Lincolnville. M. H. Evans, of Joplin, and associates have leased 520 acres in this section and have subleased 440 acres with contracts for doing 9000 ft. of drilling. The development of the Lawton-Waco field continues and a good strike was reported this week two miles northeast of Waco, in new territory. Two miles west of the old Badger mines, in Cherokee County, Kan., much prospect drilling has indicated good orebodies. Five fine drill strikes have been made and 20 drill rigs are at work in a radius of two miles. Cosden, Curtis and Aiken Co., of Tulsa, which bought out the Admiralty Zinc Co.'s properties at Century, Okla., some time ago, is steadily transferring its interests from the sheet-ground field at Webb City to the new Oklahoma field. It will move the McDonald mill south of Webb City to Tar River soon. Its Red Bird mill has been shut down and will be sold or moved to Oklahoma, and its Queen Esther mill alone is now operating but will be closed down soon. W. B. Shackelford, of Carthage, is manager for the Tulsa oil operators, and frankly says there is small inducement to continue operations in the sheet-ground field at present ore prices.

TORONTO—Oct. 6

Canada Copper Co., in the development of their property at Copper Mountain, B. C., will involve an expenditure approximating $6,000,000 in the Southern Okanagan and Similkameen Valleys. In addition to the $2,500,000 which the company proposes to spend on opening up the mine on an extensive scale, the Kettle Valley Railway Co. will build a branch line from Penticton to Copper Mountain, through 14 miles of mountainous country, to provide ore transportation facilities at a cost of about $1,000,000. Power will be provided by the Kootenay Power Co., which will spend $2,500,000 in the construction of a high-tension power line from the end of its boundary system near Greenwood west to Copper Mountain.

Industrial and Scientific Research in Canada has received a further impetus by the action of the Canadian House of Commons, which has voted the sum of $91,600 for the recently established Bureau of Industrial and Scientific Research. Dr. McCallum, chairman, will devote his whole time and receive a salary of $10,000, the others giving their services gratuitously. It is proposed to select university students, allowing them $600 for the first year, and $750 the second year Subsequently they may either continue their investigations in college or be transferred to industrial establishments. In this connection the University of Saskatchewan will undertake an investigation into the commercial possibilities of the Western coal fields.

EL PASO—Oct. 8

American Mining Companies in Mexico will be compelled to shut down according to a statement of an official of the American Smelting and Refining Co. unless the Carranza Government alters its attitude or the United States lifts its embargo on gold shipments. The Federal Reserve Board issued circulars to the effect that it will receive applications for arranging to supply amount of gold necessary for American companies to pay operating expenses in Mexico, and will allow the re-exportation of gold into Mexico during October, to give the Carranza government a chance to modify its order regarding the exportation of gold and silver. According to this order, reëxportation of refined gold taken out as bullion or concentrates must be made within 10 days. In the case of the A. S. & R. it requires 120 days for gold bullion to go through the refinery. It is also provided in the order of the Mexican government that 25% of the value of silver shipped out must be returned in gold. The State and Treasury Departments and Federal Reserve Board have taken the matter up with the Mexican government and it is thought possible that some favorable solution may be arrived at. It is believed that the Carranza order is designed to compel the United States to remove its embargo on gold. Professor Kemmerer, of Princeton University, is at present in Mexico endeavoring to work out a plan for silver coinage of Mexico.

The Mining News

ALABAMA

Calhoun County

SOUTHERN MANGANESE CORPORATION (Anniston)—Operating seven electric furnaces, making ferromanganese. Theodore Swann, president and manager. Main office, Birmingham, Ala.

Jefferson County

ALABAMA CO. (Gate City)—At Hammond Mine sinking its slope on Irondale seam at 2000-ft. depth. Seam is 6 ft. thick.

GULF STATES STEEL CO. (Gadsden)—A. L. Conner, works manager, announces bonus of 10%, effective Oct. 1, making bonuses 40%. Will affect about 3000 men

WOODWARD IRON CO (Bessemer)—On Oct. 1 employees' wages will be raised 10%, being third raise this year, affecting about 10,000 men. All plants operating to capacity.

ALASKA

KENNECOTT (Kennecott) — Production of copper for September amounted to 7,100,000 lb., compared with 7,148,000 lb. in August.

ALASKA GASTINEAU (Thane) — Reports fail to show any improvement in ore grade; decrease in tonnage due to labor shortage Ore recovery in August averaged 99.4c per ton against 98.5c. in July and an average yield of $1.15 per ton treated during preceding 2½ years.

ARKANSAS

Boone County

ARKANSAS-MISSOURI (Zinc) — Prospecting on two properties near Tar Kiln mine and Madison. Chas. La Vassuer, in charge.

PHILLIPS (Yellville) — Idle last year, resuming operations again.

GREAT EASTERN, ROZELLE (Yellville)—Located in Hall Mountain camp, started operations. A. J. Mossman, in charge.

LONNIE ROY (Rush)—Owned by Zimmermann and Schofield and associates. Development work in progress and small plant will be built this autumn.

BIG BUCK (Yellville)—Owned by Elmer Owens and associates. Developing lead orebody. Face opened up 40 ft. wide and 8 ft. deep.

ARIZONA

Maricopa County

MANGANESE DEPOSIT discovered southwest of Sentinel in Eagle Tank Mountains; ore reported to contain 44% Mn. J. D. Peggs, of Tucson, locator.

Mohave County

RATTLESNAKE (Chloride) — Recently shipped two cars of ore from 750-ft level.

NEW MOWHAWK (Chloride)—Opening up high-grade ore in both shafts and shipping. Operating the Puzzle and Moose.

SCHENECTADY (Chloride)—Commercial ore 3 ft. wide opened in south drift on 175-ft level. Plans to install electric hoist and pumping plant.

TOM REED (Oatman)—Bullion production for first half of September was over $31,000 and expect about same during last half. Aerial tramway expected to cut operating cost 10c. W. B. Phelps, mine superintendent.

Navajo County

APACHE R.R. CO. (Holbrook)—State Corporation Counsel granted permission to issue $1,000,000 bonds to build first 20 miles of road from here into Black Mesa Forest region Road will be 71 miles long when completed and open important bituminous-coal deposits.

Pinal County

PINAL DEVELOPMENT (Kelvin)—Development in winze continues to open up good ore; shipping.

TROY-ARIZONA (Kelvin)—Fire recently destroyed building at pumping plant which supplies town with water. Loss was slight.

MAMMOTH (Mammoth) — Shaft-house and other surface buildings destroyed by fire entailing loss of $10,000 on Sept. 28. Mill shut down until temporary hoisting equipment installed.

HERCULES (Kelvin)—First unit o pumping plant to supply concentrator ha arrived. About 60% of concentrator equip ment is on ground

SILVER BELLE (Price)—Taken ove by Arizona Hercules interests and will be gin shipping at once. Tonnage of lead silver ore opened up.

U. S. VANADIUM (Kelvin) — Groun broken for 50-ton concentrator to be buil by Minerals Recovery Co., of Denver. Spu to be built on Arizona-Eastern at Erma to facilitate transportation.

Santa Cruz County

ARIZONA EUROPEAN MINING CO (Nogales)—Tunnel driven 100 ft. and shaf 60 ft. below tunnel level. Ore carries cop per, silver, and gold; 8 to 12 in. hig grade and 8 in. low grade. James Ritchie formerly with R.R.R. mine, superintendent Manuel Escalada, president; W. Schuck mann, treasurer.

Yavapai County

BLUE BELL (Mayer)—Drifting on 1200 ft. level to find orebody developed on 1000 ft. level with considerable chalcocite.

GREEN GULCH COPPER (Crown King —O. L. Haberbush, in charge of propert recently taken over by syndicate in El Pas

VENTURE HILL (Jerome)—Operatio resumed under E. L. Bartholomew. Sha will be sunk 65 ft. to depth of 400 ft. belo tunnel level or a total of 665 feet.

JEROME COPPER (Jerome)—Four-dri compressor, brought from Oatman in ope ation. Two shifts working Formerly wi the Ewing & Hooker group. T. G. Flyn superintendent.

Yuma County

CACTUS QUEEN (Swansea) — H. Barbee, president and manager gone Kansas City to arrange for purchase machinery and motor trucks. Let contrac for 600 ft. of sinking before departure.

CALIFORNIA

Amador County

SOUTH KEYSTONE (Sutter Creek)—Development progressing from North Star shaft. H. Colpe, manager.

CENTRAL EUREKA (Sutter Creek)—Extensive development expected on 2540-ft. level. Extraction in progress on 2690-, 3425- and 3350-ft. levels. In last level, drifting north and south from shaft for known orebodies. Extracted 8455 tons, yielding $26,168 bullion and concentrates in July and August. Total expenditures amounted to $29,501, including $19,500 actual cost of mining and drilling; other cost included repairs to shaft, tailings dam and flume. Tailings reservoir almost completed.

Butte County

LUCK (Oroville)—Completed installation of 5-stamp mill on this property in Granite basin. Good ore reported.

Calaveras County

GARIBALDI (Oakland) — Permitted to issue 14,400 shares in exchange for claim and to sell shares for development.

Colusa County

CERISE (Willows)—Situated on Sulphur Creek. Mill destroyed by fire, rebuilt. Ore shows $10 gold per ton and amount of quicksilver said to equal milling cost. Large tonnage said to be blocked out. Preparations made to run during winter.

Cantra Costu County

BUTTERS (Martinez) — Reported construction of zinc reduction works by Charles H. Butters, of Oakland, started. Report that Chabot aluminm dust laboratories would be removed from Oakland to Martinez denied. Zinc plant to occupy site of old Peyton Chemical Works.

Eldorado County

CHROME ore shipped from Volcanoville by Warren Green, of Georgetown. Two carloads from Northside in two weeks.

RISING HOPE (Placerville) — Crosscut driven toward lowest part of old channel bed for pay gravel. Nugget recently obtained weighs 1⅜ oz.

Inyo County

CASA DIABLO (Bishop) — Acquired by John M. and C. Taylor, of Chicago.

Nevada County

GOLDEN CENTER (Grass Valley)—Reported good ore carrying gold disclosed on 500-ft. level in vein 2½ ft. wide.

OCEAN STAR (Washington) — Vein is said to be 6 ft. wide and to carry ore averaging $7 a ton. Being developed by Honolulu company. Development by 300-ft. shaft. Former operation through tunnel and ore sent to 20-stamp mill by aerial tram. Company owns power plant on river at short distance. Employing 30 men.

Plocer County

PLACER COUNTY CHROME (Newcastle)—Machinery for new plant being hauled from the railroad to the mine near Lime Kiln. Expected to be immediately installed. R. H. Farmer, owner.

San Bernardino County

FRANC COPPER MINING CO. (Los Angeles)—Permitted to sell 427,500 shares capital stock to Dan Murphy for $15,000 cash. Mine in Kelso district.

San Diego County

INTERNATIONAL MAGNESITE CO. (Chula Vista)—Has chartered several steam schooners to bring raw material from Magdalena Bay, Baja California, to San Diego. Planned to import 1500 to 2000 tons per month.

Shasta County

LITTLE NELLIE (Redding)—Resumed operation after shutdown of two years. During that period diamond drills employed prospecting copper-bearing lenses. More than 30 holes drilled, with average depth of 800 ft. Result shows sulphides of 2 to 7% copper. The 15-stamp mill running on gold ore. Copper ore will be shipped to Mammoth smeltery at Kennett.

Siskiyou County

HAPPY CAMP DISTRICT activity renewed by completion of Copco dam on Klamath River for conserving water in reservoirs for mines. Placer locations being made for distance of 120 miles along the Klamath, from the confluence of Shasta River to Orleans Bar. Bears Copper mines on Indian Creek being developed, with Frank Swearingen, superintendent. Crumpton-Maddux opening good copper prospects; will work during winter. Tebbe copper mines, south of Indian Creek, doing assessment work. Davis Consolidated placers, largest in district, will resume work at once. Boorse, Green and Duck copper holdings will start work under contract with James B. Nesbit. Chrome being shipped from Callahan; 10 carloads was output last summer. Salmon River Mining Co. arranged for development of new ground and increasing number of workmen; ditches and flumes repaired and water system improved. O. H. Poor, superintendent. Bonally placer claims sold to Forks of Salmon Mining Co.

COLORADO

Boulder County

ST. JOE (Boulder)—This old Gold Hill mine will be reopened. Lead-zinc producer in past.

SLIDE (Boulder)—Mill operating satisfactorily. Flotation used; dump material being treated.

NEW SILVER STRIKE northwest of Carribeau Hill made recently. Stated ore shows good silver contents and 40% lead in 10-ft. discovery shaft.

Clear Creek County

HUDSON MILL (Idaho Springs)—New flotation unit being installed.

JACKSON MILL (Idaho Springs)—Plant running to capacity. Custom ore from Idaho Springs, Georgetown, Silver Plume and Central City being treated.

PRIMOS CHEMICAL CO. (Empire)—Contract let to drive 2000-ft. tunnel to cut 600 ft. under present workings at Camp Boericke molybdenum property.

Gilpin County

GOLD LODE (Central City)—Lease and bond taken. Shaft, orehouse and machinery overhauled.

GEIGER EXTENSION (Apex)—Development under way on this Michigan Hill property. Crosscut tunnel being driven to cut vein.

Lake County

ROBERT E. LEE (Leadville) — This Fryer Hill property shipping 40 tons silver ore daily. Produced zinc carbonate ore until recently; metal price caused change.

MATCHLESS (Leadville) — Long term lease secured. Shaft will be retimbered to its depth of 250 ft., and then sunk to second contact. Large producer in past. H. A. W. Tabor formerly interested.

Ouray County

CAMP BIRD (Ouray)—New tunnel in 7100 ft.

PAYMASTER (Ironton) — Lessees shipping copper-silver ore.

SARATOGA (Ironton)—Stated mine will be reopened by Boston men. Oxidized surface ore carrying gold and silver underlain by heavy pyrite ore. Mill remodeled three times in past but never obtained economical treatment of ore. Price of silver incentive to new operations.

Pueblo County

NORCROSS CHEMICAL CO. (Pueblo)—Will erect 50-ton sulphuric acid and 25-ton nitric acid plant to be known as Zurcher unit. Has secured 120 acres of land and contracted with Pratt Engineering and Machine Co., of New York, for construction of buildings.

Saguache County

RAWLEY MINING CO. (Bonanza)—Contracted with Colorado Power Co. for 900 hp. of service for Shirley mill; power company reconstructing Salida plant and installing new turbine to handle additional load. Let contract to American Steel and Wire Co. for aerial tram seven miles long from mine to new mill at Shirley on D. & R. G. R.R.; capacity, 80,000 lb. ore per hour, in 6-cu.ft. buckets carrying 800 lb.

San Juan County

COLUMBUS (Animas Forks) — Driving crosscut tunnel to cut vein at 700-ft. depth.

BELCHER (Silverton)—Reopened by lessees. Good-grade copper-silver ore shipped.

NORTH STAR MILL (Silverton)—Operating steadily on Silver Lake ore and custom ore from Silverton and Red Mountain.

PLATA REY (Chattanooga)—First shipment silver-lead ore made. Leasing company operating Margie and Silver King claims of Telescope Mining Co. Development under way.

San Miguel County

MODENA (Telluride)—Shipping to Durango smeltery. Under development by lessees.

STANDARD CHEMICAL CO. (Placerville)—Shipping carnotite ore from Paradox Valley. Hauled in wagons to railroad at Placerville.

Teller County

BLUE FLAG GOLD (Cripple Creek)—At annual stockholders' meeting elected J. F. Eresman, president and general manager; J. J. Gunnell, vice-president; J. S. Pigall, secretary and treasurer. Recently resumed operations on Blue Flag, sinking main shaft from 1100- to 1400-ft. level. O. W. Bevan, superintendent.

JERRY JOHNSON (Cripple Creek)—Development on 650- and 750-ft. levels by Caley & Caley, lessees. A 2- to 4-in. streak of high-grade gold ore opened on 650-ft. level. Drift will be advanced on 750-ft. level to cut downward extension of this oreshoot.

IDAHO

Shoshone County

GIANT LEDGE (Murray)—Constructing 150-ton mill, with view to later doubling capacity. Lead orebody developed in shaft at 200 and 400-ft. levels.

CARNEY COPPER (Mullan) — Carload from tunnel No. 1 showed 6.19% copper. Crosscut from No. 3 tunnel being extended to cut ore shoot 350 ft. below No. 2. Will continue work all winter.

LOMBARDY MINING CO. (Kellogg)—Consists of 15 claims being surveyed for patent, lying one mile north of Kellogg. Completed 200-ft. shaft and drifting started. Orebody uncovered on tunnel level. Hoist, compressor and 16-cu.ft. skip already installed. Peter Albinola, president; H. O. Bemis, manager.

MISSOULA COPPER MINING CO. (Mullan)—Diamond drilling property since Sept. 10. Option formerly held by Snow Storm Mining Co. given up after expending $35,000 in opening up copper ore for 300 ft. but too low grade to warrant payment of $600,000 for property. Fault cut off orebody and then worked to east to find extension. Present operators believe orebody may be found to west.

MARYLAND

CHROME and MAGNESIA DEPOSITS being opened at Owings Mills in Baltimore County by J. H. Buxton, Jr., mining engineer. Reported chrome ore runs 45% and magnesite 38 in. wide of high quality. Using steam with electricity for lighting but expect to secure power later from Baltimore. Property prospected during last year. Expects to get out 40-ton carload daily within three months.

MICHIGAN

Copper

BEAR LAKE "POOL" (Calumet)—Diamond drilling stopped; entered soft ground, where caving occurred; will ressume soon.

LA SALLE (Calumet)—Back partly into Osceola lode of Osceola 45th level, with same high grades over 2900 ft. in from Osceola shaft No. 6.

OLD COLONY-MAYFLOWER (Houghton)—Two boilers from Elm River shipped to Old Colony-Mayflower plant. Remainder of plant being scrapped.

CALUMET & HECLA (Calumet)—Second unit in the leaching plant at the mills at Lake Linden being installed rapidly. New turbine installation progressing slowly.

RICHMOND (Adair)—Ore delivered to Milwaukee R.R. at Adair by aërial tramway. Is shipped crude, averages 6% copper and $1.50 gold. August shipments averaged carload per day.

NEW BALTIC (Houghton)—Drifted 20 ft. on new 8-ft. lode, 12 ft. west of shaft in good copper. May be New Arcadian lode; crosscut being driven to determine, but difficult as there are many lodes and it is 3000 ft. from New Arcadian shaft, the only other opening.

MINNESOTA

Mesabi Range

COOPER (Keewatin) — This property south of Bray mine being check drilled by Carlson Drill Co., of Hibbing, for M. A Hanna & Company.

DUNWOODY (Chisholm)—Controlled by Tod-Stambaugh interests, shipped 280,000 tons and will continue until navigation closes. Crews will then remove taconite rock in pit

NORTH UNO (Hibbing)—Operated by Hanna Ore Co. Tearing out gasoline hoist installed few years ago and replacing by electrically operated one: current from Great Northern Power Company.

SCRANTON (Hibbing)—Let contract to Winston-Dear Co. for stripping. Unable to get equipment so will not work till next spring. Overburden will be hauled several miles south of site just purchased for this dump. Pickands Mather Co., operators.

NEWPORT MINING CO. (Grand Rapids)—With another operator has taken six months option lease on several properties. Formerly leased by the Oliver Iron Mining Co., who withdrew when they dropped Great Northern and other properties after having proved up ground. Later leased by Interstate Iron Co., who quit at outbreak of war owing to unsettled conditions. Two drills now on property.

MISSOURI

Joplin District

J. P. CLARK. (Mexico, Mo.)—Purchased for $50,000 a 10-acre lease in Oklahoma just south of Baxter Springs, on Bingham land. Tract has good drill record.

KANOAK METAL (Picher, Okla.)—Building 350-ton mill south of Picher, on proved lease. A. M. Gaines, Joplin, general manager.

REPUBLIC (Tar River, Okla) — Will build mill on lease in Tar River. Shaft down and in ore. Headquarters, Miami, Okla. H. E. Huttig, manager.

GOLDEN EAGLE (Baxter, Kan.) — Building 350-ton mill south of Kansas-Oklahoma line, northeast of camp of St. Louis. To be steam plant with usual equipment.

CARTHAGE (Carthage)—Incorporated with $32,000 to develop recent lease, northeast of Picher, Okla. Charles Turner, Joplin, and Emma Knell, Carthage, principals.

VACATION (Joplin)—Opening up old mine, two miles east of Duenweg. Extensive drilling campaign shows ore. Mill will be erected. W. O. Cragg and A. W. Canada, of Joplin, managers.

L. P. BUCHANAN (Joplin)—Bought for $75,000 lease of Acme Mining Co. at Lawton, Kan., and will sink shaft from 150-ft. level to 250-ft. and replace 150-ton mill now on tract with 400-ton plant. Also during past week purchased for $70,000 lease just north of Beaver mine, west of Picher, Okla., from E. M. Meirs, of Salina, Kan. Shaft down to 250 ft. will be sunk deeper immediately and 400-ton mill built.

MERRILL (Baxter, Kan.)—Completing plant north of Quapaw, Okla. The 350-ton mill has three seven-cell rougher jigs and seven-cell cleaner and five-cell sand jig; power furnished by Fairbanks-Morse oil engines, first in the district; sludge department of 18 tables; Dorr thickener and classifier; regrinding rolls and 90-in. classifying screen. Has built club house and a 40-room hotel for workers. Has leased 120 acres and will build several more mills when this is in operation. W. E. Merrill, principal owner and general manager.

MONTANA

Cascade County

NEIHART DISTRICT silver properties, inoperative for last 15 years due to low price of silver, being reopened by C. D. McLure of Philipsburg, present owner. To clear up arrear taxes, county officials ordered treasurer to accept total of original tax, amounting to $6798.

Beaverhead County

ELKHORN DISTRICT RAILROAD route will soon be graded and ready for tracklaying. Road will be narrowgage due to impossibility of securing standard rails. Will cross Wise River near Churchill ranch, above Dewey, and then follow river up to Elkhorn mines.

Silver Bow County

CLARK-MONTANA REALTY (Butte)—Hearing of injunction asked against Butte & Superior ordered by Federal District Court continued from Oct. 19 to Nov. 12.

CORBIN INDEPENDENT MINING CO (Butte)—Filed articles of incorporation with county recorder, Oct. 1. Capitalization, $100,000. Directors are August Bechtold, Gust Schultz and Oscar Lang.

ANACONDA (Butte)—Rather than continue all Butte mines with crews below normal, closed Diamond and Rarus mines on Oct. 9 and transferred Diamond crew to the Mountain Consolidated to bring production in latter almost up to normal. Rarus crew transferred to Mountain View pending completion of repair work in Rarus shaft. The result will be that two mines are working normally instead of four with sub-normal crews. Present output averages 11,000 tons ore a day and expect to reach normal Oct. 31. Sale of Alice property to company upheld by court.

NEVADA

Humboldt County

NEVADA PACKARD MINES CO. (Packard, via Lower Rochester)—Equipped with 100-ton cyanide plant. H. G. Thompson, general superintendent.

Mineral County

CALAVADA (Luning)—Opened oxidized orebody on 1000- and 1100-ft. levels on contact of monzonite and limestone. Extensive work done in last three years and considerable ore shipped. Sulphide ore with precious metal contents on fault contact on 1000-ft. level. Ore will be shipped to Mason Valley smeltery. H. A. Geisendorfer, in charge.

Nye County

TONOPAH ORE PRODUCTION for week ended Sept. 29 amounted to 9519 tons, valued at $166,582, comparing with 9388 tons the previous week. Producers were: Tonopah Belmont, 2454 tons; Tonopah Mines, 2550 tons; Tonopah Extension, 2380 tons; Jim Butler, 850 tons; West End, 1095 tons; Rescue, 127 tons; Midway, 63 tons.

TONOPAH EXTENSION MINING CO. (Tonopah)—Receipts from operations for August amounted to $113,914; current expenses, $84,855; operating profit, $29,058.

WHITE CAPS (Manhattan)—East orebody exposed on fifth level. Hanging wall side first struck by south crosscut. After drifting 25 ft. along vein, course changed to cut ore at right angles and so far no sign of foot wall.

MANHATTAN CONSOLIDATED MINES DEVELOPMENT CO. (Manhattan)—Cutting fourth station, timbers all in and lateral work from fourth level started. Pump for third-level seepage into shaft installed at fourth level and 15-ft. sump below level. Third level south crosscut driven to strike downward extension of free milling orebody explored west and south of present working shaft. Fourth level east drift being made to strike east orebody developed at 200- and 300-ft. level, should encounter according to survey 250 ft. from shaft.

NEW MEXICO

Grant County

LAWRENCE (Lordsburg)—Drifting by contract with Trendt & Hughes from No. 2 shaft to connect with No. 1 and No. 3. Will erect mill. I. T. Dewey, manager.

EIGHTY FIVE (Lordsburg)—Constructing mill to use flotation process. Dam being built near power house for mine water. Grading for spur from Arizona and New Mexico R.R. J. W. Crowdus, in charge of construction. A. J. Interrieden, general manager.

Otero County

SACRAMENTO COPPER CO. (Tularosa)—Churn drilling on property.

TWIN BUTTES COPPER CO. (Tularosa)—Filed articles of incorporation at Santa Fe, Sept. 21. Capitalization, $2,000,000. R. L. Davenport, Tularosa, agent.

Sierra County

KINGSTON, HILLSBORO AND LAKE VALLEY DISTRICTS, stimulated by high silver price. Producers in past.

Santa Fe County

SANTA FE GOLD DREDGING CO. (Golden)—Expects to begin operations by December. Employing 50 men.

OREGON

Josephine County

GREENBACK (Grants Pass)—Fire at this gold mine destroyed tool house; supposed that cause was tree falling on power wire making short circuit. Operators using hand drills until power is advanced. F. F. Childers, manager.

SOUTH DAKOTA

Custer County

PRINGLE QUARRY (Pringle) — Shipments of limestone being made to plants of Western Sugar Beet Co.

SPOKANE LEAD AND SILVER (Custer)—Work started on erection of concentrator for low-grade lead-silver ores. High-grade ore being shipped to smeltery.

CRAWFORD MICA MINING AND MILLING (Custer)—Work resumed at Old Mike mine and new oil engine and compressor installed. One car of mica shipped to Chicago and will make regular shipments of one car per week.

UTAH

Beaver County

MILFORD COPPER (Milford)—Full force employed and developing considerable tonnage. Work on new railroad spur progressing, about half the grading completed. Expect to reach 200-ton output per day shortly, at present producing 80 to 90 tons.

Juab County

DESERT MOUNTAIN (Tintic)—Main vein tapped on crosscut from new shaft on 300-ft. level. Drifts will be run north and south on 300 ft. level and every 100 ft. thereafter. Level stoping will be done when this work is completed.

Tooele County

POTASH BRINE in area near southwest end of Great Salt Lake, at Grant, is being worked by the Diamond Match Co. Plant installed to treat the brine obtained from dry sink. In operation, but details of output not available. Brine reported to be low in potash but free from objectionable associations.

CANADA

British Columbia

CONSOLIDATED MINING AND SMELTING COMPANY OF CANADA (Trail)—Operating three copper furnaces, smelting 1000 tons of ore per day, most of which supplied by Rossland mines. Coke supply improving. J. Buchanan, smeltery superintendent.

New Brunswick

COPP COPPER MINE (Midway, Albert Co.)—Henry A. Copp and Sons gave option on property to J. D. Hubbard, of Chicago, representing a syndicate. Price is $750,000, option running nine months while prospecting property. Owners to receive 25% of returns from ore shipped. Stated ore carries high percentage copper and veins are of some length.

Ontario

SILVER QUEEN (Cobalt)—Leased and shipping.

LAKE SHORE (Kirkland Lake)—Constructing 75-ton mill.

BOSTON HOLLINGER (Boston Creek) Installing development plant.

KIRKLAND PORPHYRY (Kirkland Lake)—Offering of 100,000 shares for development oversubscribed.

ASSOCIATED GOLD FIELDS (Larder Lake)—Main shaft on Maxwell side of property down 430 ft. Mill to be enlarged.

TEMISKAMING (Cobalt) — Considering flotation treatment of old tailings, estimated to contain over 600,000 oz.

SCHUMACHER (Schumacher) — For month ended Sept. 15 treated 3400 tons, recovering $23,000 of bullion.

BEAVER (Cobalt) — Statement quarter ended Aug. 31 shows cash on hand, $49,972; ore and bullion and due from smelters, $158,477.

CROESUS (Munro Township) — Water difficulties overcome. Developing on lower levels. Milling operations again normal, heads running $40 per ton.

McINTYRE (Schumacher)—Only Porcupine mine showing gain for last year. Report for 15 months ended June 30 shows $840,554 profit.

CANADIAN KIRKLAND (Kirkland Lake)—Shaft on No. 2 vein down 25 ft.; vein is whole width of shaft and assays show gold content. Will sink to depth. No. 1 vein uncovered for about 400 ft. and good surface showings encountered.

MEXICO

LABOR TROUBLES occurred in Tampico oil fields when employees of Aguila Oil Co. refused to work, demanding a 50% increase in wages. The government instructed Governor General Ricaut to take precautions to avoid disorder. I. W. W. and German agents reported to have instigated strike. [Later—Dispatches dated Oct. 9 report strike settled and men promised to return to work immediately. Governor Ricaut present with strong force of troops.]

CIA DU BOLEO (Santa Rosalia, Baja Calif.)—Production for August amounted to 1,433,040 lb. of copper. Average grade was 3.23%.

HERMOSILLO COPPER CO. (Sonora)—Incorporated in Mexico with $1,500,000 capitalization, being reorganization of Verde Grande Copper Co. Shipped ore for test to flotation-machinery manufacturers. Main office, Columbus, Ohio. J. L. Zimmerman, president.

NICARAGUA

GRECIA MINES CO. (Leon)—This gold-silver mine is being operated by the Butters Salvador Mines interests. Supplies brought in through port of Corinto, by rail to Leon, thence by trail to mine.

SALVADOR

BUTTERS SALVADOR MINES (San Sebastian)—Recently paid first liquidation dividend; ore reserves about exhausted but small additional discoveries have extended life of mine somewhat. Has operated about 15 years. British company began paying dividends in 1902-3; operation highly profitable; reorganized as Canadian company in 1912. Stockholders receiving shares in the new Grecia mine in Nicaragua. Affiliated Divisadero company not operating at present, owing to power difficulties.

CHILE

BRADEN (Sewell)—Production of copper for September amounted to 5,318,000 lb. comparing with 4,512,000 lb. in August or an increase of 836,000 lb.

PERU

CERRO DE PASCO (La Fundición)—Production of copper for September amounted to 7,041,000 lb., comparing with 6,036,000 lb. in August. September output establishes a new high record.

The Market Report

SILVER AND STERLING EXCHANGE

Oct.	Sterling Exchange	Silver		Oct.	Sterling Exchange	Silver	
		New York, Cents	London, Pence			New York, Cents	London, Pence
4	4.7530	92⅛	46¾	8	4.7525	90⅛	45¾
5	4.7525	91⅛	46¼	9	4 7525	89⅝	45½
6	4.7525	90⅝	46	10	4.7525	88⅞	45⅛

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

DAILY PRICES OF METALS IN NEW YORK

Oct.	Copper	Tin	Lead		Zinc
	Electrolytic	Spot.	N. Y.	St. L.	St. L.
4	*23½	60¾	7⅝ @8	7.60 @7 90	7⅞ @8⅛
5	*23½	60¾	7⅝ @8	7 60 @7 90	7⅞ @8⅛
6	*23½	60¾	7⅝ @8	7 60 @7 90	7⅞ @8⅛
8	*23½	61¼	7⅜ @7⅝	7⅜ @7⅝	7.80 @8 00
9	*23½	61	7⅜ @7⅝	7⅜ @7⅝	7.80 @8 00
10	*23½	61	7⅜ @7⅝	7⅜ @7⅝	7.80 @8 00

* Price fixed by agreement between American copper producers and the U. S. Government, according to official statement for publication on Friday, September 21, 1917.

The above quotations (except as to copper, the price for which has been fixed by agreement between American copper producers and the U. S. Government, wherein there is no free market) are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

The quotations for electrolytic copper are for cakes, ingots and wirebars.

We quote electrolytic cathodes at 0.05 to 0.10c. below the price of wirebars, cakes and ingots.

Quotations for spelter are for ordinary Prime Western brands. We quote New York price at 17c per 100 lb. above St. Louis.

Some current freight rates on metals per 100 lb. are: St. Louis-New York 17c.; St. Louis-Chicago, 6.3c.; St. Louis-Pittsburgh, 13.1 cents.

LONDON

Oct.	Copper			Tin		Lead	Zinc
	Standard		Electrolytic				
	Spot	3 Mos.		Spot	3 Mos.	Spot	Spot
4	110	110	125	245½	243	30½	54
5	110	110	125	245¾	243½	30½	54
6							
8	110	110	125	244¾	243¾	30½	54
9	110	110	125	244½	242½	30½	54
10	110	110	125	244½	244	30½	54

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2,240 lb. For convenience in comparison of London prices, in pounds sterling per 2,240 lb., with American prices in cents per pound the following approximate ratios are given, reckoning exchange at $4.75½. £30½ = 6.474c.; £54 = 11.462c.; £120 = 25.473c.; £137 = 29.082c.; £240 = 50.946c. Variations, £1 = 0.212277c.

Metal Markets

NEW YORK—Oct. 10

The market generally continued dull. The outstanding features were the pronounced weakness of lead and a decidedly softer tone in spelter. Conditions in the copper business continued chaotic, but the Committee of Producers is working to develop a practicable system for carrying on business, and is receiving general coöperation.

Copper, Tin, Lead and Zinc

Copper—Government specifications were slow in coming forward, and therefore, in spite of a substantial requisition by the Allies, the Committee of Producers thought that they could release some copper to domestic manufacturers, and did so. The effort of the Copper Producers' Committee is to supply domestic manufacturers with all the copper that is possible and is necessary to maintain the supply of essential articles into which copper enters. The committee hopes that it is going to be able to supply enough to keep the wheels going.

Copper Sheets are quoted at 35c. per lb. for hot rolled, and 1c. higher for cold rolled. Wire is quoted nominally at 31c. per lb., f.o.b. mill.

Tin—This market was rather quiet, but a fair amount of business was done from day to day. At the close, Straits tin was quoted at 61c. and Banka at 59¼@59½c.

Imports of tin and terne plates into the United States for the fiscal year ended June 30, 1917, were only 1,370.462 lb., being 425,391 lb. less than in 1916, and 47,507,485 lb. less than in 1915. Exports for the year were the largest ever known, being 521,861,390 lb., against 516,257,463 lb. in 1916, and 105,899,762 lb. in 1915.

Lead—This market was distinctly weaker, the metal being offered at 7½c., New York, with some round lots reported sold at about that figure. The transactions reported for the week aggregated a fairly large tonnage, the bulk of which was represented, however, in relatively few transactions.

Our Washington correspondent reported, under date of Oct. 10, that the Government has arranged with the lead producers that the settling price on Government business for lead for October shall be the St. Louis price quoted by "Engineering and Mining Journal," subject, however, to a maximum of 8 cents.

Zinc—A fair volume of transactions in 100-ton lots was done during the week. During the first three days practically all the business reported was at 8c., but in the latter part offerings at that price became so free that other sellers reduced their price.

Zinc Sheets—Price of zinc sheets has not been changed. Market is still at $19 per 100 lb. f.o.b. Peru, Ill., less 8% discount.

Other Metals

Aluminum—This metal continues weak and dull, though stocks are light. We quote 40@41c. for small lots of No. 1 ingots at New York.

Antimony—Extremely dull and slightly weaker. We quote 15@15¼c. for spot. The quotation for futures is rather nominal at 15c., c.i.f., in bond.

Bismuth—Unchanged at $3.50 per pound.

Cadmium—This metal is quoted at $1.45 @1.55 per pound.

Nickel—Steady at 50c. per lb., premium of 5c. per lb. for electrolytic.

Quicksilver—A decline in the market has not stimulated buying. Some sales were made at $100, which we quote as the market. San Francisco reports by telegraph $102.50, barely steady.

Gold, Silver and Platinum

Silver—This market has been a receding one owing to the absence of buyers on China account. Shipments to London direct continue light, as so much has been placed ahead, and deliveries here are to fill old contracts. The market closed at 88⅞c. in New York.

Mexican dollars at New York: Oct. 3, 71c.; 4, 70c.; 5, 69c.; 6, 68⅜c.; 8, 68¼c.; 9, 68c.

Coined silver in the United States on Sept. 1 is reported by the Treasury Department as follows: Standard dollars, $568,270,061; subsidiary coins, $200,837,387; total, $769,107,448. Of the dollars $473,468,062 are held in the Treasury against silver certificates outstanding.

Platinum—A fair business was reported at $103@105.

Palladium—We quote $115@125.

Zinc and Lead Ore Markets

Joplin, Mo., Oct. 6—Blende, per ton, high, $76.15; basis 60% Zn, premium $75@70; medium to low, $67.50@60; calamine, per ton, basis 40% Zn, $38@35; average selling price, all grades of zinc, $62.92 per ton.

Lead, high, $90; basis 80% Pb, $90@80; average selling price, all grades of lead, $86.94 per ton.

Shipments the week: Blende, 7890 tons; calamine, 272 tons; lead, 1129 tons. Value, all ores the week, $611,760.

Electric-power troubles have caused all mines using electric power to reduce use of current one-third, with a number of most recent contracts temporarily suspended. Low water and disabled generators are given as the cause. The hydro-electric company is getting in position it was a year ago. In accepting new contracts, prior to the installation of increased power equipment, the overloaded plant has given away. This will operate to lower production about 25% for several weeks.

Platteville, Wis., Oct. 6—Blende, basis 60% Zn, $67 base for premium ore down to $62 base for medium grade. Lead ore, basis 80% Pb, $80 per ton. Shipments reported for the week are 3704 tons of zinc ore, 28 tons of lead ore, and 813 tons of sulphur ore. For the year to date the figures are: 110,971 tons of zinc ore, 5044 tons of lead ore, and 21,703 tons of sulphur ore. Shipped during week to the separating plants, 3468 tons of zinc ore.

Other Ores

Molybdenum Ore—Unchanged at $2.20 per lb. on the basis of 90% molybdenum sulphide.

Pyrites—Spanish lump quoted at 15c. per unit on basis of 10s. ocean freight, buyer to pay war risk, express freight and any duty. Ocean freights are 35s. for northern ports, 40s. for south Atlantic and 42s. 6d. for Gulf ports. Some concessions have been expected in ocean freights for several weeks, but have not yet materialized.

Tungsten Ore—We quote high-grade wolframite unchanged at $23@25.

Tungsten ore production of Tavoy, Burma, for the six months ended June 30 is reported at 1639 tons of concentrates.

Iron Trade Review

NEW YORK—Oct. 10

With the leading iron and steel makers in conference with the War Industries Board, a further announcement of agreed prices may be expected at any moment. What will interest the trade nearly as much as prices, says *Iron Age*, is the extent to which there will be a realignment of basing points and other changes in trade practices. The sweeping recommendations proposed in fixing pig-iron prices at the same figure for all furnaces are conspicuously epochal. Whether finished steel will be quoted at equal figures for Chicago as well as Pittsburgh is a question; it was not, it appears, discussed at the meetings in Washington out of which came the price promulgation on Sept. 24.

New buying in steel is still negligible. With the announcements from time to time of fresh and enlarged Government building programs, the trade is coming to accept the attitude of mills in refusing further commitments for the time being, for, in addition to the direct Government needs, it is recognized that the effect passes through the ramifications of the industry to the provisions of plant extensions and the building of machinery and apparatus. Pig-iron production statistics have shown how difficult it is, with fuel and labor shortage, to increase the basic output.

PITTSBURGH—Oct. 9

Since the beginning of last week the manufacturers in the different branches of the steel trade have been in conference for the purpose of arriving at a schedule of prices to be submitted to the War Industries Board, covering such unfinished steel as billets, slabs and sheet bars and the important finished steel products the prices of which were not fixed at the time of the original agreement. This agreement set bars at 2.90c., shapes at 3c. and plates at 3.25c., while prices for wire products, tubular goods, sheets, etc., were to be fixed in relation to these other finished products. While the manufacturers have not formally met the War Industries Board, in connection with these conferences, they have been furnished some information as to what Washington had in mind and this has resulted in their scaling down some of the prices that it was originally expected to submit. Tomorrow there will be the formal conference between the War Industries Board and the manufacturers. If a schedule is agreed upon between them it will go to the President for consideration. No formal announcement therefore is to be expected for several days at the earliest. The blast-furnace men sent their views to Washington a week ago, covering the matter of differentials between grades as well as differentials between districts, all referable to the basis price originally agreed upon of $33 for foundry, malleable and basic iron at valley furnaces.

Market transactions have been extremely light both in the products for which prices are already fixed and in those for which prices are still to be fixed. With few exceptions producers have cheerfully adopted the prices fixed but as they are already well sold up they are indisposed to sell at this time. There has been little demand, except for small lots for early deliveries, and these could hardly be furnished, irrespective of price.

There has been a marked further decrease in the volume of specifications filed against finished steel contracts, which suggests that the rate of consumption of steel products is decreasing. A fortnight ago a prominent authority predicted that within 60 days orders for 7,000,000 tons of steel would be placed on behalf of the Government and its Allies. Orders thus far have not been much heavier than formerly, and while the 7,000,000 tons will doubtless be placed the time will probably be longer than predicted

Pig Iron—Practically all the blast furnaces assert that they are ready to supply pig iron on the basis fixed, when the pig iron is really needed, but they are reserved about making actual sales when they are already so well sold up, and when they have many contracts at higher prices, for their making sales would encourage the holders of the higher priced contracts to seek a revision or cancellation. Small transactions have occurred, and there appear to be few consumers who are under the necessity of making purchases just at the moment There appears to be a better supply of pig iron than was supposed We quote basic, malleable at the fixed price of $33, valley, and bessemer at the tentative price of $36.30, valley, prices delivered Pittsburgh being 95c. higher

Steel—The rumor now going the rounds of the trade that the manufacturers will submit at Washington prices of $55 for billets and $57 for sheet bars is an old one, it having since been decided to submit lower prices, as there was reason to believe the War Industries Board was disposed to ask for prices below $50 The last billet sale reported was at $60, ten days or more ago

Ferroalloys

Ferromanganese—The market has become practically nominal, because it is expected prices will be set by agreement with the Government at materially lower levels than those recently ruling, about $375 for prompt and $350 for contract

The production of spiegeleisen and ferromanganese in the United States in the nine months ended Sept. 30 was 311,229 tons.

Coke

Connellsville—The Priority Board has ordered a 100% car supply for the Connellsville coke region, this order to take precedence even over the priority order in favor of lake coal This may help production somewhat, but labor is so scarce as to prevent any large increase. Sales at the $6 price are increasing, but are still of relatively small volume, as producers are filling up their contract customers Foundry coke is not selling at all as the differential has not been established and it could be sold only at $6

STOCK QUOTATIONS

N. Y. EXCH.†	Oct 9
Alaska Gold M	3½
Alaska Juneau	2¼
Am.Sm.& Ref.,com	91¼
Am. Sm. & Ref., pf	107
Am. Sm. Sec., pf., A	95
Am. Sm. Sec., pf. B	‡93
Am. Zinc	16½
Am. Zinc, pf	52½
Anaconda	67½
Batopilas Min	1½
Bethlehem Steel	85
Bethlehem Steel, pf.	88
Butte & Superior	21¼
Cerro de Pasco	32½
Chile Cop	16½
Chino	46½
Colo. Fuel & Iron	39½
Crucible Steel	67
Dome Mines	8
Federal M. & S.	14½
Federal M. & S., pf	40
Great Nor., ore ctf.	30½
Greene Cananea	40
Gulf States Steel	91
Homestake	102
Inspiration Con	48½
International Nickel	31½
Kennecott	33½
Lackawanna Steel	79
Miami Copper	31½
Nat'l Lead, com	49
National Lead, pf	102
Nev. Consol	18½
Ontario Min	5½
Quicksilver	1
Quicksilver, pf	1½
Ray Con	23
Republic I.&S.,com.	77½
Republic I. & S., pf	99½
Sloss-Sheffield	40
Tennessee C. & C.	13½
U. S. Steel, com	105½
U. S. Steel, pf	115½
Utah Copper	85
Va Iron C. & C.	56

N. Y. CURB†	Oct 9
Big Ledge	2½
Butte & N. Y.	¾
Butte C. & Z	8½
Butte Detroit	½
Caledonia	.65
Calumet & Jerome	1½
Can. Cop. Corpn.	1½
Carlisle	4
Cashboy	06
Con. Ariz. Sm.	2
Con. Coppermines	8
Con. Nev.-Utah	06½
Emma Con.	¾
First Nat. Cop	2¼
Goldfield Con.	35
Goldfield Merger	‡05
Greenmonster	75
Hecla Min	7
Howe Sound	5
Jerome Verde	1⅛
Kerr Lake	5½
Louisiana	75
Magma	43
Majestic	35
McKinley-Dar-Sa	60
Milford	1½
Mohican	½
Mother Lode	31
N. Y. & Hond	13
Nipissing Mines	8½
Ohio Cop	1
Ray Hercules	3½
Richmond	57
Rochester Mines	48
St. Joseph Lead	17½
Standard S. L.	⅝
Stewart	⅜
Success	14
Tonopah	6
Tonopah Ex	2
Tribullion	1
Troy Arizona	15
United Cop	50
United Verde Ext	34½
United Zinc	3½
Utica Mines	21
Yukon Gold	2

SAN FRAN.*	Oct 9
Alta	03
Andes	10
Best & Belcher	02
Bullion	01
Caledonia	10
Challenge Con	01
Confidence	05
Con. Virginia	15
Gould & Curry	‡ 01
Hale & Norcross	03
Jacket-Cr Pt	08
Mexican	15
Occidental	80
Ophir	07
Overman	04
Savage	03
Seg Belcher	‡ 02
Sierra Nevada	16
Union Con	72
Utah Con	01
Belmont	4 00
Jim Butler	85
MacNamara	17
Midway	10
Mont.-Tonopah	1 18
North Star	‡ 09
Rescue Eula	10
West End Con.	65
Atlanta	08
Booth	05
Comb. Frac	02
D'field Daisy	02
Florence	12
Jumbo Extension	10
Kewanas	08
Nevada Hills	12
Nevada Packard	22
Round Mountain	25
Silver Pick	12
White Caps	1 22½
Big Jim	‡ 62½
United Eastern	3 75

BOSTON EXCH *	Oct 9
Adventure	1½
Ahmeek	93
Algomah	25
Allouez	60
Ariz. Com., ctfs	10½
Arnold	.25
Bonanza	21
Butte-Balaklava	40
Calumet & Ariz	71
Calumet & Hecla	500
Centennial	14½
Copper Range	50½
Daly West	2
Davis-Daly	4½
East Butte	10½
Franklin	5½
Granby	75
Hancock	12
Hedley	‡17
Helvetia	25
Indiana	1½
Isle Royale	29½
Keweenaw	2
Lake	7
La Salle	3
Mason Valley	6½
Mass	7
Mayflower	1½
Michigan	1½
Mohawk	76
New Arcadian	2½
New Idria	11
North Butte	15
North Lake	‡.95
Ojibway	1½
Old Dominion	43
Osceola	80½
Quincy	80
St. Mary's M. L.	64
Santa Fe	1
Seneca	7
Shannon	5½
Shattuck-Ariz.	22
So. Lake	2½
So. Utah	.18
Superior	7
Superior & Bost.	3½
Trinity	5
Tuolumne	1⅛
U. S. Smelting	54½
U. S. Smelt'g, pf	48½
Utah Apex	3
Utah Con	14
Utah Metal.	3½
Victoria	3
Winona	2
Wolverine	38½
Wyandot	70

BOSTON CURB*	Oct 9
Alaska Mines Corp	37
Bingham Mines	11½
Boston Ely	70
Boston & Mont	59
Butte & Lon'n Dev	12
Calaveras	2½
Calumet-Corbin	01
Chief Con.	2½
Cortez	10
Crown Reserve	26
Crystal Cop	74
Eagle & Blue Bell	2½
Houghton Copper	75
Intermountain	1½
Iron Cap, Com	15½
Iron Cap Cop., pf	15½
Mexican Metals	30
Mines of America	1½
Mojave Tungsten	16
Nat Zinc & Lead	35
Nevada-Douglas	1⅛
New Baltic	1½
New Cornelia	16½
Oneco	28
Pacific Mines	35
Rex Cons	12

SALT LAKE*	Oct 8
Bannack	26
Big Four	01
Cardiff	4 50
Colorado Mining	13
Daly	1 70
Daly-Judge	7 90
Empire Copper	1 27½
Gold Chain	17
Grand Central	65
Iron Blossom	87
Lower Mammoth	03
May Day	05½
Moscow	11
Prince Con	1 00
Silver-King Coal'n	2 07
Silver King Con	3 00
Sioux Con.	04
So. Hecla	90
Tintic Standard	1 47½
Uncle Sam	04
Wilbert	25
Yankee	08

TORONTO*	Oct 8
Adanac	16
Bailey	05
Beaver Con	30½
Chambers Ferland	12
Coniagas	3 80
Hargraves	11
La Rose	41½
Peterson Lake	10
Right of Way	‡ 05
Temiskaming	32
Wettlaufer-Lor	07
Dome Exten	13
Dome Lake	14
Foley O'Brien	‡ 60
Hollinger	5 10
McIntyre	1 40
Newray	60
Porcu Crown	40
Schumacher	‡ 42
Teck-Hughes	42
Vipond	25
West Dome	16

STOCK QUOTATIONS—Continued

COLO. SPRINGS	Oct. 9
Cresson Con.	5.37½
Doctor Jack Pot	.03
Elkton Con.	.03½
El Paso	.15
Gold Sovereign	02½
Golden Cycle	1 90
Granite	40
Isabella	08
Mary McKinney	02½
Portland	1 48
United Gold M	15
Vindicator	48

LONDON	Sept. 25		
Alaska Mexican	£0	5s	0d
Alaska Tre'dwell	1	0	0
Burma Corp	4	3	1½
Cam & Motor	0	10	0
Camp Bird	0	10	6
El Oro	0	11	3
Esperanza	0	10	0
Mexican Mines	6	6	3
Nechi, pfd.	0	13	9
Oroville	0	18	9
Santa Gert'dis.	0	16	0
Tomboy	0	18	6

* Bid prices. † Closing prices ‡ Last Quotations

MONTHLY AVERAGE PRICES OF METALS

Silver	New York			London		
	1915	1916	1917	1915	1916	1917
Jan	48 855	56 775	75 630	22 731	26.960	36 682
Feb	48.477	56 755	77 585	22 753	26 975	37 742
Mar	50 241	57 935	73 861	23.708	27 597	36 410
April	50.250	64 415	73 875	23 709	30 662	36 963
May	49 915	74.269	74 745	23 570	35.477	37 940
June	49 034	65.024	76.971	23 267	31 060	39 065
July	47.519	62 940	79.010	22 597	30.000	40 110
Aug	47.163	66.083	85.407	22 780	31.498	43 418
Sept	48.680	68.515	100.740	23.591	32.584	50 920
Oct.	49 385	67 855	. .	23.925	32.361	.
Nov.	51 714	71 604	. .	25.094	34 192	.
Dec	54 971	75 765		26 373	36.410	
Year	49 684	65 661		23 675	31 315	. .

New York quotations cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Copper	New York		London			
	Electrolytic		Standard		Electrolytic	
	1916	1917	1916	1917	1916	1917
Jan.	24 008	28.673	88 083	131.921	116 167	142 895
Feb.	26.440	31 750	102 667	137.895	133 167	148 100
Mar.	26.310	31 481	107 714	136.750	136 000	151 000
April	27 895	27 935	124 319	133 842	137 389	147 158
May	28 625	28 788	135 457	130 000	152 522	142 000
June	26.601	29 962	112.432	130 000	137.455	142 000
July	23 865	26 620	95 119	128 409	125 500	140 409
Aug.	26 120	25.380	110 283	122 391	126 304	137 000
Sept.	26.855	25 073	113 905	117 500	134 071	135 250
Oct.	27 193		122 750		112 523	..
Nov.	30 625		134 659		155 432	
Dec	31 890		145 316		162 842	
Year	27 202		116 059		138 281	

Tin	New York		London	
	1916	1917	1916	1917
January	41 825	44 175	175 548	185 813
February	42 717	51 420	181 107	198 974
March	50 741	54 388	193 609	207 443
April	51 230	55 910	199 736	220 171
May	49 125	63 173	196 511	245 114
June	42 231	62 053	179 466	242 083
July	38 510	62 570	168 357	242 81
August	38 565	62 681	169 870	241 978
September	38 830	61.542	171 345	244 038
October	41 241	. .	179 307	.
November	44 109	.	186 932	
December	42 635	.	183 368	
Av year	43 480	.	182 096	

Lead	New York		St Louis		London	
	1916	1917	1916	1917	1916	1917
January	5 921	7 626	5 826	7 530	31 167	30 500
February	6 216	8 636	6 164	8 595	31 988	30 500
March	7 136	9 199	7 375	9 120	34 440	30 500
April	7 630	9.288	7 655	9 158	34 368	30 500
May	7 463	10 207	7 332	10 202	32 967	30 500
June	6.936	11 171	6 749	11 123	31 011	30 500
July	6.352	10 710	6 185	10 644	28 137	30 500
August	6 244	10 504	6 088	10 518	29 734	30 500
September	6 810	8 680	6 699	8 611	30 786	30 500
October	7 000		6 898		30 716	
November	7 042		6 945		30 500	.
December	7 513		7 405		30 500	.
Year	6 853		6 777		31 359	

Spelter	New York		St Louis		London	
	1916	1917	1916	1917	1916	1917
Jan	16 915	9 619	16 745	9 449	89 810	48 329
Feb	18 420	10 045	18 260	9 875	97 762	47 000
Mar	16 846	10 300	16 676	10 130	95 048	47 000
April	16 695	9 459	16 525	9 289	99 056	54 632
May	14 276	9 362	14 106	9 192	94 217	54 000
June	11 752	9 371	11 582	9 201	68 591	54 000
July	8 925	8 643	8 755	8 473	50 750	54 000
Aug	8 730	8 360	8 560	8 190	51 587	54
Sept	8 990	8 136	8 820	7 966	52 095	54
Oct	9 829		9 659		54 159	.
Nov	11 592		11 422		56 023	
Dec	10 665		10 495		55 842	
Year	12 804		12 634		72 071	

New York and St Louis quotations, cents per pound London, pounds sterling per long ton

Pig Iron, Pitts	Bessemer‡		Basic‡		No 2 Foundry	
	1916	1917	1916	1917	1916	1917
January	$21 60	$35 95	$18 78	$30 95	$19 70	$30
February	21 10	36 37	18 93	30 95	19 61	30
March	21 81	37 37	19 20	33 49	19 45	35
April	21 65	42 23	18 95	38 90	19 45	40
May	21 78	46 94	19 11	42 84	19 58	43
June	21 95	53 22	18 95	50 05	19 34	50
July	21 95	57 45	18 95	53 80	19 20	53
August	21 95	54 17	18 95	50 37	19 22	53
September	22 88	46 40	19 58	43 24	19 63	48
October	24 61		21 26		21 51	
November	30 07		28 18		26 55	
December	35 16		30 95		30 79	
Year	$23 88		$20 98		$21 15	

‡ As reported by W. P Snyder & Co

Current Prices—Materials and Supplies

IRON AND STEEL

SHEETS—Quotations are in cents per pound in various cities from warehouse, also the base quotations from mill:

Blue Annealed	Large Lots, Pittsburgh	St. Louis	Chicago	San Francisco	New York
No. 10	8.00	10.05	10 00	11.00	10.00
No. 12	8.05	10.10	10.05	11.05	10.05
No. 14	8.10	10.15	10.10	11.10	10.10
Black					
Nos. 18 and 20	7.80	10.15	9.80	11.07	10.30
Nos. 22 and 24	7.85	10.20	9.85	11.12	10.35
No. 26	7.90	10.25	9.90	11.12	10.40
No. 28	8.00	10.35	10.00	11.57	10.50
Galvanized					
No. 10	8.50	10.95	10.70	....	10.80
No. 12	8.60	10.95	10.70	12.15	10.90
No. 14	8.60	10.95	10.70	12.15	10.90
Nos. 18 and 20	8.90	11.15	11.00	12.45	11.25
Nos. 22 and 24	9.05	11.30	11.15	12.59	11.55
No. 26	9.20	11.45	11.20	12.74	11.70
No. 28	9.50	11.75	11.50	13.03	12.00

STEEL RAILS—The following quotations are per 100 lb. f.o.b. Pittsburgh and Chicago for carload or larger lots. For less than carload lots 5c. per 100 lb. is charged extra:

	Pittsburgh		Chicago*	
	Oct. 8, 1917	One Year Ago	Oct. 8, 1917	One Year Ago
Standard bessemer rails	$38.00 to 60.00	$33.00	$38.00	$33.00
Standard openhearth rails	40.00 to 60.00	35.00	40.00	35.00
Light rails, 8 to 10 lb.	83.00	50.00	95.00	43.00
Light rails, 12 to 14 lb.	82.00	49.00	95.00	42.00
Light rails, 25 to 45 lb.	75.00	47.00	95.00	40.00
Rerolled rails	75.00 to 80.00	....	....	....

TRACK SUPPLIES—The following prices are base per 100 lb. f.o.b. Pittsburgh for carload lots, together with the warehouse prices at the places named:

	Pittsburgh					
	Oct. 8, 1917	One Year Ago	Chicago	St. Louis	San Francisco	Dallas
Standard railroad spikes	$7.00	$2.65	$5.00	$5.75	$7.25	$5.75
Track bolts	7.00 to 8.00	3.25	6.25	Premium	8.80	Premium
Standard section angle bars	3.75 to 4.00	2.00	4.50	Premium	4.65	Premium

STRUCTURAL MATERIAL—The following are the base prices f.o.b. mill, Pittsburgh, together with the quotations per 100 lb. from warehouses at the places named:

		New York					
	*Pittsburgh	Oct. 8, 1917	1 Yr. Ago	St. Louis	Chicago	San Francisco	Dallas
Beams, 3 to 15 in.	($3.00)	$5.25	$3.35	$5.05	$5.00	$7.75	$6.00
Channels, 3 to 15 in.	(3.00)	5.25	3.35	5.05	5.00	7.75	6.00
Angles, 3 to 6 in., ¼ in. thick	(3.00)	5.25	3.35	5.05	5.00	7.75	6.00
Tees, 3 in. and larger	(3.00)	5.30	3.40	5.05	5.05	7.75	6 00
Plates	(3.25)	10.00	4.00	10.05	10.00	10.50	9.00

*Government price.

RIVETS—The following quotations are per 100 lb.:

STRUCTURAL

	Mill, Pittsburgh	Warehouse				
		New York	Chicago	St. Louis	San Francisco	Dallas
¾ in. and larger	$5.25	$7.00	$5.50	$5.55	$7.15	$8.50
CONE HEAD BOILER						
¾ in. and larger	5.35	7.10	5.60	5.65	7.25	8.60
⅜ and 11/16	5.50	7.25	5.75	5.80	7.40	8.65
½ and 9/16	5.85	7.60	6.10	6.15	7.75	9.00

Lengths shorter than 1 in. take an extra of 50c. Lengths between 1 in. and 2 in. take an extra of 25c.

HORSE AND MULE SHOES—Warehouse prices per 100 lb. in cities named:

	Mill, Pittsburgh	Cincinnati	Chicago	St. Louis	Denver	Birmingham
Straight	$4.75	$6.75	$7.00	$7.00	$7.75	$7.00
Assorted	4.90	7.25	7.25	7.15	8.00	7.50

WIRE ROPE—Discounts from list price on regular grades of bright and galvanized are as follows:

	New York	St. Louis	Chicago	San Francisco
Galvanized	10—2½%	10—2½%	10—2½%	15%
Bright	20—2½%	20—2½%	20—2½%	10%

SWEDISH (NORWAY) IRON—This material per 100 lb. sells as follows:

	Oct. 8, 1917	One Year Ago
New York	$14.00	$6.00
Cleveland	15.00	6.30
Chicago	13.50	5.50

In coils an advance of 50c. usually is charged:
Note—Stock scarce generally.

PIPE—The following discounts are for carload lots f.o.b. Pittsburgh, basing card in effect July 2, 1917, for iron, and May 1 for steel:

Steel			Iron		
Inches	Black	Galvanized	Inches	Black	Galvanized
BUTT WELD					
¾ to 3	49%	35½%	¾ to 1½	33%	17%
LAP WELD					
2	42%	29½%	2	26%	12%
2½ to 6	45%	32½%	2½ to 4	28%	15%
7 to 12	42%	28½%	4½ to 6	28%	15%
13 and 14	32½%	....	7 to 12	25%	12%
15	30%	....			
BUTT WELD, EXTRA STRONG PLAIN ENDS					
¾ to 1½	47%	34½%	¾ to 1½	33%	18%
2 to 3	48%	35½%			
LAP WELD, EXTRA STRONG PLAIN ENDS					
2	40%	28½%	2	27%	14%
2¼ to 4	43%	31½%	2¼ to 4	29%	17%
4½ to 6	42%	30½%	4½ to 6	28%	16%
7 to 8	38%	24½%	7 to 8	20%	8%
9 to 12	35%	19½%	9 to 12	15%	2%

From warehouses at the places named the following discounts hold for steel pipe:

	Black		
	New York	Chicago	St. Louis
¾ to 3 in. butt welded	38%	41.9%	34.27%
3½ to 6 in. lap welded	18%	37.9%	21.27%
7 to 12 in. lap welded	10%	.....	21.27%
	Galvanized		
	New York	Chicago	St. Louis
¾ to 3 in. butt welded	22%	26.9%	19.27%
3½ to 6 in. lap welded	List	23.9%	13.27%
7 to 12 in. lap welded	List + 20%	.....	6.27%

Malleable fittings, Class B and C, from New York stock sell at 5 and 5% from list prices. Cast iron, standard sizes, 34 and 5%.

MISCELLANEOUS

FLOTATION OILS—Prices of oils for flotation, in cents per gallon, in barrels:

			Denver	
	New York	Chicago	In Bbl. Lots	In Carload Lots
Pure steam-distilled pine oil	$0.50½	$0.45	$0.30	$0.27
Pure destructively distilled pine oil	.40	.43	.30	....
Pine tar oil	.28½	.30	.24½	.19
Crude turpentine	.37	.47	.44	.38
Hardwood creosote	.19½*	.....	.34½	.31

*F.o.b. Cadillac, Mich.

SODIUM CYANIDE—New York price is 37c. per lb.; Denver, 46c. to 43c.; in Chicago, 65c.

SODIUM SULPHIDE—In New York the price per pound is 4c. to 4¼c. for concentrated, 2¼c. to 2½c. for crystals. The Denver price for concentrated is quoted at 3½c. The Chicago price is 3½c. Concentrated comes in 500-lb. drums, the crystals in 400-lb. barrels.

ZINC DUST—New York price is 18c. per lb. in 1600-lb. barrel; Chicago, 18c.

CALCIUM CARBIDE—Price f.o.b. cars at warehouse points east of Mississippi River (except in Alabama, Georgia and Florida) is $90 for Cameo, $95 for Union. In territory between Mississippi River and the Rockies and in Alabama, Georgia and Florida, add $5; west of Rockies add $10 to $15.

LINOLEUM—In 50-sq.yd. rolls in carload lots the price is 88c. per square yard, for concentrating tables.

HOSE—

Fire

	50-Ft. Lengths
Underwriters' 2⅝-in.	70c. per ft.
Common, 2½-in.	40–10%

Air

	First Grade	Second Grade	Third Grade
¾-in. per ft.	$0.55	$0.30	$0.25

Steam—Discounts from list

First grade... 30% Second grade... 30-5% Third grade... 40-10%

RUBBER BELTING—The following discounts from list apply to transmission rubber and duck belting:

Competition	50–10%	Best grade	25%
Standard	40%		

LEATHER BELTING—Present discounts from list in the following cities are as follows:

	Medium Grade	Heavy Grade
New York	40%	35%
St. Louis	45%	40%
Chicago	40—5%	35—10%
Birmingham	35%	35%
Denver	40%	35%

RAWHIDE LACING—40%

MANILA ROPE—For rope smaller than ⅝-in. the price is ½ to 2c. extra; while for quantities amounting to less than 600 ft. there is an extra charge of 1c. The number of feet per pound for the various sizes is as follows: ⅝-in., 8 ft.; ¾-in., 6; ⅞-in., 4½; 1-in., 3½; 1⅛-in., 2 ft. 10 in.; 1¼-in., 2 ft. 4 in. Following is price per pound for ⅝-in. and larger, in 1200-ft. coils:

Boston	$0.34	Kansas City	$0.33½
New York	.33½	Los Angeles	.30
Chicago	.31½	Seattle	.33½
St. Paul	.34	Denver	.34

PACKING—Prices per pound:

Rubber and duck for low-pressure steam	$0.77
Asbestos for high-pressure steam	1.54
Duck and rubber for piston packing	.88
Flax, regular	.66
Flax, waterproofed	.99
Compressed asbestos sheet	.99
Wire insertion asbestos sheet	1.21
Rubber sheet	.55
Rubber sheet, wire insertion	.88
Rubber sheet, duck insertion	.44
Rubber sheet, cloth insertion	.25
Asbestos packing, twisted or braided, and graphited, for valve stems and stuffing boxes	1.10
Asbestos wick, ½- and 1-lb. balls	.65 to .70

FIRE BRICK—Quotations on the different kinds in the cities named are as follows, f.o.b. works:

	New York	Chicago
Silica brick, per 1000	$50.00 to 55.00	$55.00 to 60.00
Fire clay brick, per 1000, No. 1	45.00 to 55.00	....
Magnesite brick, per net ton	135.00 to 145.00	
Chrome brick, per net ton	135.00	
Deadburned magnesite brick, per net ton	85.00 to 90.00	....
Special furnace chrome brick, per net ton	60.00 to 70.00	60.00 to 80.00

Standard size fire brick, 9 x 4½ x 2½ in. The second quality is $4 to $5 cheaper per 1000.

St. Louis—High grade, $55 to $65; St. Louis grade, $40 to $50.

Birmingham—Fire clay, $25 to $30; Denver, $23, per 1000.

RAILWAY TIES—For fair-size orders, the following prices per tie hold:

	Material	7 in. x 9 in. by 8 Ft. 6 In.	6 in. x 8 in. by 8 Ft.
New York	Yellow Pine	$1.32	$1.06 to 1.11
St. Louis	No. 1 White Oak	1.00	.75
Chicago	White Oak	.97	.82
Chicago	Creosoted	1.30	1.15
San Francisco	Green	.97	.74
San Francisco	Creosoted	1.85	1.37

GREASES—Prices are as follows in the following cities in cent sper pound for barrel lots:

	New York	Denver	Chicago	Birmingham	St Louis
Cup	5 to 7	9½	7½	5½	5.6
Fiber or sponge	5 to 7	15	7¾	12½	5.9
Transmission	5 to 7	13	6½	12½	5.9
Axle	3 to 7	5	5	4½	3.3
Gear	4 to 5	4½	6½	10½	6
Car journal	5½ to 7¼	4	6	9	3.75

WIPING CLOTHS—In Cleveland the jobbers' price per 1000 is as follows:

13¼ x 13¼ .... $35.00   13¼ x 20½ $45.00

In Chicago they sell at $30 to $33 per 1000

COTTON WASTE—The following prices are in cents per pound:

	New York		Cleveland	Chicago
	Oct. 8, 1917	One Year Ago		
White	11.00 to 12.00	12.50	16.00	14.00 to 15.00
Colored mixed	8.50 to 12.00	9.00	14.00	10.00 to 12.00

LINSEED OIL—These prices are per gallon:

	New York		Cleveland		Chicago	
	Oct. 8, 1917	One Year Ago	Oct. 8, 1917	One Year Ago	Oct. 8, 1917	One Year Ago
Raw in barrels	$1.23	$0.73	$1.30	$0.77	$1.27	$0.75
5-gal. cans	1.33	.83	1.40	.87	1.37	.85

WHITE AND RED LEAD in 500-lb. lots sell as follows in cents per pound:

	Red				White	
	Oct. 8, 1917		1 Year Ago		Oct. 8, 1917	1 Yr. Ago
	Dry	In Oil	Dry	In Oil	Dry and In Oil	Dry and In Oil
100-lb. keg	12.25	12.50	10.50	11.00	12.00	10.50
25 and 50-lb. kegs	12.50	12.75	10.75	11.25	12.25	10.75
12½-lb. keg	12.75	13.00	11.00	11.50	12.50	11.00
1 to 5-lb. cans	14.25	14.50	12.50	12.50	14.50	12.50

NUTS—From warehouse at the places named, on fair-sized orders, the following amount is deducted from list:

	New York		Cleveland		Chicago	
	Oct. 8, 1917	One Year Ago	Oct. 8, 1917	One Year Ago	Oct. 8, 1917	One Year Ago
Hot pressed square	List	$1.50	$1.65	$2.75	$3.00	$3.25
Hot pressed hexagon	List	1.50	1.50	2.75	3.00	3.25
Cold punched square	List	1.00	1.25	2.50	1.50	3.00
Cold punched hexagon	List	1.50	1.25	3.00	1.50	3.50

Semifinished nuts sell at the following discounts from list price:

	Oct. 8, 1917	One Year Ago
New York	50%	50—10
Cleveland	45%	60
Chicago	50%	60%

MACHINE BOLTS—Warehouse discounts in the following cities:

	New York	Cleveland	Chicago
¾ by 4 in. and smaller	30%	35%	10—10%
Larger and longer up to 1 in. by 30 in.	15%	25%	3—5%

WROUGHT WASHERS—From warehouses at the places named the following amount is deducted from list price:

New York ... $4.00 Cleveland ... $3.80 Chicago ... $4.00

For cast iron washers the base price per 100 lb. is as follows:

New York ... $5.00 Cleveland ... $4.50 Chicago ... $3.50

EXPLOSIVES—Price per pound in small lots at cities named:

	Low Freezing 20%	Gelatin 40%	Gelatin 60%	Gelatin 80%	Black Powder
New York	......	$0.26½	$0.34½	......	$2.50*
Boston	......†	......†	.36¼	$0.43¾	....
Kansas City	$0.20	.26¼	.33¼	.43¼	....
New Orleans	......	.25¼	.30¼	......	....
Los Angeles	.19	.25	.32¼	......	....
Seattle	.37	.49½	.63½	.83½	....
Chicago	.18¾	.22¾	.32¼	.42	....
St. Paul	.20	.28¼	.33¼	......	2.55*
St. Louis	.16¼	.20¼‡	.29½	.39½	2.55*
Denver	.19	.25¼	.32¼	.42¼	....
Dallas	.25	.29	.39	.49	....

*25-lb. kegs. †No local demand. ‡45%.

FUEL OIL—Price variable, depending upon stock. New York quotations not available owing to this fact. In Chicago and St. Louis the following prices are quote:

	Chicago	St. Louis
Domestic light, 22-26 Baume	7¾c.	8.5c.

Note—There is practically no fuel oil in Chicago at present time.

OILS—Price per 50-gal. bbl. is as follows:

City	Fuel	Black	Red Engine	Steam Cylinder	Gasoline
New Orleans	$5.00	$7.75	$9.50	$16.30	$11.25
Seattle	4.40	6.25	11.00	21.00	10.25
Denver	2.87	8.25	15.50	23.00	12.00
Los Angeles	1.45	6.50	12.00	26.00	10.00
Denver	2.87	8.25	15.50	23.00	12.00
St. Paul	3.00	5.50	11.00	17.50	10.05
Cincinnati	5.00	5.50	10.50	17.00	12.00
Boston	5.25	8.00	12.50	18.75	12.50
Kansas City	6.95	4.35	10.35	17.35	10.15

Note—Standard prices of oil are necessarily difficult to give. Those above are for average grades.

CONSTRUCTION MATERIALS

ROOFING MATERIALS—Prices per ton f.o.b. New York or Chicago:

	Carload Lots	Less Than Carload Lots
Tar felt (14 lb. per square of 100 sq.ft.)	$61.00	$62.00
Tar pitch (in 400-lb. bbl.)	15.00	16.50
Asphalt pitch (in barrels)	29.00	30.50
Asphalt felt	60.00	62.00

PREPARED ROOFINGS—Standard grade rubbered surface complete with nails and cement costs per square as follows in New York and Chicago:

	1-Ply		2-Ply		3-Ply	
	c.l.	l.c.l.	c.l.	l.c.l.	c.l.	l.c.l.
No. 1 grade	$1.15	$1.10	$1.45	$1.60	$1.75	$1.90
No. 2 grade	1.10	1.25	1.25	1.40	1.50	1.65

Asbestos asphalt saturated felt (14 lb. per square) costs $5.35 per 100 lb.

Slate-surfaced roofing (red and green) in rolls of 108 sq.ft. costs $1.85 per roll in carload lots and $2.10 for smaller quantities.

Shingles, red and green slate finish, cost $4.75 per square in carloads, $5 in smaller quantities, in Philadelphia.

HOLLOW TILE—

	4x12x12	8x12x12	12x12x12
Boston	$0.0957	$0.171	$0.2268
Kansas City*	.0595	.1125	.1575
Denver	.09	.17	.25
New Orleans	.0892	.1417	.1863
Los Angeles*	.05	.10	.165
Chicago	.07	.135	...

*In quantities of 1000.

LUMBER—Price per M in carload lots:

	8 x 8-in. x 20 Ft. and Under				12 x 12-In., 20 Ft. and Under	
	Y.P.	Fir	Hemlock	Spruce	Y.P.	Fir
Kansas City	$39.00	$34.00	$31.00	....	$45.00	$34.00
Seattle	21.00	21.00	21.00	$21.00	21.00	21.00
Los Angeles	....	30.00	30.00			30.00
San Francisco		24.00	24.00		..	24.00
St. Paul		38.00	31.50			43.00
Denver		30.00	...	27.50		32.00

	1-In. Rough, 10 In. x 16 Ft. and Under			2 In. T. and G. 10 In. x 16 Ft.	
	Y.P.	Fir	Hemlock	Y.P.	Fir
Kansas City	$43.00	$43.50	$42.00	$51.00	...
Seattle	21.00	21.00	21.00	21.00	$21.00
Los Angeles	30.00	30.00			21.00
San Francisco		24.00	24.00		24.00
St. Paul		51.00	34.00	59.00	57.50
Denver		30.00	30.00		30.00

PORTLAND CEMENT—These prices are for barrels in carload lots, including bags:

	Oct. 8, 1917	One Month Ago	One Year Ago
New York	$2.22	$2.22	$1.72
Jersey City	2.18	2.18	1.80
Boston	2.77	2.77	1.92
Chicago	2.31	2.31	1.80
Pittsburgh	2.31	2.31	1.81
Cleveland	2.44	2.44	1.94
Denver	3.20	3.20	...
Los Angeles	2.30	2.10	...

LIME—Warehouse prices:

	Hydrated per Ton		Lump per 300-Lb. Barrel	
	Finished	Common	Finished	Common
New York	$16.50	$13.25	$2.10	$1.90
Chicago	15.00	12.00	1.90	
St. Louis	12.00	10.75		
Dallas	20.00	15.00		
San Francisco	18.00		1.65	

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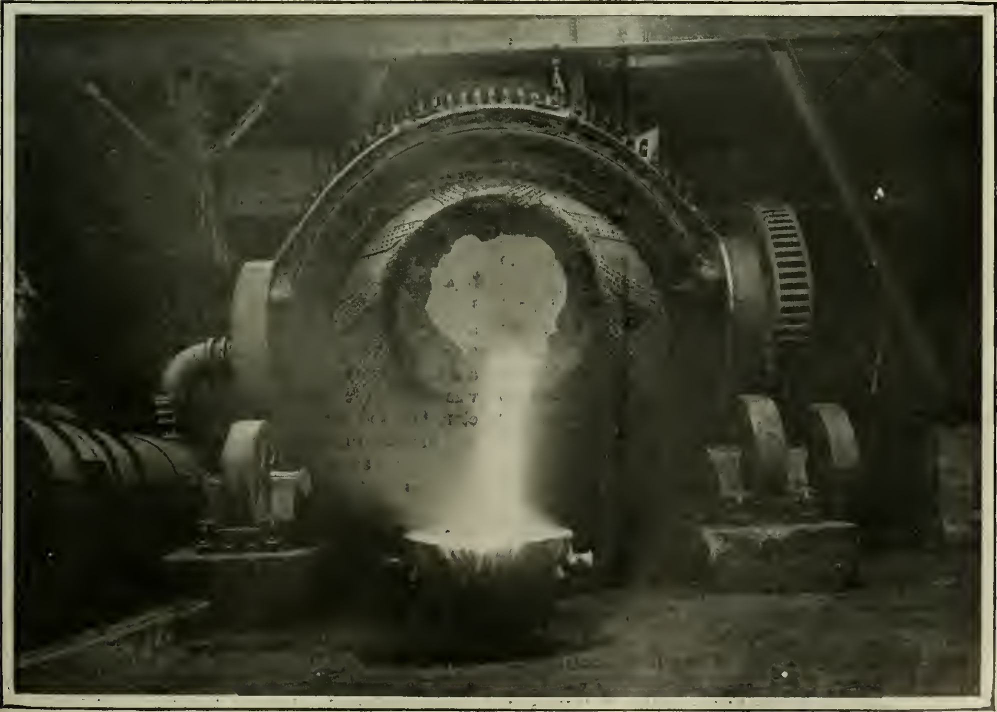
Development of Copper Converting

BY MILO W. KREJCI*

The gradual development of copper converting is discussed from its experimental stages at the Parrot works in Butte, through the period of acid converting, to the renaissance of the basic lining and the subsequent application of magnetite coating to increase the life of the lining.

THE converting of copper matte is accomplished by forcing air through small openings called tuyeres, into molten matte contained in a steel vessel lined with refractory material. The converting temperature is about 1200° C. The small streams of air, passing through the liquid matte, oxidize the iron to iron oxide and the sulphur to sulphur dioxide. The iron oxide combines with silica, forming slag, while the sulphur dioxide passes off as gas. The process is entirely pyritic, the heat being furnished by the oxidation of the iron and sulphur and by the formation of the iron-silicate slag. The copper is reduced to the metallic state and settles to the bottom of the vessel, from which it is cast, either directly or through the medium of refining furnaces, into shapes suitable for further treatment.

The steel converter first used by Sir Henry Bessemer in 1856 paved the way for the conversion of copper mattes in a similar apparatus. Although several attempts along this line had been made by Raht, Semenikow and Hollway, it was not until 1880 that Manhès and David produced copper successfully in a converter. Their first radical departure from the steel practice



THE 20-FT. UPRIGHT CONVERTER DEVELOPED AT GREAT FALLS, MONT.

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was to change the situation of the tuyeres from the bottom and to place them on the side, a short distance above the bottom. Not that the bottom-blast converter cannot be used for copper mattes, but that the operating conditions are so much more simple with the side-blast tuyeres of today.

The proper operating conditions for converting copper were so little understood when the Manhès converter was first introduced at the Parrot smelting works at Butte, in 1883-4, that for a while there was a doubt whether or not it would be adopted commercially. It was a common occurrence to have the charge become so cold that the tuyeres would "freeze," as well as the entire charge, and again so hot that the charge would foam violently and discharge the entire contents of the vessel on the converter floor. The converters were lined with quartz and clay, their capacity varying from one to 4½ tons of matte.

On account of the troubles experienced, it was found advisable to divide the converting into two separate operations: (1) Blowing matte from 35% up to 80% copper, and then casting the resultant white metal. (2) Blowing the remelted white metal to copper. This was abandoned in a few years as it was found unnecessary. The operators, having become sufficiently skilled in the work, were able to skim their charge at the right time, and blowing to finished copper without the remelting of the white metal was carried out as it is in the present-day practice.

BATTLE OF THE UPRIGHT AND HORIZONTAL CONVERTER

The upright or Parrot type of converter, which was followed by the horizontal, or Leghorn, type, was installed at Bisbee and Anaconda in the early 90's and continued to be the prevailing type of converter, with the exception of the plants at Great Falls, Mont., and Aguascalientes, Mexico. The horizontal form of converter consisted of a horizontal, cylindrical vessel, with lateral tuyeres, resting on cast-iron rollers, and revolving in a horizontal plane by means of a rack and pinion operated by hydraulic power. There were no radical departures in the horizontal type of converter until the advent of the Peirce-Smith apparatus in 1910, with the possible exception of the change from hydraulic to electric power for tilting the converter.

The vertical or Great Falls type of converter went through a number of radical changes as to the shape of the converter bowl, as well as other features, and finally resulted in the present 12-ft. vertical-type converter. The converters at Great Falls have always been of the vertical type. The Great Falls converter plant was started in 1892, using a converter which closely followed the design used in the steel practice. They were circular in cross-section, 7 ft. 1.5 in. in diameter, and 14 ft. 9.5 in. high, over all, were arranged for acid lining and had eight side-blast tuyeres. The converter revolved on trunnions, through one of which the air blast entered, while the other was fitted with a pinion which engaged a horizontal rack attached to the piston rod of a hydraulic cylinder. The control of the air and the tilting was from a central pulpit on the opposite side of the building from the converters, and in full view of them. This was taken from the steel practice, which practice, I believe, is still followed at all steel converter plants.

The first linings were tamped by hand, and it was not until 1896 that this work was done with a tamping machine. This resulted in a more substantial lining, an increase of the output of the same by 25%, and a much lower cost. The 7-ft. type, or Class I as it was known at Great Falls, was supplanted in 1904 by a converter elliptical in cross-section, 9 ft. 8 in. by 8 ft. 8 in., with the long diameter at right angles to the trunnions. This was known as Class II. In the 7-ft. converter it had been observed that the linings always wore away more rapidly at the tuyeres than anywhere else. The next most rapid wear seemed to be opposite the tuyeres, while the least wear appeared to be at the sides. This new type allowed a heavier lining on the tuyere side to be used.

ADVENT OF ELECTRICALLY TILTED CONVERTERS

The advent of this converter resulted in doubling the output per lining, larger charges and an increased speed of working of about 40%. It differed from the Class I in that it had twelve 1⅛-in. tuyeres instead of eight ⅞-in. tuyeres. It was larger in size and was operated electrically instead of by hydraulic power.

This was the first application of electric power for converter operation, and was so successful that it has almost entirely supplanted the use of hydraulic power for this work.

Although the results obtained from the Class II converter were encouraging, it was felt that further improvements could be made which would give a still larger capacity and faster working. It was found that the Class II converter lining first wore out at points on the sides under the trunnions; also that the converter would work faster if it had more tuyeres. This led to the design and installation of the Class III type. It was an elliptical converter with the long diameter on the line of the trunnions instead of at right angles to them, as in the Class II. The long diameter was 12 ft. and the short diameter 10 ft.; the height was 1 ft. less than Class II and there were 15 instead of 12 tuyeres. It was put into operation during 1907. The work of this converter was a great improvement over the Class II, and resulted in a greater output per lining, and more rapid working.

A study of the linings and operation of the Class III converter showed that it wore out at the tuyeres, as in Class I. In order to retain the thickness of the Class III lining, and make it thicker at the tuyeres, a new converter was designed and called Class IV. It was circular in horizontal section, was 12 ft. in diameter, had the same height and also the same number and size of tuyeres as the Class III. The Class IV converter was put into operation in February, 1910, and was found to be satisfactory and resulted in the abandonment of all of the other previous types except the Class III converter.

OTHER DEVELOPMENTS OF ACID-CONVERTING PRACTICE

During the 25 years of acid-converter operation many other improvements took place in the method of handling matte, casting copper and slag, namely:

1. The casting of matte and the remelting of the same in cupolas which poured directly into the converters were replaced by the installation of forehearths or settlers following the blast furnaces. From these,

or from large reverberatory furnaces, the matte was tapped into ladles and poured into the converter directly by means of overhead cranes, or by way of a launder from a car equipped with a tilting arrangement.

2. The disposal of the liquid converter slag was changed from the old method of casting the same in beds of sand or flue dust, and then breaking up the chilled cake and smelting in blast furnaces to one of the following: (a) Pouring the liquid converter slag into reverberatory furnaces or into blast-furnace settlers. (b) Casting the slag in casting machines of the circular or straight-line type and resmelting in blast furnaces. (c) Agglomeration of the slag with fine ore, concentrates and flue dust into nodules and smelting the product in blast or reverberatory furnaces.

3. The casting of the copper was changed from the method of pouring directly into molds, set on trucks placed underneath the converter, to the present method of pouring from the converter into a large ladle, which is carried by an overhead crane to a casting machine, either of the circular or straight-line type, or to a refining or heating furnace, from which it is cast.

4. The old "latch" tuyere valve was replaced by the Dyblie ball tuyere valve. Though the original has been changed somewhat in detail, the same main features prevail today.

5. The use of barren quartz and clay for converter linings was replaced by ore with an admixture of other copper-bearing material, such as slime, copper precipitate, etc.

6. The life of the acid linings was materially lengthened by the addition of ore to the converter charge, which method of charging ore is the present practice in basic converters.

7. The first small converters were operated by means of a lever, later by a wormwheel, but as the size increased hydraulic power was used, followed later by electrical control. The last two survive, though the electrical control predominates.

Basic Converting

A radical departure from the acid-lining practice took place in 1910, by the adoption of the converter lined with magnesite brick, following the experiments of Peirce and Smith at Baltimore and Salt Lake City on lead-copper mattes. It is generally known as basic converting to distinguish it from acid converting. Unlike the basic-converting steel practice, the lining is inert and does not enter into the chemical reactions in the converter.

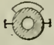
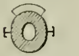
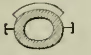
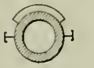
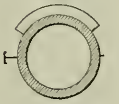
Many early attempts had been made to use a converter lined with chrome or magnesite brick along these lines by Keller, Knudsen, Baggaley and by experimenters at Anaconda and Great Falls. The best results, previous to those of Peirce and Smith, were probably obtained by Baggaley at Butte.

The Peirce-Smith Horizontal Converter

The converter of Peirce and Smith consists[1] of a horizontal, cylindrical shell of steel plate 10 ft. to 13 ft. in diameter and from 26 to 37 ft. 2 in. long, and holds from 30 to 60 tons of copper. It is bound with three cast-steel I-beams revolving on three pairs of carrying rollers. The heads of the cylinder are also of steel and are made adjustable in order to take care of the longitudinal expansion. The heads telescope into the shell and are held in place by I-beams.

The converter is equipped with 32 to 41 tuyeres 1¼ to 1¾ in. in diameter, placed in a horizontal run. The shell contains removable plates along the tuyere line to allow for repairing the tuyere zone without cooling down the converter, and it is provided with an opening near the end for charging the ore and a vent for the gases, but in some installations this has been placed in the center. An opening with a spout is provided on the pouring side of the shell for the removal of slag and copper. The converter is lined with magnesite brick. Hydraulic or electric power is used for tilting by means of two wire ropes, one end of each being attached to the converter and the other to a block connected with the operating mechanism. In the main it is the ordinary, horizontal converter with the ends extended to allow for larger capacity.

DEVELOPMENT OF THE VERTICAL CONVERTER AT GREAT FALLS

Class No.	Diameter of Shell	Kind of Lining	Tuyeres No.	Tuyeres Diam.	Tons per Lining	Minutes Blowing per Ton of Copper
	Circular 7 ft. 1.5 in.	Acid	8	⅞ in.	17	43
 II	Elliptical 8 ft. 8 in. x 9 ft. 8 in.	Acid	12	1⅛ in.	40	30
 III	Elliptical 12 x 10 ft.	Acid	15	1⅜ in.	54	26.3
 IV	Circular 12 ft.	Basic	26	1⅛ in.	..	30*
 V	Circular 20 ft.	Basic	26	2 in.	..	12 6

* Lower grade matte (38% Cu) treated. Matte treated under acid practice 45 to 52% copper.

Magnesite Lining Generally Adopted Following Peirce and Smith's Successful Work

Shortly after the Peirce-Smith converter proved to be commercially successful, the horizontal converters at Anaconda were lined with magnesite and proved that the success was not confined to the details of the Peirce-Smith converter. At Great Falls the first magnesite-lined converter for regular basic practice was put into operation early in 1911, and in a few months the change was made throughout the entire plant. All of the Class IV converters were lined, as well as one of the Class III as a spare.

The first converter was fitted with 15 tuyeres of 1¼-in. extra-strong tubing. After the second and third converters had been lined, using the same number of tuyeres, a fourth converter was lined, which was an exact duplicate of the others, but was fitted with 26 tuyeres of the same diameter. The spare converter was fitted with 24 tuyeres. All of these converters were operated successfully from the start. The converters with the greater number of tuyeres naturally worked their charges more rapidly, due to the increased volume of air used.

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[1] The latest standard type of Peirce-Smith converter is described on page 674.

It was then decided to go to a much larger unit; a 20-ft. converter was decided upon, still adhering to the upright type. The first converter of this type was fitted with 62 tuyeres of 2-in. boiler tube, having an internal opening of 1¾ in. These were finally replaced with 26 tuyeres having an opening of 2 in. This large type of converter has been adopted both at Great Falls and Anaconda and is doing good work. Wherever the vertical type of converter has been installed in plants other than those mentioned, the 12-ft. circular vessels have been used.

PROTECTING THE BASIC LINING

As the magnesite lining of a converter is expensive and requires considerable time to put in place, it is naturally of the utmost importance to prolong the life of the same as much as possible.

The principle of the basic lining is simple. A basic (or neutral) material is used in order to avoid chemical action between the lining and the products of the process, which are also basic. The necessary silica to form slag is supplied by introducing siliceous ores into the converter, either through the mouth or the tuyeres. The usual practice is to use a magnesite-brick lining in the converter shell, varying from 9 to 30 in. in thickness, the heaviest lining being at the tuyeres.

Unless the temperature is too high, there should be no chemical action on the lining. However, the temperature in the converter is continually varying as the process is an intermittent one. The lining is hot during the blowing period and cools down during the period of pouring and before recharging. These variations of temperature cause the lining to crack and spall off. With an exposed lining of brick there is a mechanical wear by the charge, which is greater when the temperature is high, as the brick is soft. Thus the chemically indestructible lining is not really so.

In order to guard against this wear and protect the brick, it was the early practice to heat up the newly lined converter and blow a few charges of white metal that had been worked up from another converter. Keeping the temperature down resulted in binding the brick and coating it with a thin layer of white metal and copper. The converter was then used in blowing matte. This offered some protection but was not satisfactory as the protection was soon gone and the brick again exposed.

DEVELOPMENT OF PROTECTIVE MAGNETITE COATING

To avoid the transfer of white metal, the practice of blowing matte in the heated new converter was adopted and an attempt made to coat the brick with it. This was done by blowing the charge for a few minutes and then allowing the converter to cool for 15 or 20 min. This process was continued until the brick had been coated with matte. This gave better results than the white-metal treatment.

This soon led to the development of coating the lining with a layer of magnetite. While blowing matte without silica to form the initial protective coating of the newly lined converter, it was observed that the material was highly magnetic. An analysis showed that it was principally magnetite. Further investigation of the subject showed that magnetite formed readily when the temperature was too low for the formation of the iron slag by union of FeO and SiO_2 and the proportion of silica was low. Any excess of iron over what was needed to combine with the silica present was oxidized to magnetite.

The melting point of magnetite was found to be given by various authorities between 1527° and 1538° C. As the ordinary working temperature of the copper converter is about 1200° C., any magnetite present would be in a mushy condition and would readily attach itself to the lining of the converter. It was evident that here was a basic coating that satisfied all conditions. It could be put on at will without any cost, from the material that was being treated. It was so simple that one wondered why it had not been thought of before. It was almost automatic. Had Keller and other early experimenters with basic linings understood this, acid linings would not have survived as long as they did. The use of this protective coating soon manifested itself in a tremendous tonnage per lining. Early in 1912 these linings were producing over three times the output of the large Peirce-Smith apparatus. It was apparent that the principle evolved by A. E. Wheeler and myself was not understood by other users of basic converters at that time.

LINING TROUBLES GREATLY REDUCED SINCE THE MAGNETITE COATING HAS BEEN ADOPTED

Before the method of applying this protective coating to the magnesite brick became known to the outside world, operating troubles with basic lining were many. The life of linings in some plants was from five to 20 days. In one plant it required the services of three successive shifts of bricklayers to keep the converters lined in order to keep them in operation. When the simple trick was learned, the entire force of bricklayers was dispensed with.

With proper operation and care, once a converter is lined, it should never be relined. This would be the case if 100% efficiency were possible. The full details of applying this coating were described[2] in 1913 at the time of the Butte meeting of the American Institute of Mining Engineers.

There have been few changes in the practice of converting copper matte during the last few years. These have been principally confined to the various mechanical features and details of the converting machine, such as tuyere design, change in the materials of construction, operating mechanism, thickness of lining, etc.

Although some copper is still being produced in acid-lined converters, it is, I believe, wholly confined to foreign countries, namely, Japan and possibly Russia and Australia. The tonnage, however, is so small that it may be said that practically all copper converting is done in basic-lined converters. Even Japan is in the process of transition, as some of the larger copper companies in that country are installing converters lined with magnesite brick.

The converters in general use today are principally confined to one of the two following types: (1) Peirce-Smith or horizontal type. (2) Great Falls or vertical type. This is entirely so in new installations. A few plants still have the old Bisbee type converters that were formerly used with acid lining. In the main

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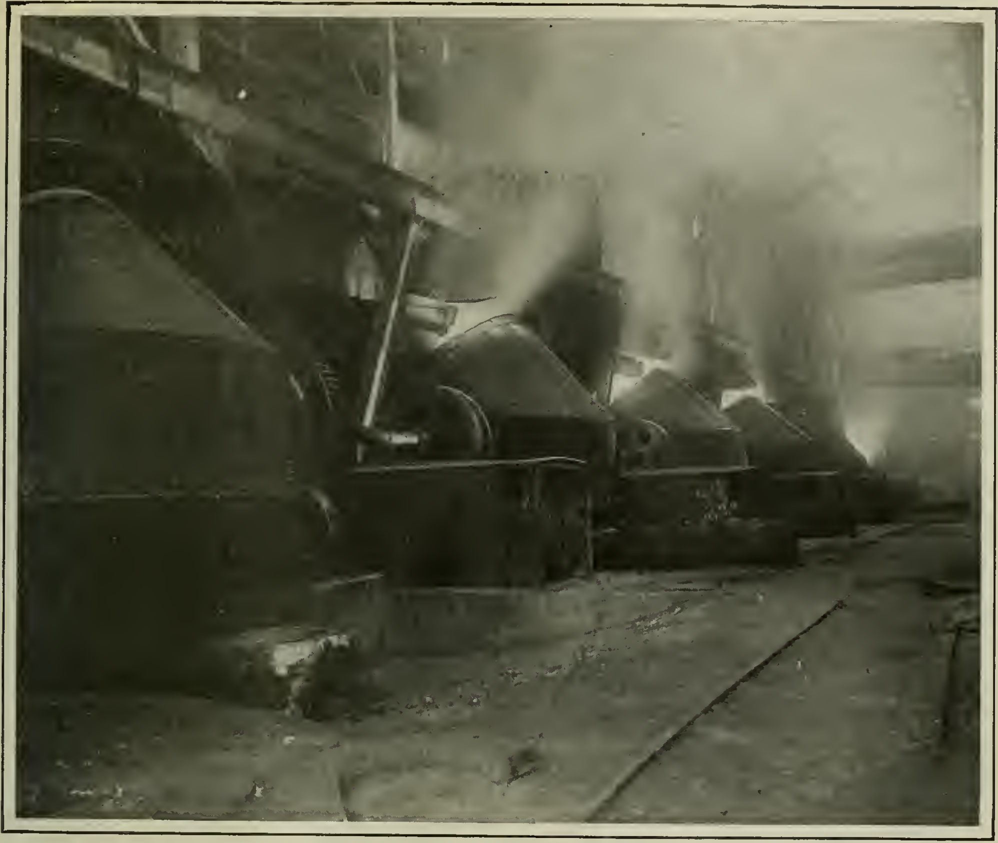
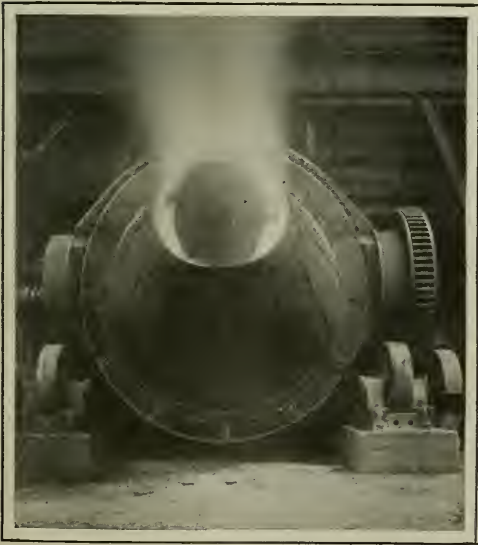
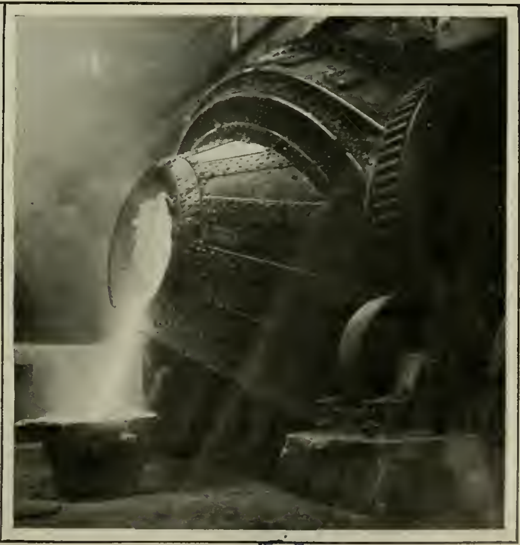
[2] Trans., A. I. M. E., 1913, Vol. 46, pp. 562-5



THE CONVERTER AISLE AT THE WASHOE REDUCTION WORKS AT ANACONDA, MONT.



STARTING THE BLOW



SKIMMING THE 20-FT. CONVERTER

the Peirce-Smith converter has been confined to the plants of the American Smelting and Refining Co., which company encouraged the development of this type.

USE OF VERTICAL CONVERTERS GREATLY EXTENDED

Up to the early part of 1912, with the possible exception of Aguascalientes, Mexico, the only vertical type converters were at Great Falls. Within the next two years, following the excellent results obtained, over a dozen plants throughout this country and other parts of the world adopted the Great Falls type of converter in their new installations.

It might be of interest to cite an instance of how the application of the magnetite coating aided materially in saving an entire relining. During the reconstruction of the Great Falls converter plant, in the latter part of 1913, when the Anaconda company was installing the 20-ft. vessels and the converter roof was open, a storm of snow and sleet resulted in soaking the brick of a newly lined converter. On drying out the brickwork preparatory to putting it into service, it was found that the lining was to all appearances about ruined as the bricks were badly spalled and disintegrating. This was particularly true in the center of the bottom. It was nevertheless decided to put it into operation and get what service could be obtained from the lining. The converter was thoroughly coated with magnetite and started. In order to protect the bottom, a charge of magnetite slag was prepared in another converter and poured into it. The converter was placed in the vertical position and the magnetite slag allowed to set for about 18 hours. Sufficient silica had been added so that the magnetite slag contained about 6% SiO_2. This had the effect of slightly lowering the melting point of the slag so that the magnetite would not freeze in making the transfer. This converter has continued to be in service, it being found necessary to patch the bottom in this manner about every six months. It demonstrated the effectiveness of the protective coating, as well as the importance of laying the brick dry.

Although magnesite brick is apparently unaffected by water at ordinary temperatures, it disintegrates rapidly from the steam generated. In order to demonstrate this, the experiment of placing a magnesite brick in a pan of water, and then covering it, was made. Steam was then turned into it. At the end of 24 hours it was found that the brick had entirely disintegrated.

The advent of basic converting has made it possible to convert low grades of matte at a profit. Under acid linings the conversion of these mattes, on account of the heavy relining expense, was prohibitive.

SOME OPERATING PRECAUTIONS

1. The converter should not be overloaded; too great a burden of matte or slag offers too much resistance to the air blast. As converting is primarily an oxidation process, the speed of working depends on the rapidity with which the air can be furnished to the molten matte. The slag should be removed as soon as it is liquid.

2. The temperature of the converter should be regulated by the addition of cold matte, ore, etc., or by the throttling of the air blast in case there is a shortage of cooling material.

3. The tuyeres should be thoroughly punched out at the end of each charge, and kept uniformly open during the blow, in order to prevent a concentration of air at any one point.

4. The addition of a small amount of hot matte about 10 min. before the charge is finished will insure hot copper and eliminate any necessity of additional heating to prevent freezing of copper in the pouring ladle while casting.

It is evident from the preceding discussion that the function of magnesite brick as the first lining is to protect the shell of the converter until such time as the magnetite lining has been properly formed and that magnetite is the true lining on which converting is carried out. If any other cheap form of initial lining could be installed that would stand the temperatures and chemical action during the formation of the magnetite, the expensive magnesite brick could be dispensed with, thus decidedly lessening the cost of a lining. Some experiments along this line have been conducted at Great Falls, but in every case the lining material has contained so much silica that it united with the iron as this was oxidized and was destroyed before the magnetite lining could be formed. It is possible that some cheap foundation may be developed so that the full benefit of the magnetite lining can be obtained. Possible materials for such a lining are, of course, the present magnesite, either as bricks or ground magnesite; chrome, either as bricks or in ground condition; alumina in some form, or perhaps the magnetite itself.

Latest Type Peirce-Smith Converter

The present type of 13 x 30-ft. Peirce-Smith converter consists of a horizontal cylindrical shell of steel plate, supported by two cast-steel riding rings, 8 ft. from each end, revolving on four sets of carrying rollers, each set comprising two rollers, with faces bearing on the riding ring and a cradle support in a cast-steel foundation plate. The heads of the cylinder are made of steel plate, flanged to telescope into the shell and are held in place by I beams. The converter has forty-one 1¾-in. tuyeres placed at 6½-in. centers, and is built with or without removable tuyere plates.

The converter is tilted by electric motor turning a shaft and pinion meshed in a girth gear riveted to the converter shell, allowing the converter to turn 360°. The converter stack is at a point halfway between the riding rings. It is an opening with axes 6 ft. x 6 ft., having curved front and back, but straight sides; the stack is made of cast steel.

Converter flux—at the rate of two tons in 5 min.—may be charged into the converter, while blowing, from a storage hopper through a "silica gun" using converter blast. Matte and cold "dope" are charged, and slag and blister copper are poured, through the stack opening. The daily capacity of the converter usually varies from 110 to 125 tons of blister copper, while converting a 40% matte.

Converters of this size are at present operating at Tacoma, Garfield and El Paso; they are being installed at Hayden, Ariz., at the Braden Copper Co. in Chile and also at the new plant of the British America Nickel Corporation at Sudbury, Ontario.

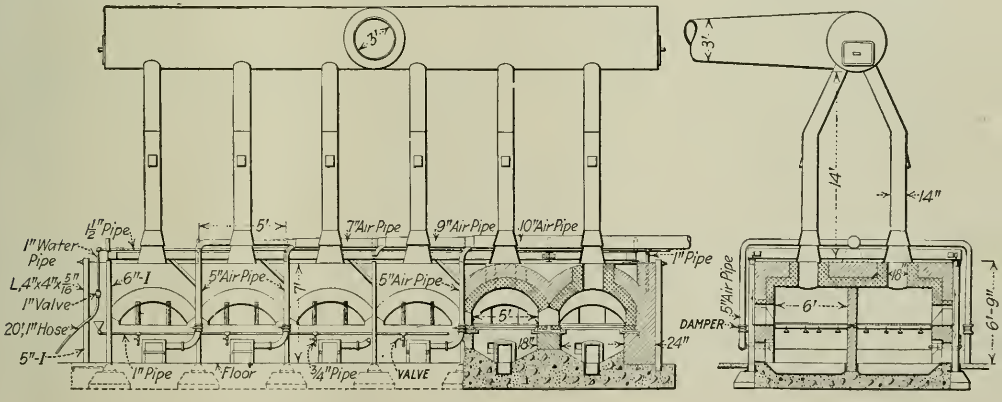
Zinc Oxide Furnaces

By JOHN F. CREGAN*

Two general types of zinc-oxide furnaces have been developed in the United States as a result of diverse conditions in ore and fuel supply. Eastern works use a series of separately controlled grates, the zinc fumes passing to a common collecting flue. Western metallurgists prefer self-contained unit; individual charges controlled by the balance of the whole furnace. The author considers that the Western practice is best adapted to varied ores and fuels.

IN THE burning of zinc ores for the production of zinc oxide there are two distinct types of furnaces in general use. Each has been subject to variations in structural details in different installations, but the basic lines of operation have been followed in every case and the distinguishing features of each type always remain well defined.

Up to a few years ago the process of zinc-oxide manufacture, on perforated grates, was carried on in two widely separated sections of the United States, namely, along the Atlantic seaboard and in the territory west of the Mississippi River. The metallurgists of these districts had different ideas and therefore developed the two types of furnaces above mentioned, which have become known as the Eastern and Western types of zinc-oxide furnaces. The two types of furnaces are shown in the accompanying drawings.



Front Elevation Sectional Elevation Cross-Section

FIG. 1. STANDARD TYPE OF EASTERN FURNACE

The Eastern furnace consists of a series of individual furnaces, each separately controlled with regard to blast pressure and exhaust and arranged so that the zinc fumes leave each separate furnace and pass into a common collecting flue or header.[1] This header is generally made of light, sheet steel and is separate from the furnace except for sheet-steel pipe connections which convey the zinc fumes from each furnace to this header. There are means of adjustment and control on each of these pipe connections so that each furnace may be shut off from the main header whenever desired. A settling tower or chamber of some sort is built separately from the furnace and connected thereto by the sheet-steel pipes which form the fume-collecting system.

The Western furnace is a self-contained unit with furnaces and dust flue under one common arch. There are secondary arches and side walls which separate the several charges, but the exhaust pressure on the individual charges cannot be controlled beyond the balance which controls the whole furnace. A settling chamber is built in with the furnace, of which it forms a continuation. The air blast and other features are practically identical in principle with practice.

The Eastern type of furnace is used principally at Palmerton, Penn.; the Western type is installed at numerous works in the West. These two distinct types of furnaces were originally developed through the use of the different ores and fuels that characterized the operation in the different sections in which the furnaces were operated. In the East the ore generally used was a pure silicate or carbonate and required no treatment other than crushing and sizing. The fuel was anthracite of good quality. Both ore and fuel came to the smelter in quantities sufficient to operate the furnaces uniformly for long periods of time. This regularity of operation and furnace charge tended toward development along certain lines and was in keeping with conditions imposed by the materials in use.

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*Superintendent, oxide department, American Zinc and Chemical Co., Langeloth, Penn.

[1] In speaking of furnaces in this article, and in this industry, there is the same confusion that exists with respect to spelter-distillation furnaces. Thus, in this paragraph Mr. Cregan has used the word "furnace" in two senses, viz., (1) describing the whole structure, and (2) describing one of its constituent portions. Europeans obviate this confusion, partially, by referring to the whole furnace as a "massive," which term has not found employment in American literature, but we use the expression "block" which is equivalent. It will be noted that Mr. Cregan, later in his article, refers to the "block." It would be better if we should confine the word "furnace" to the whole, and in the case of oxide furnaces describe the constituent parts as "grates." —W. R. I.

The Western territory presented different and more complicated conditions. Ore was obtained in the open market whenever and wherever it was offered. This resulted in a varied supply, consisting of silicates, carbonates and sulphides, and the diversity of the supply usually resulted in a variable tonnage which would not permit the operation of the furnaces on any one kind of ore for any considerable period. The fuel problem presented the same conditions as the ore supply. Diverse sources of fuel supply meant a fuel of uncertain and irregular quality, when compared with conditions in the East, and produced conditions which were never met with in the Eastern territory. A furnace was accordingly developed to meet all the varied conditions as they were presented.

In the operation of both types of furnaces the primary object is to treat the largest quantity of ore per furnace consistent with a burden which will permit the smallest metal content remaining in the cinder. In order to accomplish this end there have been numerous experiments with grate areas. While the burden per square foot of grate surface per furnace depends entirely on the character of the ore used, there are certain physical limitations that govern the amount of grate area per furnace which will produce the best results. A discussion of all of these governing conditions would be too lengthy for the scope of this article.

Governing Conditions of Furnace Design

A furnace may be only as wide or as long as the degree of structural stability of the arch whose span is the length or width of the furnace desired. The furnace should be of such width that inaccessible corners may be reduced to a minimum. It should be of such length that an ordinary unskilled workman may operate it with tools within his ability to handle. It should have a tonnage capacity so that each charge may be of such size that the operator will work at his greatest efficiency with the least effort. Finally, the grate area of each furnace should be so proportioned to the total grate area in the furnace block that the drawing and charging of the individual furnaces in their regular order will have the minimum cooling effect on the block itself. Experience has shown that individual furnaces, 6 x 6 ft., meet the above conditions in general, and certain combinations, such as making double furnaces of the above dimensions, work satisfactorily.

With the grate area of an individual furnace as stated above, the question of the number of furnaces per block may be discussed. The Eastern practice has settled the number at present to six, although there are furnaces in this district so modified that the actual number of furnaces is only four per block. In the West the number varies from eight to 16 double furnaces per block. In this matter the radical difference in the theory and practice between the Eastern and Western types is strongly marked, and at first glance seems irreconcilable, but the elements governing both are the same although the working conditions are the exact opposites of each other. The maximum number of furnaces that can be built into a block would be the number which in ordinary operation would generate as much heat as the structural materials and baghouse equipment could withstand. In other words, it would be the number of furnaces which would produce heat enough to keep the plant right at the danger point all the time unless methods were employed to reduce the heat, and those methods would at the same time reduce the efficiency of the furnace. The minimum number of grates per block is the number which in ordinary operation will hold the heat of the block at a degree that will not retard the working of any grate in the block when one or more grates in the block is drawn or charged. This should be accomplished without the aid of devices for the equalizing of the operating conditions of the block during the charging periods.

When all other conditions have been considered, it is well to have the size of the furnace block accord with the arrangement for the necessary labor to operate the furnaces. Success in operation depends largely on continual watchfulness, and this may be aided by having as few operators on the furnace block as possible, so that responsibility for the condition of the furnaces may be restricted. This is important, owing to the strong tendency in the industry toward 8-hour shifts which increase the number of men per block and, in so doing, divide the responsibility. A combination that would meet all the foregoing requirements most satisfactorily would be blocks of 16 single furnaces in the Eastern type and blocks of 12 double furnaces in the Western type. This arrangement would so place the men that the minimum number would be employed per block and each man's work would show its maximum worth.

Mechanical Equipment

The zinc-oxide process has been the subject of experimentation for many years and, while numerous changes have been made in the furnace detail, the only radical changes worth mentioning are the semi-automatic disposal of slag which was introduced in 1898 and was followed later (in 1904) by the automatic charge mixer and the mechanical charger. These developments have been practically confined to the Eastern territory and have been the salvation of the industry in that section. One Western furnace is equipped with the mechanical charge mixer and furnace charger and one other plant in that section has the mechanical charge mixer. While the Eastern furnaces are particularly adapted to these mechanical features, there is no reason why their installation should be limited to that section, inasmuch as the Western-type furnace represents a greater field for a further combination, with this equipment, of a mechanical slag puller which has yet to be developed. The introduction of these mechanical features not only increased the efficiency of the furnaces but abolished the most arduous duties in connection with the process. They greatly reduced the number of men required for operation under the old process, and, through the abolishing of the "man-killing" duties which existed under that process, permit a much simplified operation to continue during the labor scarcity of the last few years. The furnaces gained in efficiency by receiving a uniformly mixed charge of correct weight and by reducing the time required for charging.

The particularly heavy character of the work required in the operation of a zinc-oxide furnace imposes the necessity of giving careful thought in constructing the furnaces, so that advantage may be taken of every feature which will render the operation less difficult. The many variations that are noted in the size and arrangement of furnaces are traceable to this effort to reduce the work. The mechanical charger eliminated the heavy work involved in the old hand-charging method, and the removal of the slag is now the element that presents the most difficulty. A characteristic of the slag in a zinc-oxide furnace is that it sticks to the brickwork on the side walls and back of the furnace. This sticking of the slag makes the cleaning of the furnace difficult and it is important that the clinker be entirely removed from a furnace before a new charge is introduced. The method of operation in the Eastern territory brings this condition more into prominence than in the West. Experiments to overcome this condition resulted in the doubling of the furnaces in various combinations. This doubling of furnaces was designed to reduce the brick area in which the clinker could stick. Eastern operators have decided that the greatest difficulty in removing the slag is presented in cleaning the side walls and have combined three single furnaces into one, thus removing two side walls. Western operators consider that their arrangement of combining two furnaces into one by removing the back wall satisfactorily meets the same condition.

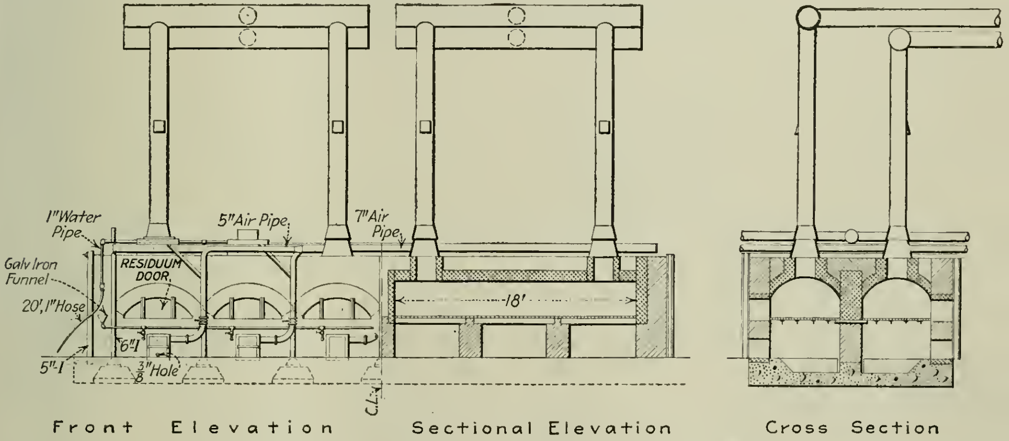


FIG. 2. EASTERN FURNACE WITH THREE GRATES THROWN LONGITUDINALLY INTO ONE

Another labor saver is introduced by placing the grates at the proper height above the operating floor. A few inches in this dimension may mean that the work on the furnace will be reduced or increased, as the case may be. The point involved is the placing of the grates at the exact elevation that will permit the average man to do the work in as easy and as natural ways as possible. The height of 2 ft. 10 in. from the floor line to the top of the dead plate has met with general approval from furnace operators.

The successful operation of a zinc-oxide furnace depends largely upon the flexibility of the air control, both in regard to the air blast and the air exhaust. There is no way in which the size of this apparatus may be figured entirely from a theoretical standpoint because the governing conditions are variables and usually beyond ordinary control. Experience in the process has determined the size and the type of this equipment that are best suited to the work, and the general practice is to have an excess of both pressure and exhaust and to control them by means of blast gates and dampers. Each furnace block should have its own air system with interchangeable connections on the blast, so that in case of trouble two blocks may be served with one blast system. The size of the equipment depends upon the number of furnaces per block. The blower should be capable of delivering a pressure of at least 6-in. water gage under the grates. The air-blast flues should always be carried above ground and introduced into the chamber under the grates by conveniently arranged conductors. This permits a definite control of the air blast at all times. It was the practice several years ago to build furnaces with underground air flues, but that system proved to be generally unsatisfactory owing to the blocking of the flues by water, dust, etc. The amount of air required per furnace is determined by experience and is regulated by a blast gate conveniently located.

Great care should be exercised in constructing a block of zinc-oxide furnaces, both in the selection of material and in workmanship. The firebrick should be chosen for its ability to resist abrasion under high heat. Liberal allowance should be made for expansion and the entire block of furnaces securely ironed in the regulation way. The firebrick in the side walls and back of furnaces should be laid in header courses with the brick dipped in a thin slurry of fireclay. For the red brick a cement mortar, strongly tempered with lime, will permit a reasonable expansion without developing cracks. Buck staves should be of structural steel and so placed as to be independent of tie-rods through the furnace structure. All tie-rods should be placed outside the furnace structure and be readily accessible in case of the necessity of repair or renewal. During the period preceding the present era of high prices a block of Eastern furnaces could be built for $5000, while a block of Western furnaces, consisting of 12 double furnaces, would cost approximately double that amount.

The heating of a furnace for the first time is an operation that requires patience and it is important that the work be both wisely and well done. A small wood fire should be started at each end of the block and maintained for several days. Other fires may be added gradually until at the end of one week each individual furnace in the block has its own wood fire. These fires may then be increased so that at the end of the tenth day from the starting of the first fire the fuel may be changed to coal under a slight air blast. The coal fire may then be increased gradually so that at the end of the third week the furnace is ready for its initial charge. This period is not too long for this preliminary heating because the furnace should be at its working heat when the first charge is introduced, and a failure to have the furnace at the required heat results in a wastage of ore and a considerable repair bill in patching the furnace and replacing broken tie-rods and buck staves.

Distribution of Labor

In the operation of the furnaces the number of men per block is dependent upon the extent of the mechanical labor-saving equipment with which the block is provided, as well as upon the number of furnaces per block. Zinc-oxide plants are now generally equipped with a charge-mixer, and this equipment divides the operation between two crews of men whose duties are entirely independent of each other. The charge mixer is an electrically driven, geared, rotating cylinder with vanes set at angles on its interior to pick up and mix thoroughly the several materials that constitute the charge. Coal, ore and flux are introduced into the mixer in proportionate quantities and the mixed charge is elevated to a bin to be drawn off as needed in weighed amounts by the furnacemen. The charge-mixing crew generally consists of eight men, and this crew will handle approximately 200 tons of material per shift.

A furnaceman should be able to charge eight furnaces in eight hours or, if the ore is such that the burden per square foot of grate area can be doubled, he should charge four 6 x 6-ft. furnaces in eight hours with each furnace working on a burden of 120 lb. of ore per square foot of grate area. The labor arrangement on all zinc-oxide furnaces is based on this general proportion and the number of men distributed per block accordingly. In plants where there is no mechanical equipment other than the charge mixer the furnaceman gets his required number of charges from the bin and arranges these charges in neat heaps on the floor before each furnace. His firing coal is provided for him. When a charge is worked off, the furnaceman breaks up the clinker and pulls it from the furnace. A wheelbarrow is conveniently arranged so as to receive this clinker as it drops from the furnace. There are generally two large barrow loads to the charge and as they are filled the barrows are wheeled to the dump. When the furnaceman has the furnace thoroughly clean he covers the grates with a thin layer of what is called bed coal. About 4 lb. of coal per square foot of grate surface will make a good bed fire if the coal is of good quality. When this bed fire reaches a state of incandescence it is carefully smoothed over with a rabble and the new charge is then spread over the grates, care being taken to have the charge layer of as uniform density as possible. A strong air blast is maintained during the entire charging period, and when the charge has been leveled off and all corners have been packed, the air blast is reduced until a film of burning gas is noted just above the top of the charge. The furnace door is then closed, water is turned into the ashpit until the overflow point is reached, and the charge requires no further attention for six hours except to watch for and eliminate any blow-holes that may appear. At the end of six hours the charge is rabbled over and the blast increased. One hour later the charge is again rabbled and the blast increased if the condition of the charge warrants it. This operation is repeated at half-hour intervals until the charge is ready to come out, which is usually at the end of eight hours. The clinker is then removed from the furnace, and the furnaceman proceeds with a new charge as before.

The charge generally consists of a certain weight of ore which varies in amount from 80 to 120 lb. per sq.ft. of grate surface. Coal is added in amounts varying from 80 to 100% of the weight of the ore. When flux is necessary, this is added in amounts varying from 10 to 90% of the ore used. The entire tonnage is mixed as intimately as possible and, when spread over the furnace grates, will form a layer from 6 to 8 in. in depth. The best fuel is anthracite coal sized to pass over ¼-in. and through $\frac{5}{16}$-in. mesh. At present this size of coal is too expensive for use in the smelting of zinc oxide, and operators have to be content with almost anything available above the quality of dirt coal. Where anthracite is not procurable except at a prohibitive cost, coke of the proper size may be used. The Western furnaces may also use various semi-anthracites, and in cases of emergency these semi-anthracites may be mixed with small percentages of the higher grade bituminous coals. The construction of the Eastern furnaces will not permit the use of this variety of fuel.

The tools used in furnace practice are few and simple in character. The furnaceman's equipment consists of an all-steel wheelbarrow, one No. 2 scoop, a rabble and a clinker bar. The rabble is simply a steel rod, ⅝ in. in diameter and about 10 ft. long, with a loop handle at one end. On the other end is welded a 10-in. piece of ½ x 2-in. iron which acts as a pusher, leveler and hook. The clinker bar is a 1-in. steel bar, 10 ft. long, with a looped handle on one end. This loop should be opened about 8 in. to give the operator a leverage on the bar. The other end is spread out in a shape to act as a slicer in Western practice and in the East this bar is provided with a chisel-pointed wedge.

Eastern Methods

The foregoing is a description of the operation as it is practiced in the Western territory. In the East the general principles are the same although the introduction of mechanical equipment divides the work differently among the men. In the East the ore and coal are delivered in bag bins. An electrically propelled scale car operates under these bins and draws off fixed amounts of ore, coal and flux. The scale car is then run to the mixer and delivers its load by gravity and goes off for another charge. When the charge has been mixed it is discharged by gravity to a skip and elevated to a bin in the furnace room. This bin discharges to electrically operated cranes on both sides of the furnace room, and these cranes are equipped with three or more weighing hoppers. These cranes take their capacity of weighed charges and distribute them to hoppers placed above each furnace. There is a chute which conveys the charges from these hoppers to the center of the furnace. The furnaces and the furnace room are elevated about 10 ft. above ground level, and on both sides of the furnaces, under the furnace building, is a system of railroad tracks for cars to receive the clinker from the floor hoppers. There are individual hoppers in the floor opposite each furnace and these hoppers are equipped with doors in the floor to receive the clinker from the furnaces and with discharge gates to permit the deposit of clinker into the cars.

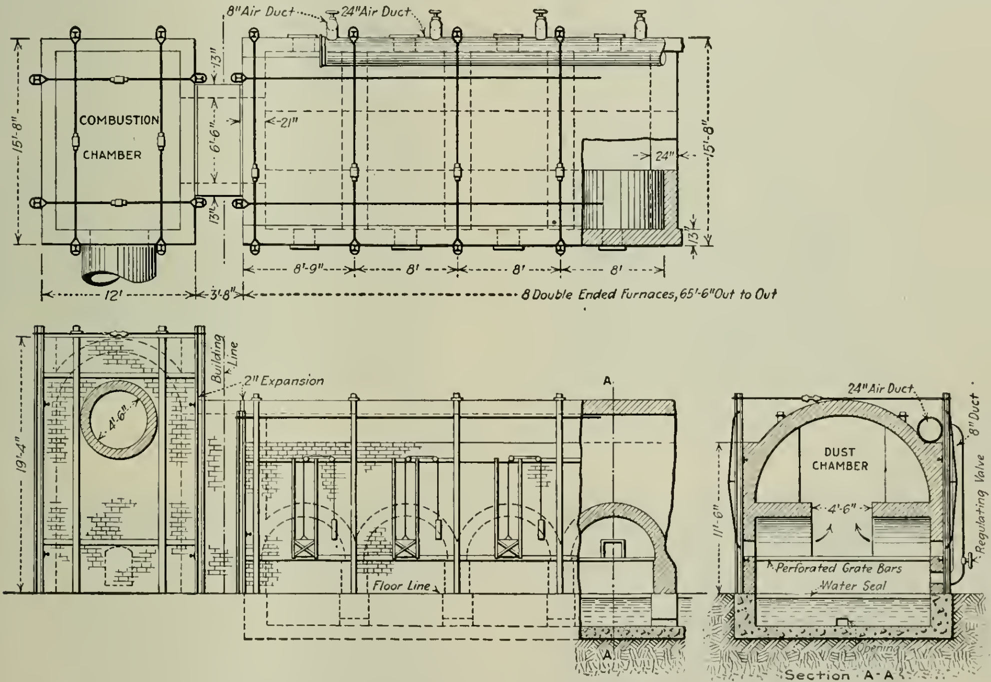


FIG. 3. WESTERN TYPE OF FURNACE AS BUILT AT LEADVILLE, COLO.

After the furnaceman has broken up the clinker in any furnace he pulls it out of the furnace with his rabble. The clinker drops by gravity into the floor hopper, and trains come along immediately and empty these hoppers and convey the clinkers to the dump. The furnaceman then proceeds with his bed fire and when this has reached the right stage of incandescence, he levels it and then opens the charge-hopper discharge gate and the charge falls by gravity into the furnace. It is then leveled and the blast regulated.

The efficiency of a zinc-oxide furnace is determined by an analysis of the clinker. A number of factors can contribute to a low efficiency but these may be eliminated through knowing its performance by the zinc content of its clinker. A furnace showing 1% of zinc in its clinker is doing excellent work and this figure may be taken as a standard because of consistent attainment at certain plants. The general practice, however, results in a much higher zinc content in the clinker, but that is due largely to giving the clinker analysis less prominence than baghouse recoveries. The latter are misleading because of the general conditions of operation. The clinker analysis determines the amount of zinc oxide that has left the ore and leaves no doubt as to the work of the furnace.

THE DIFFERENT THEORIES

As previously stated, the conditions that were presented in the two sections of the country in which the zinc-oxide industry was established led to different theories of operation, and this variation in theory led to different types of construction. These differences continue to exist and the continued construction of new furnaces along the same lines in each section seems to indicate that these different theories are still deep-seated.

The Eastern practice is based on the assumption that zinc oxide is perfect at the immediate instant of its volatilization from the ore. The subjection of the zinc oxide to continued heat after its formation is held to be detrimental to the pigment, giving it a pink or brownish tint. In fact, the rapid removal of the zinc fumes from the heat zone produces the bluish-white tint that is commercially so desirable. To meet the conditions of this theory, the furnaces are built in individual units so that each charge will work independently of every other charge. Each furnace is a distinct unit by itself, and the only relation that one furnace bears to the other is that by their assembly sufficient heat will be held in the block to permit the operation to continue. The zinc fumes are drawn from each furnace as rapidly as possible and subjected to no heat other than that with which the zinc oxide was volatilized.

Clinker Should Be at a Bright Red Heat When Drawn from Furnace

The conditions imposed by the above theory result in working conditions of an intensive character. It is necessary to be ever on the alert and take advantage of every minute while the furnace is in operation. It is of prime necessity that each furnace be charged as rapidly as possible and that working conditions begin within the furnace without delay. The furnace must be gradually brought up to its working maximum with the idea in mind that the clinker will be at a bright red heat when drawn and, to accomplish this end, the clinker is drawn when it ceases to give off zinc fumes. This state is reached about the end of the seventh hour after the charging of the furnace. The entire process is operated virtually on a time schedule and in case of circumstances which would delay the operation of charging to any degree the method requires the forcing of the furnaces to bring them up to schedule.

The working conditions for the furnacemen under this method are particularly severe. When the clinker is at the bright red heat that is necessary, it is at its maximum of toughness and is extremely difficult to remove from the furnace. The severity of the work, coupled with the heat radiating from the furnace and clinker, produces working conditions of a drastic order. The element of time requires that the work be performed rapidly and the entire operation of drawing the clinker and recharging the furnace involves practically 45 min. of so much intensive and exhausting labor that usually no duties are imposed on the furnaceman during the 1¾ hours intervening until the next charge becomes due.

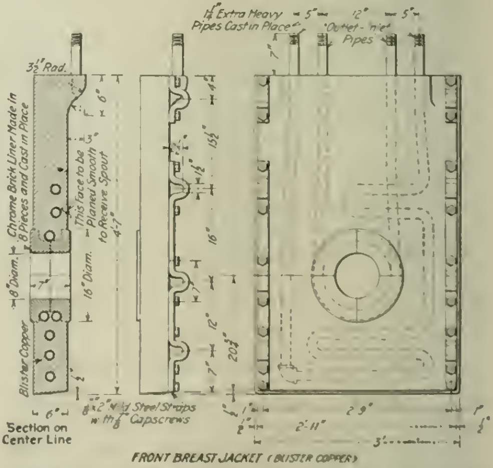
The Western operation is based on a plan of conservation of heat. The theory is that the heat from one furnace should be utilized in a direct manner in aiding the operation of the other furnaces which will thus maintain the heat of the entire block at its unit working temperature. It is held that the passage of the zinc fumes through a series of furnaces of equal temperature produces no ill effects on the resulting product. It is also held that this method of operation will maintain the equilibrium of the block and obviate the necessity of regulating the heat in the entire block through variation in the heat of individual furnaces. The working of the furnaces under this plan permits of a comparatively leisurely operation and increases the working efficiency of the furnacemen at least 100%. As the heat of one furnace is directly communicated to the next furnace, and so on, no furnace is dependent upon itself for working conditions. There is no necessity of forcing the charge by means of the air blast, and the charge burns out completely before it is removed from the furnace. The zinc content of the clinker is reduced to the last possible degree and the clinker itself, being comparatively cold at this stage of the operation, is easily removed from the furnace.

There is no good reason for the existence of the two radically distinct types of zinc-oxide furnaces. The Eastern type is fundamentally an anthracite burner and cannot produce commercial zinc oxide without the use of a smokeless fuel. Its operation is difficult because of the trouble in holding a constant degree of heat. Its method of operation is defined by its structure and the resulting conditions for labor are most severe, tending to increase cost.

The Western type may be styled a universal furnace. It can be operated on various grades of fuel and can produce commercial zinc oxide not only from anthracite and other smokeless fuels but also from semi-bituminous coal. It will produce a clinker lower in zinc than the Eastern furnace and the finished product of zinc oxide will be of equal quality. There is no trouble in conserving the heat, and the labor conditions are such that except in extremely hot weather no trouble is experienced in training men for the work. Its range of operation is greater and more flexible and permits a wider field of successful operation than can be accomplished under the limited conditions imposed by the Eastern type of furnace.

Chrome-Brick Bushing for Water-Cooled Copper Breast Jackets

The front breast jacket used in a 54 x 360-in. copper blast furnace, operated by the Granby Consolidated Mining, Smelting and Power Co. at Anyox, B. C., required frequent replacing and was a continual source of annoyance. The jackets used were made of converter copper cast around 1¼-in. extra-heavy cooling pipes. As a large amount of low-grade corrosive matte had to be handled, the life of such breast jackets was of short duration at the Granby works.


1¼" Extra Heavy Pipes Cast in Place
5"
12"
5"
Outlet-Inlet Pipes
3½" Rad.
6"
3"
15½"
16"
12"
7"
20¾"
Chrome Brick Liner Made in 8 Pieces and Cast in Place
This face to be Planed Smooth to Receive Spout
4'-7"
8" Diam.
16" Diam.
7"
Blister Copper
6"
Section on Center Line
⅜ x 2" Mild Steel Straps with ⅝" Capscrews
1"
2'-9"
2'-11"
3'
½"
FRONT BREAST JACKET (BLISTER COPPER)

CHROME BRICK BUSHING IN GRANBY BREAST JACKET

To obviate this, chrome-brick liners were inserted around the connection hole as shown in the accompanying sketch. This chrome-brick bushing protected the jacket from the cutting effect of the matte and gives an almost unlimited life to the breast jacket if the chrome brick be renewed whenever the furnace is down for general repairs.

A Group of Distinguished Metallurgists

ROBERT C. STICHT

WILLIAM WRAITH

JAMES HEGGIE

FOREST RUTHERFORD

Copper Metallurgy of the Next Generation, a Forecast

BY EDWARD P. MATHEWSON*

A prophetic suggestion of conditions that will confront the future metallurgist. He will be replaced by the industrial chemist who will simplify processes and increase recoveries. "Labor problem" of today to be solved by more democratic management with "Brains, Capital and Labor" as partners.

WITHIN a very few years, unless all signs fail, the copper metallurgist will be replaced by the industrial chemist or the chemical engineer. A great advance has been recorded in copper metallurgy during the last 30 years, but still greater achievements will soon be chronicled.

The first great change that will take place will be the substitution of electricity for all other forms of power and also for carbonaceous fuel in the smelting of the ore except in those cases where carbon reduction is necessary. The electricity will be generated either at hydro-electric plants or at the coal mines.

The electrification of the Butte, Anaconda & Pacific Ry. and the Chicago, Milwaukee & St. Paul Ry., in Montana, has been accompanied by such a great financial saving that as soon as the great war is over the attention of the whole world will be called to the electrification of its railroads. In the East there are several examples of electrified railway terminals. Coal mines even now could be used as generating stations for electrical power. Electricity is transmitted 300 miles in any direction without great line loss, so that generating stations at mines 600 miles apart would solve the problem. It is not too much to expect that electricity will be transmitted 1000 miles without serious loss. Today there are known coal deposits at sufficiently frequent intervals across the American continent to permit the above scheme to be carried out.

Another important discovery will doubtless be made, namely, a method of converting heat directly into electricity. Then electricity will be by far the cheapest source of power and will be applied in all branches of copper metallurgy.

The advocates of conservation will soon put a stop to the present wasteful system of hauling coal to haul coal. All railroads will be electrified. The next step will be to discover the method of really harnessing the lightning. The apparatus required will be simple and the amount of power available tremendous.

In metallurgy proper the complication of processes now in use will be discarded and the model smeltery of today will soon be regarded as a crude and wasteful affair. One simple operation will extract the metal from the ore and put it in the form of matte which will then be treated chemically for the extraction of all its constituents. Of course, in many localities even the smelting operation will be omitted and the ore treated chemically from the start. In very favored instances the ore will be treated in place.

The wire-rope tramway will disappear and ore will be transferred from mountain side to smeltery by giant aëroplanes that will act like enormous hawks seizing their prey and carrying it away in their talons. In those plants where smelting is practised all gases will be purified, separated one from the other and saved. Nitrogen and its compounds will be most important by-products of the smeltery. Sulphuric acid and condensed sulphur dioxide will be regular products of every large plant. The farmer will welcome the smeltery to his locality for two reasons: In order to bring him a good market close to the farm for his product and to make cheap fertilizer available, for the smeltery will soon be the chief producer of complete fertilizer, of which arsenic will be an important constituent. All the rare metals will be saved and such bothersome, common metals as zinc and aluminum will add to the revenue of every up-to-date plant. Refineries will preferably be built near the source of power.

The labor question will be largely solved. Capital will be considered as "cold-storage labor." It will not regard labor as the hired servant, neither will labor regard capital as its slave. There are three important factors in each industrial enterprise: "Brains, labor and capital." Some one is said to have asked Andrew Carnegie which of the three was the most important, and the canny Scot replied by asking, "Which is the most important leg of a three-legged stool?"

These three elements will be regarded as partners As an indication of what is coming, numerous profit-sharing schemes may be cited today and in some cases labor is even represented in the local management of industries. Labor is surely going to have just as much to say as capital on the board of directors. The brains (technical, managerial and financial) will probably hold the balance of power.

Boards of directors will be such in reality and not only in name. Dummies will be absent from them. The true state of affairs will be known to every one on the board and thus to every one connected with the establishment. With perfect frankness in these matters a real democratic management and set of employees will result. In this way the labor agitator will be dethroned. The company's interest is the interest of every employee, and the millenium is at hand. Joking aside, there is no doubt that the labor problem will be solved along some such lines as above. Capital will have to be content with smaller returns.

Taxation will have to be regulated in such a manner as to keep capital employed. It may be necessary that a provision be made whereby excess labor can be used in Government enterprises, public works, etc. With this provision or safety valve for the labor of the country, prosperity will reign and we shall truly have a "government of the people, by the people and for the people." If we are not happy then it will be our own fault.

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*General manager, British America Nickel Corporation, Toronto, Ont., Canada

Metallurgy of Antimony[*]

By K. C. Li[†]

Production of "antimony crude," antimony oxide and regulus is described together with the developments of the Herrenschmidt process as used in China. The principal types of furnaces are illustrated.

STIBNITE, Sb_2S_3, antimony sulphide or antimony glance, is the chief ore from which antimony is extracted. The other ores, such as cervantite, kermesite, etc., occur only in small quantities in nature and are generally mixed with the stibnite before smelting. Up to the present, dry methods of extraction have proved most successful and are generally adopted. The more or less pure sulphide of antimony is called antimony needle or antimony "crudum" while the refined metal is called "antimony regulus."

REVERBERATORY FURNACES OF WAH CHANG MINING AND SMELTING CO., CHANGSHA, CHINA

Sixteen of these furnaces are used to reduce the antimony oxide produced by the modified Herrenschmidt process. In the foreground on either side of the firebox are the first and second slag skimmings. The first slag skimmed is discarded; the second slag—at the right—is saved and retreated. On top of the furnaces are piled for drying the oxides saved from the scrubbing towers

One of the first and simplest steps in the smelting of antimony is the process called "liquation" of crude antimony. Ores containing over 90% sulphide are considered crude and receive no further treatment. Ores containing less than 90% and more than 40% sulphide are converted into crude antimony by means of the liquation process. Ores to be treated by this process should not be crushed too small, walnut size being the most convenient. If the ore is too large the heat will not penetrate effectively, and the same thing results if the ore is finely powdered and packs closely together. Ores containing less than 40% sulphide are used for producing regulus direct.

In the liquation process it is important to maintain the proper temperature, which is a red heat. Any increase of temperature leads to volatilization of the sulphide, whereas any decrease results in too much sulphide being left in the residue. Liquation may be carried out either by (a) intermittent working in pots, or (b) continuous working in tube furnaces or in reverberatory furnaces.

In China the former is the usual practice although it is generally supposed to be less efficient than continuous liquation. In the first method the smelting is done in pots which may be heated by actual contact with the fuel in the furnace or by the flame only. Pot liquation is simple and can be carried out easily at the mine. With rich ores and cheap fuel it is a satisfactory method. In China the liquation is carried out in a narrow furnace built of ordinary brick, each furnace containing two pairs of pots or crucibles. One pot sits above the other and the ore is charged into the upper pot. The heat liquates out the sulphide, which trickles through one or two ½-in. holes in the bottom of the upper pot into the lower or collecting pot. When sufficient of the molten sulphide has accumulated in the lower pot, it is ladled out into molds. Each pair of crucibles is fired independently, being separated from its neighbor by a partition wall. The lower pot is embedded in the ashes so as to avoid the full temperature of the furnace. The pots used are manufactured locally and last from 300 to 360 hours according to the labor conditions. The Chinese evidently consider that the advantages possessed by this method more than outweigh the disadvantages and inefficiency of intermittent working. The furnace (Fig. 1) is cheap and easy to build; the operation requires but little skill or experience.

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[*] Excerpt from a paper entitled "Antimony, Its Metallurgy and Uses," read before the American Institute of Metals and reprinted from its "Journal," Vol. 11, No. 1, with additional illustrations and descriptions, supplied by the author.

[†] Mining engineer and metallurgist, Woolworth Bldg.; representative in New York of the Wah Chang Mining and Smelting Co., Ltd., Changsha, China.

At different places in Germany, Hungary, and France the liquation process is conducted in a still more primitive fashion. The pots are heated by being placed on the fuel in an open fire. The upper or charging pots are made of fireclay and are of varying sizes which hold from 10 to about 40 lb. The lower pots or receivers are made of burnt clay and are deeply embedded in the ashes of the fire. The pots are arranged in rows, each row being separated from the next by means of a brick wall. The space around the pots is packed with fuel. The receivers are emptied at convenient intervals and the residues in the charge pots are found to contain usually more than 12% sulphide which is treated as low-grade ore for white oxide, and then for metal when the antimony market is high. When the price was high during 1915 and 1916, the residues in China were reworked. The tonnage of metal produced within two years from residues was not less than 9000 tons.

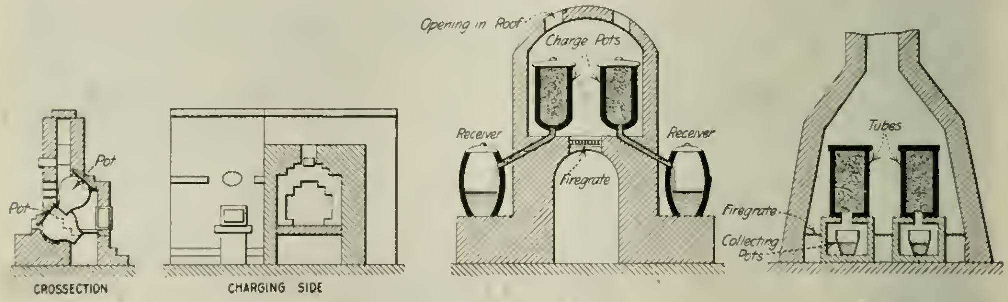


FIG. 1 FIG. 2 FIG. 3

FIGS. 1 TO 3. EARLY TYPES OF LIQUATION FURNACES FOR PRODUCTION OF ANTIMONY CRUDE

By placing the pots in a furnace (Fig. 2) instead of in an open fire, heat is conserved, fuel is economized, and it is possible to work with lower-grade ores. The pots containing the charges are placed alongside the fire grate and the receivers are placed either directly below the bed of the furnace and surrounded by sand, or, better still, they are placed outside the furnace altogether and connected by clay pipes to the bottom of the charge pots. The advantage of the latter method is that the receivers can be emptied whenever necessary without interrupting the working of the furnace.

It has already been stated that intermittent working is expensive in fuel and uneconomical in results. Better results are obtained by the adoption of continuous working in tube or reverberatory furnaces. The tube furnace (Fig. 3) is built of brickwork, the inside being firebrick. There are three fire grates completely surrounding the tubes which are arranged in groups of four, the tubes are over 3 ft. high and are 10 in. in diameter at the top, tapering to about 7¾ in. at the bottom. The tube walls are approximately ¾ in. thick. In the side of each tube is a small hole through which the residue can be removed. During working, these holes are closed with a clay plug. Underneath the tubes are little chambers containing the receiving pots which may rest on the floor of the chamber or may be placed on a carriage provided with wheels. The charge for each tube is about 5 cwt., a charge requiring about three hours for complete liquation. If coal is used, the fuel consumption is about 65% of the sulphide production; that is, 65 cwt. of coal is burnt in securing 100 cwt. of crude antimony.

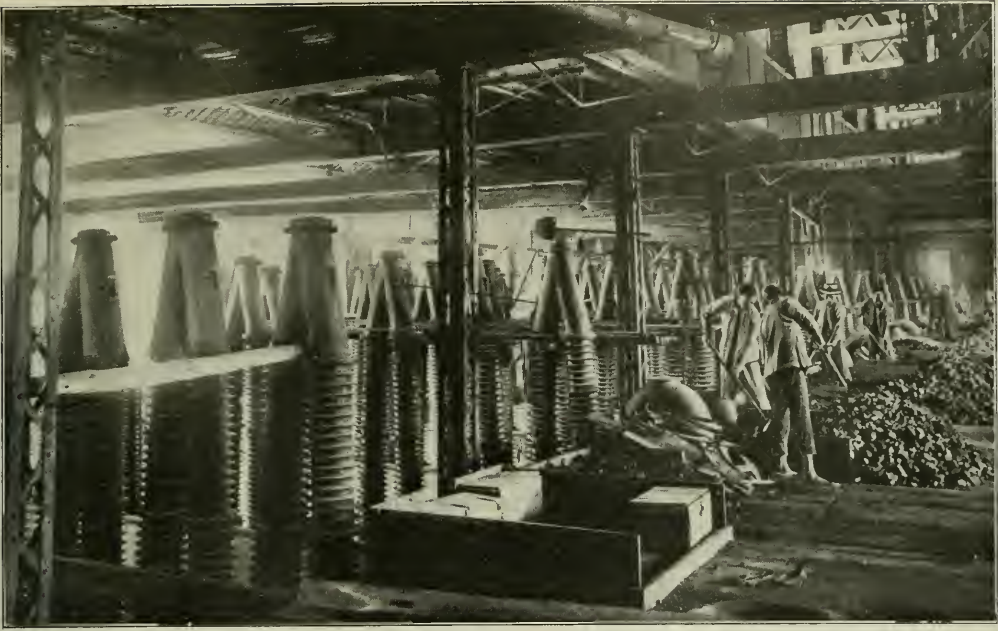
Continuous liquation is sometimes carried out in ordinary reverberatory furnaces with a taphole placed at the lowest point in the bed for tapping the molten sulphide. The advantages are: (1) Less expense for fuel; (2) less labor required; (3) furnaces require fewer repairs; (4) large quantities of sulphide can be produced in a short time. The disadvantages are: (1) Cost is heavy; (2) there are heavy losses, due to volatilization during the operation. The volatilization can be offset by using the Herrenschmidt condenser.

In commerce, antimony regulus or metal is the most important product of antimony smelting, and some details of the different processes in use for producing antimony metal will now be considered. The method adopted for the production of metal depends upon the quality of the ore to be smelted. Low-grade ores, such as are produced by the Wah Chang Mining and Smelting Co., of Changsha, China, cannot profitably be smelted directly into metal. Such ores must first be converted into oxides and then reduced in reverberatory furnaces. On the other hand, rich ores may be converted into metal by direct methods although in China it is a more common practice to convert the richer ores into a crude form, oxidize it into oxide in reverberatory furnaces and then reduce into metallic antimony.

As low-grade ores are more plentiful than rich ores, the process of oxidizing the ore and then reducing the oxide is the more important and should be considered first. When antimony ore undergoes an oxidizing roast, the product is either the stable tetroxide or the volatile trioxide. If the latter is obtained, the roast is called a volatilizing roast.

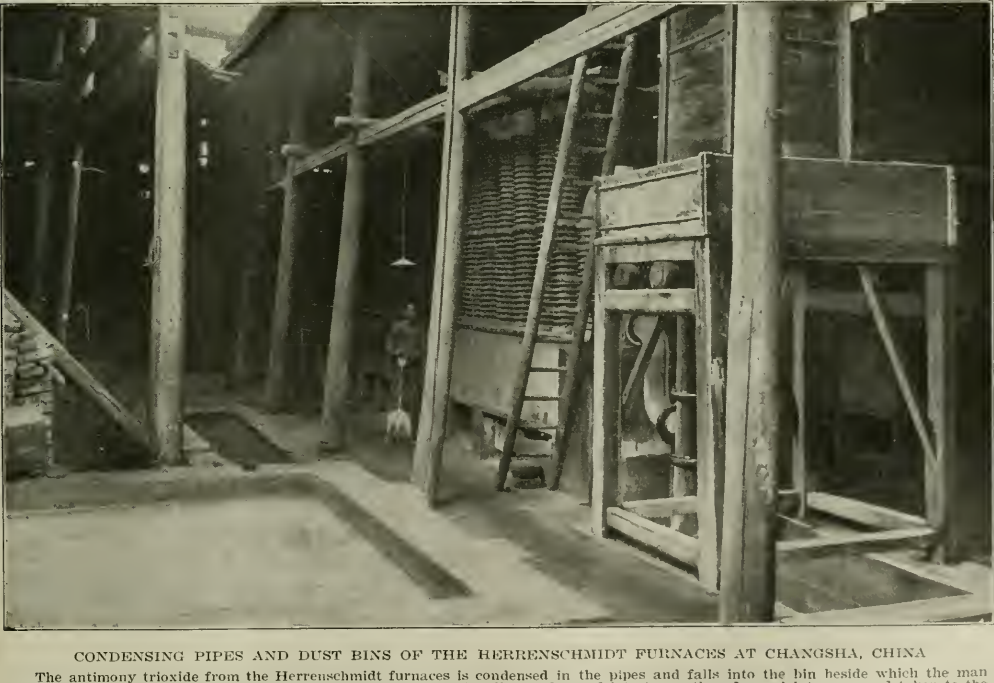
When antimony glance is heated a little over 350° C., the trioxide is formed and sulphur dioxide is given off.

$$Sb_2S_3 + 9O = Sb_2O_3 + 3SO_2$$



FEED FLOOR IN THE HERRENSCHMIDT DEPARTMENT OF THE WAH CHANG ANTIMONY WORKS

After considerable experimentation the Wah Chang Mining and Smelting Co. succeeded in placing the Herrenschmidt furnaces on a satisfactory operating basis. The furnaces are shaft furnaces, of which four are used, producing antimony trioxide, which is in turn reduced in reverberatory furnaces producing a high-grade antimony. The condensing pipes which form a prominent feature of this view are shown from a slightly different angle in the lower illustration. The ores are fed by hand, with two men to each furnace. This plant is at Changsha in the Province of Hunan



CONDENSING PIPES AND DUST BINS OF THE HERRENSCHMIDT FURNACES AT CHANGSHA, CHINA

The antimony trioxide from the Herrenschmidt furnaces is condensed in the pipes and falls into the bin beside which the man is standing. The oxide is removed at intervals through the handholes, dropped into trays, then dumped into cars and taken to the reverberatory-furnace department. The gases and any uncondensed fume are passed through the scrubbing towers at the right

A part of the trioxide is further oxidized to the pentoxide, Sb_2O_5, which, combining with some of the trioxide, forms the tetroxide Sb_2O_4. The roasted material should consist chiefly of tetroxide but under ordinary conditions the product may contain antimony glass, undecomposed sulphide, etc. The proper temperature (about 350° C.) should be maintained and the charge must be prevented from fritting by constant and regular rabbling. The richer ores cause more trouble through fritting, and the presence of gangue is found to help in preventing fritting. The temperature should be raised toward the end of the roast, so as further to roast any remaining unoxidized sulphide. An ore properly roasted has an ashy gray color on cooling and should not frit in the furnace. Excess of air is, of course, necessary to produce the tetroxide, otherwise the volatile trioxide would be the product.

The roasting of stibnite for the production of tetroxide of antimony is now generally carried out in reverberatory furnaces provided with condensing apparatus. The furnaces are of two kinds: (1) Egg-shaped intermittent hand-rabbled furnaces; (2) long-hearth reverberatory furnaces also rabbled by hand, the charge being moved progressively from the cool or feed end as in the old hand reverberatory furnaces formerly used for roasting lead ores.

In the egg-shaped furnace (Fig. 4) from 5 to 6 cwt. of ore can be roasted in about six hours. The door must be closed during the first two hours, but should be opened toward the end so that air is admitted freely and the workmen can rabble the charge well to prevent fritting. There is about 4–8% loss of antimony, depending upon the skill of the laborers.

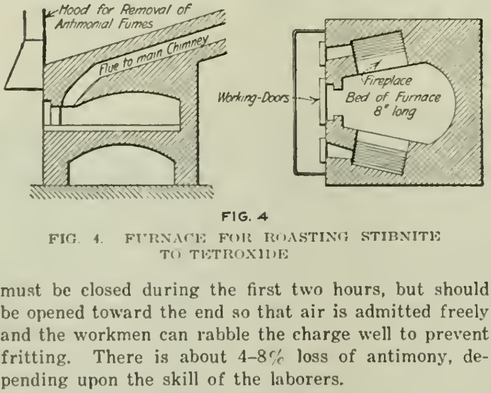


FIG. 4

FIG. 4. FURNACE FOR ROASTING STIBNITE TO TETROXIDE

In the German type of hand furnace there is a long bed of over 40 ft., having a width of 7 ft. 6 in. The furnace is capable of holding about 30 cwt. and there are working doors along each side. Five or 6 cwt. is charged in at one time and there are three charges in 24 hours. Each charge remains in the furnace about 40 hours. The charges are gradually worked from the cooler to the hotter parts of the furnace, and during the last two hours the heat is strong and the charges are rabbled almost continuously. Generally speaking, rich ores require a longer time to roast and freer admission of air.

Volatilizing Roasting

When it is desired to produce the volatile trioxide of antimony, recourse is had to the process of volatilizing roasting. In this method the admission of air is restricted and higher temperatures are required; the trioxide is readily formed by admitting steam at a high temperature, and at the same time the hydrogen combines with the sulphur in the stibnite to form hydrogen sulphide. The many advantages derived from adopting this method have brought it into general favor, and it is extensively used in one form or another both in France and China.

Its advantages are: (1) Arsenic oxide is more volatile than antimony trioxide and can be separated therefrom. (2) When the ores contain precious metals, these are generally found in the residues after volatilization. (3) It is the only method really suited to low-grade ores. (4) Condensation is more efficient and loss is almost eliminated. (5) Less fuel is required, as the sulphur in the ore can be utilized as fuel. (6) The condensed trioxide can be reduced to metallic antimony or it can be marketed as white oxide, without further treatment, to make paint, enamels, etc.

Important Developments of Herrenschmidt

Although Mr. Herrenschmidt was not the originator of the volatilization method it is not too much to say that his work in this direction was the most successful and resulted in great improvements in the method. I therefore feel justified in devoting most attention to describing the Herrenschmidt process and only glancing at others.

The method of producing trioxide of antimony by volatilization was first applied in 1844 and between that year and 1881 gradual improvements were effected. In 1881 Mr. Herrenschmidt patented a process which was the forerunner of his later and greatly improved processes.

A low-grade ore, say 20 to 25% antimony, was placed in a blast furnace or cupola with about 10% of coal. For an oxide ore larger percentages of coal were needed. In this furnace the ore was smelted to produce the volatile trioxide, which passed from the furnace into a condensing chamber directly connected to the furnace. Any trioxide not being condensed in the condenser passed along to a reservoir containing water and was there condensed. The air necessary for oxidation was drawn in by a fan seated at the far end of the water reservoir. Part of the oxygen drawn in combined with the sulphur in sulphide ores to form sulphuric acid.

The chief fault in this process was that the condensation was not as efficient as it might have been, and some years later, in 1903, the inventor took out another patent which was a decided improvement on his first one. He saw that the condenser must possess a large cooling surface, have great facilities for deposition of the oxide and also be able to subdivide the current of volatile oxide. All these were provided for in his 1903 patent. The arrangement of the apparatus is shown in Fig. 5.

The ore is charged into the furnace A where it is roasted to produce the oxide. A fan H draws the volatile oxide into the flues B as shown by arrows, then through a series of condensing tubes D. Any uncondensed oxide passing through the fan is absorbed by the water contained in the tank J. The tubes are covered on the top by the casings C while underneath the tubes are other casings E. It should be noted that the oxide has to traverse a tortuous path, and in so doing it comes in contact with a large cooling surface. The lower cases E are provided with inclined walls F which greatly facilitate the removal of the condensed oxide. The transverse section on the right of the main sketch gives a better idea of the tubing and the manner of removing the condensed oxide.

In 1908 Herrenschmidt again improved on his previous patents. The furnace was improved and the flues between the furnace and the condensing pipes were eliminated, so that the oxide passed directly from the furnace to the condensers. The casings over the tops of the pipes were discarded, and the pipes were joined together at their tops to form a series of inverted V's, as shown in the views of the Wah Chang plant at Changsha; in addition to these improvements two ventilators were introduced, and any volatile trioxide passing through the fans was condensed by coming in contact with water sprayed down at intervals through a coke tower. In 1909 the Wah Chang Mining and Smelting Co., Ltd., of Changsha, China, bought the patents of Herrenschmidt to convert low-grade stibnite ores and the residues from the liquation process into antimony oxide. The tonnage of antimony residues in Hunan Province, China, was large, but since this process was adopted the residues have been nearly smelted out, and may account for the recent great increase in production.

The oxide produced by the Herrenschmidt process is smelted with some fluxing materials in a reverberatory furnace to produce antimony regulus. The yield of oxide is over 90% of the antimony content, and about 6 tons of low-grade ore can be treated in 24 hours, the fuel consumption being 4 to 5% of coke, or 6 to 7% of charcoal. The percentage of extraction and the consumption of fuel depends chiefly on the skill of the laborer. The ore and fuel should be charged into the furnace frequently and spread out so that the ore is thoroughly burned and the antimony contents are fully volatilized. By doing this the percentage of fuel can be cut down to about 2 to 3% and the yield of oxide can be increased to 95 per cent.

In 1902 M. Plews patented a process for the production of antimony oxide. In his process the sulphide ore is crushed into small pieces and charged into an ordinary type, rotary furnace, which has been previously heated to a dark red. An oxidizing flame is then produced in the furnace, and the temperature increased to a light red. This temperature is maintained until all the volatile trioxide is given off. The oxide is drawn off into condensers by means of a fan in the usual way and the last traces of uncondensed oxide are absorbed by coming in contact with water. The oxidizing flame is obtained from coal or producer oil-gas.

In Italy in 1907 a process was invented of which the chief features were the following: (1) Cold water runs continually along the roof of the condensing chambers. (2) Sacks are suspended in the chambers to catch the condensed oxide. (3) The smoke is passed through a chamber containing a number of filter bags and is there robbed of any volatile oxide which it may contain.

The last phase in the metallurgy of antimony is the production and refining of metallic antimony. Unrefined antimony metal is sometimes called crude antimony, but as such metal is never marketed, the name is unnecessary and might be confused with the liquated sulphide which is also commonly called crude antimony or more correctly antimony crudum.

Antimony metal may be obtained from the oxides (trioxide or tetroxide), antimony crudum, or by direct smelting of antimony ores. The first two sources are generally used. Reduction of the oxides is carried out either in reverberatory furnaces, water-jacketed furnaces, or blast furnaces. In reducing the oxide, care must be taken to guard against volatilization and also to prevent any unaltered sulphide remaining in the mass. A fusible slag composed of substances such as potash, soda, Glauber salt, etc., is provided, and being lighter than the metal, forms a cover which prevents volatilization, and at the same time dissolves any sulphide of antimony present. The slag also acts as a refining agent, carrying off most of the impurities which may be in the oxides. The ores produced by the Wah Chang company carry a low percentage of antimony, and the volatilization and reduction processes are used, because they are cheaper than any other method, and produce a metal of high purity. By these processes a large quantity of antimony can be conveniently smelted, and the company has been able to increase greatly its production to meet the extra demands for antimony created by the present war.

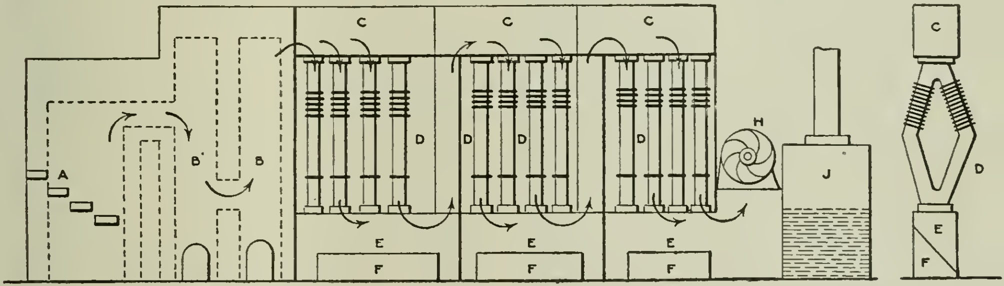


FIG. 5. HERRENSCHMIDT 1903 APPARATUS FOR PRODUCTION AND CONDENSATION OF ANTIMONY TRIOXIDE

Reduction with Reverberatory Furnaces

The reduction of ores in reverberatory furnaces is simple and easy to control but is attended by heavy loss of antimony and is seldom used except for rich ores and cheap fuel. The loss of metal is generally about 20% and may be even 30 to 40% with careless working.

Oxides mixed with oxide ores, liquation residues, antimonial flue dust, etc., are charged into reverberatory furnaces having an egg-shaped bed. The dimensions of the furnace (Fig. 6) are: Length about 8 ft.; width in center, 5 ft. 3 in.; width at bridge, 3 ft. 4 in.; height of bridge, 1 ft. 4 in. At the deepest part of the bed is a hole through which the metal is tapped. An 8-in. flue leads into condensing chambers about 400 ft. long. The antimonial vapor passes into these chambers and is there deposited. The condensate obtained from the chambers may contain as much as 50% of antimony.

The furnace charge consists of about 500 lb. of roasted ore, oxidized ores, flue dust, etc., together with about 100 lb. of flux, composed of salt, soda, about 70 lb. of ground charcoal and sometimes a small quantity of Glauber salt. It is also found to be good practice to re-melt about 300 lb. of slag from previous charges. The flux is charged into the furnace first, and when it is melted down and all boiling or agitation of its surface has ceased, the other materials are charged into the furnace, about 40 lb. every 15 or 20 min. The charge is then well stirred, and the scum produced is drawn off. After the last charge has been put in, the temperature of the furnace is raised and kept up until the process is completed.

During the smelting the charcoal acts as a reducing agent, robbing the antimony of its oxygen, while part of the soda combines with the sulphur and the remainder helps to form a slag with the gangue. Any other metals present are carried into the slag, as sulphides, by the action of the sulphide of soda which is produced through the reduction of the Glauber salt by the charcoal. Common salt serves the same purpose by carrying foreign metals into the slag as chlorides. The fuel consumption is somewhere between 5 and 6 cwt. per charge and the loss is about 14 to 15%. When considerable antimony sulphide is present, a little iron or iron slag may be added to assist in reducing the sulphide. When the smelting is complete, the metal is drawn off into molds through a tapping hole, and during the cooling in the mold care must be taken to have it completely covered over with slag. When the metal solidifies, the slag is knocked off by hammering.

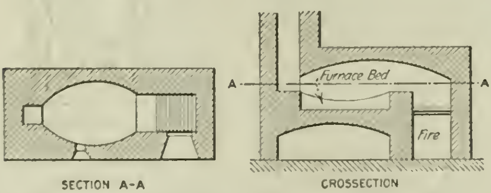


FIG. 6. REVERBERATORY FURNACE FOR REDUCING ANTIMONY OXIDE TO REGULUS

The trioxide produced by the volatilization method can be reduced in an ordinary reverberatory furnace provided with the Herrenschmidt condensing apparatus. The furnace is first heated, then charged with the following: Ten parts of the trioxide; 6 parts of the sulphide (crude); 1 part of carbon (charcoal or anthracite). The charge is thoroughly rabbled after about six hours in the furnace and the metal separates out from the slag and is soon ready for tapping into molds. The "starring" of the regulus is done in the mold. A purifying mixture, composed of 6 parts of carbonate of soda and 4 parts of antimony trioxide, is melted down in a small chamber at one end of the reverberatory furnace. When the metal is ready to be tapped some of this molten mixture is poured into the molds to be used. The regulus is then run into these molds, and the purifying mixture, being lighter, immediately comes on top, forming a cover over the regulus. When the metal solidifies, any of the mixture remaining on top is removed by hammering.

Reduction of roasted ores may also be carried out in water-jacket blast furnaces. The ores, having been first roasted in a reverberatory furnace, are charged into a shaft furnace with three tuyeres. A fluxing charge is added, and after reduction is complete the metal is drawn off. The metal obtained is by no means pure and requires to be further refined.

Herrenschmidt suggests that the trioxide could be reduced in a water-jacketed furnace in the following manner. Balls, about the size of an egg, are made up of 82% trioxide of antimony, 12% carbon and 6 to 7% carbonate of soda. These balls, mixed with 5 to 20% coke, are charged into the furnace and there reduced. The loss of oxide due to volatilization is considerable but may be recovered by using the Herrenschmidt condensers. The metal obtained is impure and must be re-melted, either in a crucible or a reverberatory furnace, in order to refine it.

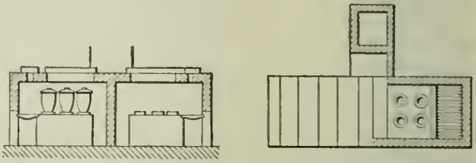


FIG. 7. FURNACE USED FOR REDUCTION IN CRUCIBLES

Reduction in crucibles is a method sometimes adopted when the ores are rich, or when antimony crude or volatile oxide is used to produce the metal. Large quantities cannot be treated and the cost is high. Herrenschmidt claims to have a process of reduction in crucibles, in which it is possible to smelt and refine or "star" the metal in one operation. Balls consisting of antimony oxide, powdered anthracite, carbonate of soda and water are charged into crucibles contained in a furnace (Fig. 7) and reduced to regulus.

Antimony crude or antimony "needle" is frequently marketed and used for various purposes, such as vulcanizing rubber, match making and the manufacture of ammunition. As the market for crude is limited, it is necessary to convert the greater part of it into antimony regulus. This may be done in one or two different ways: (1) Converting the sulphide into antimony oxides and then reducing the oxides in reverberatory furnaces. (2) Direct smelting of the sulphide to metal, iron being added as the reducing agent.

The Wah Chang Mining and Smelting Co., having a monopoly of antimony smelting in Hunan Province in China, is in a position to obtain large quantities of crude from other companies that have no facilities for producing regulus. The Wah Chang company tried the direct method of reducing the antimony sluphide, but owing to its inconvenience and cost, this method was abandoned in favor of the first-mentioned method. The antimony crude is powdered and charged into a furnace where it is oxidized. The oxides produced are either the stable tetroxide or the volatile trioxide.

These oxides are reduced with the oxides obtained by the roasting of low-grade ores. In this connection it might be noted that the Wah Chang company has recently adopted a method for volatilizing roasting, which is claimed to be as good as the Herrenschmidt process. Instead of using the elaborate Herrenschmidt condensers two long, simply constructed condensing chambers are used. At first these chambers were not fitted with any baffle plates, and it was believed that the introduction of baffle plates would greatly increase the condensing efficiency.

Production by the Crucible Process

In the direct process of reducing the antimony crude the crushed sulphide or perhaps rich ore is charged into crucibles which are put in a crucible furnace. Iron is added and the sulphur, having a greater affinity for iron, combines with it to form iron sulphide, and antimony metal is left. The high specific gravity of the iron sulphide makes it difficult to separate the metal from the iron sulphide. This difficulty is overcome by adding sodium sulphate and carbon, which combines with the iron sulphide to form a fusible slag of low specific gravity. The iron is generally in the form of shavings, or turnings, and common salt may be used instead of sodium sulphate and carbon. In this process the chief losses are due to volatilization and to loss of metal carried away in the slag, and may amount to 35% or more. The metal produced is impure and must be remelted to refine and "star" it.

The extraction of antimony by wet methods is still a matter of academic discussion rather than practical application, and I shall therefore pass over these methods in the present discussion and conclude the metallurgy of antimony with a few words on the methods employed for refining the metal.

Refining of Antimony

The impurities generally found in antimony are sulphur, iron, arsenic, copper and lead. The latter occurs frequently as it is a common thing to find antimony and lead together in ore. Arsenic can be separated out during oxidizing, while the other impurities must be carried off in the slag. Copper and iron can be removed by the addition of antimony sulphide, together with soda or potash, or Glauber salt and charcoal. The addition of soda or potash also helps to remove sulphur by fusion, and converts arsenic into arsenate of soda or potash. It is somewhat difficult to remove the lead, and when antimony ores are found to contain a considerable percentage of lead, they may with advantage be smelted together with lead ores to produce hard lead.

In the trade the purity of antimony is generally judged by the "starring." The "star" either does not appear or it is poorly defined if the antimony is impure, if the pure metal is exposed during solidification or if the slag covering sets before the metal does.

In the Herrenschmidt method, as used by Wah Chang company, the refining is practically done in the furnace, while additional refining and "starring" are accomplished by means of the starring mixture poured into the molds ready to receive the molten metal.

The metal obtained by the smelting processes adopted in Mexico, England, Hungary and other countries is so impure that refining must be carried out as a separate process. In England the impure metal is broken up small and charged into pots or crucibles which are placed close to the fireplace in a crucible furnace. Whenever the metal commences to melt, the purifying or "starring" charge is added and the flux must cover the metal completely. When fusion appears to be complete the mixture is stirred once with an iron rod and the charge is poured. The success of the operation is judged by the appearance of the slag which should be smooth and of a deep-black color.

Copper-Casting Apparatus

Like everyone else, the Consolidated Arizona Smelting Co., of Humboldt, Ariz., finds it almost impossible to get quick shipments on new machinery and, in order to handle the increased production, it built in 20 days the copper-casting machine shown in the accompanying illustration. The old copper trucks, which were originally used for handling the bullion direct from the converters, have been utilized in the new installation.

COPPER-CASTING APPARATUS BUILT IN 20 DAYS AT CONSOLIDATED ARIZONA SMELTERY

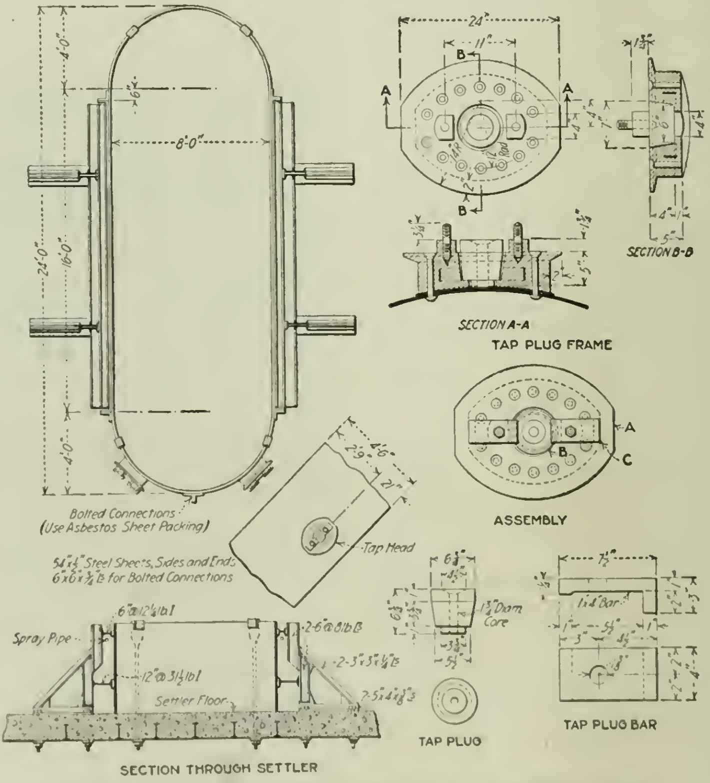
The principal points of interest are the pouring of the molds underneath the casting ladle—which keeps the bottom of the ladle hot and prevents heavy skulls from forming—and the loading of each charge direct into the car for shipping. The men operating the machine trim the bars. A chain block is used for tilting the ladle, and a winch for moving the trucks carrying the molds. The ladle is lined with hot slag once every 24 hours, and easily handles 100 tons of bullion per day.

Tennessee Copper Co.'s New Settlers

By T. W. Cavers*

At the smeltery of the Tennessee Copper Co., Copperhill, Tenn., the round settlers formerly used have been replaced by narrow ones, 8 ft. wide and 24 ft. long, in the shape of a rectangle, 8 ft. by 16 ft., to which is added semicircular ends of 4-ft. radius. The straight part on the sides of the settler is a single sheet, stiffened by two I-beams and supported by knee-braces. The semicircular end next to the furnace is made in one piece; the other end is in two pieces, each having a tap head for removing matte.

All the pieces are joined together by heavy bolts through cast-steel angles which are riveted to the sheets. Sheet asbestos is used to make the joint tight. Half-inch steel plate is used throughout. The sheets rest on their edges on the concrete floor to which they are anchored.



NEW SETTLER OF TENNESSEE COPPER CO. AT COPPERHILL, TENN.

A spray line runs completely around the settler and the water is caught in a concrete ditch in the floor. There are two slag spouts, each connected with a launder. The slag stream is cut off by a piece of clay on the end of a "dolly bar." The settlers are lined with a refractory brick, preferrably chromite. The bottom is about 16 in. thick and consists of four courses of standard-size brick, laid on the concrete floor, one on edge, one flat and then two on edge. The sides are built of 9-in. brick with the end of the brick tight against the steel. For the circular ends, No. 2 keys and 9-in. straights are used.

Tap heads and plugs are made of cast iron. The plug fits the round hole in the tap head; it is luted with retort cement and held in place by lugs and set screws. The tap head is cast around a wrought-iron or steel hoop to prevent cracking vertically when in use.

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*Smelter superintendent, Tennessee Copper Co., Copperhill, Tenn.

Theory of Contact Catalysis

Theory of contact catalysis was discussed by Prof. Wilder D. Bancroft, in a paper before the American Electrochemical Society, from the standpoint of adsorption upon the catalyst as the determining factor controlling catalytic action. He concludes that: (1) Only those substances which are adsorbed by a solid are catalyzed by it; (2) while the catalytic action of solids may be solely the result of the increased surface concentration in some cases, this is not always the only factor; (3) a solid catalytic agent may be considered as equivalent to a solvent and may therefore displace the equilibrium; (4) as a result of selective adsorption different reaction products may be obtained with different catalytic agents; (5) a catalytic agent tends to produce the system which it adsorbs the more strongly.

Raritan Copper Works at Perth Amboy, N. J.

The Raritan Copper Works is one of the world's greatest copper refineries. After preliminary furnace refining, the copper is refined electrolytically and finally cast into commercial shapes known as wire bars, slabs, wedge bars, cakes, ingots and ingot bars. Silver, gold, platinum, palladium, selenium and tellurium are obtained from the anode slimes; other byproducts are copper sulphate and nickel sulphate.

THE plant of the Raritan Copper Works is situated 23 miles from New York in Perth Amboy, N. J., at the mouth of the Raritan River. In addition to lighterage service to New York and the foreign steamship lines, the works has direct rail connection with the Pennsylvania, Central of New Jersey and Lehigh Valley railroads. Shipping facilities for incoming and outgoing material are thus unexcelled.

The plant covers an area of 40 acres and has a refining capacity of 40,000,000 lb. of copper per month.

VIEW OF THE RARITAN COPPER WORKS, LOOKING EAST

The materials received from the copper smelteries are all in the form of crude bullion, no ores being handled. Most of the copper received comes from Western smelteries. The greater part of the copper products of the Anaconda Copper Mining Co. of Montana and all of those of the International Smelting Co. of Tooele, Utah, the Inspiration Consolidated Copper Co. of Arizona, the Miami Copper Co. of Arizona, the Greene-Cananea Copper Co. of Cananea, Mexico, and the Pennsylvania Salt Manufacturing Co. of Natrona, Penn., is refined at this plant. In addition, copper is regularly received from the Rio Tinto, British Columbia, Copper Queen, and Arizona Copper companies and also from Japanese and other companies.

The regular products of the plant include all commercial forms of refined copper, such as wire bars, ingots, ingot bars, square and round cakes, wedge bars, slabs and billets. The byproducts produced are refined silver and gold, platinum, palladium, selenium, tellurium, copper sulphate, and nickel salts.

Two grades of copper are produced. The highest, or "N. E. C." brand of copper, is probably as pure a commercial grade as any on the market. It has a high electrical conductivity and meets all requirements where copper of exceptional purity is desired. The second grade, "M. A." and "A. B. S." brands, is a pure ingot copper, and, while of too low conductivity for electrical uses, is exceptionally satisfactory for casting purposes.

Silver, gold, platinum, palladium, selenium and tellurium are obtained from the anode slimes resulting from the electrolytic treatment of the copper anodes. Silver and gold are ordinarily disposed of in the usual bar form; platinum and palladium as sponge. Selenium is produced in several different forms; namely, the red amorphous form, in powder; the vitreous form, in powder, sticks and half-pound cakes. Tellurium is made up into sticks and 1-lb. and 5-lb. cakes. A small proportion of nickel is found in most crude copper. In the process of electrolytic refining this accumulates in the electrolyte and is separated out and crystallized, at this plant, as pure nickel sulphate ($NiSO_4.7H_2O$).

The furnace department, in which crude copper and electrolytic cathodes are melted and refined, contains six refining furnaces with an aggregate capacity of about 2,300,000 lb. of copper per day and five anode furnaces with a total capacity of about 2,000,000 lb. per day. Waste-heat boilers used on the furnaces generate a large part of the steam used in the plant.

Electrolytic refining of the anodes, received from the smelteries and produced in the anode furnaces, is carried on in two tank houses. No. 1 tank house contains 1800 lead-lined tanks and is capable of turning out

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*Excerpts from a description of the Raritan Copper Works, published in connection with an exhibit of its products at the third "Exposition of Chemical Industries," Sept. 24-29, Grand Central Palace, New York.

21,000,000 lb. of cathodes per month. No. 2 tank house, containing 1656 tanks, will produce 19,000,000 lb. per month. The electrolytic slimes resulting from electrolysis of the copper are worked up by fire and electrolytic methods. The silver and gold are parted electrolytically by the Thum and Mœbius systems. Facilities are also provided for recovering the other byproducts already mentioned. Power for refining and general uses is supplied from two power houses. The aggregate capacity of the steam- and electric-generating units is about 14,000 kw.

ELECTROLYTIC REFINING OF COPPER

The electrical industry, which uses most of the copper output, requires a very pure grade which the fire-refining process cannot furnish; moreover, most copper ores carry traces of silver and gold which concentrate in the "blister copper" and are not recovered by fire refining. For these reasons practically all blister copper is refined by the electrolytic method. With two or three exceptions, all the copper refineries of the United States are situated on the Atlantic coast to facilitate shipping the finished material to Europe, for even in normal times the amount of refined copper sent thither far exceeds that consumed at home. Refining at this works may be divided into three stages: Melting the blister copper and casting into anodes; electrolysis and deposition of cathode copper of 99.98% purity; melting cathodes and casting into commercial shapes, such as wire bars for wire mills, cakes for rolling mills, ingots for the brass and alloy manufacturers.

ADMINISTRATIVE BUILDINGS AND MAIN LABORATORY OF THE RARITAN COPPER WORKS

Small brick building in left foreground was used as the Anaconda laboratory before acquisition of the refinery by the Anaconda Copper Mining Co. Circular tank used for storage of ashes. In the background are shown the tank houses to the right and the furnace building to the left

The blister copper is delivered to the refinery in the form of slabs weighing about 300 lb. These are melted in reverberatory furnaces known as blister furnaces of 500,000 lb. capacity, the details of the operation being practically the same as in the refining furnaces to be described later. In this melting but little refining is attempted although some of the impurities are removed with the slag and the sulphur is practically eliminated. The copper is cast into anodes 37 x 28 x 1⅝ in., weighing about 500 lb. A typical assay of anodes follows: Cu 99.25%, Ag 70 oz., Au 0.25 oz., As 0.060%, Sb 0.052%, Ni 0.050%, Pb 0.053%, Fe 0.058%, Bi 0.003%, S 0.004%, Se, 0.008%, Te 0.038%, O 0.100%. Complete analysis would disclose traces of other elements.

The anodes are then electrolyzed in tanks in an acid solution of copper sulphate, usually 16% bluestone with 12% free sulphuric acid. The voltage is about 0.25 volt per tank. One ampere of current per hour deposits 1.186 grams of copper according to Faraday's law copper being divalent. The products of electrolysis are: Cathode copper, 99.98% pure; anode residues and slimes, and impure electrolyte. Of the usual impurities found in blister copper, the nickel, cobalt, iron, zinc and arsenic dissolve and foul the electrolyte, while the silver and gold, along with the rest, remain in the slimes and drop to the bottom of the tanks.

At the Raritan works the multiple system of refining is employed. In this the anodes and cathodes in the tanks are connected in multiple, the tanks themselves being connected in series. The electrolytic tanks are of wood, 118 x 34 x 44 in., and are lead-lined. They are carefully insulated on glass and are so placed that any leakage of electrolyte may easily be detected. There are two tank houses, one of 1800 tanks and the other of 1656 tanks. Four circuits of 7000 amp. in each tank house give a current density of 18 amp. per sq.ft. of cathode surface. The tanks are arranged in nests of 11 cells each, the nests being so placed together so as to circulate the electrolyte in cascade through two tanks. The circulation of the electrolyte is maintained at the rate of 4 gal. of solution per minute per tank.

After leaving the lower tank in the cascade the solution drops to hot wells where it is reheated by means of steam coils to 60° C. and thence pumped to the top of the cascade. Tests have shown that the best conditions for the electrolysis is a circulating solution at 55° Centigrade.

Each tank contains 28 anodes and 29 cathodes. The anodes, each weighing 500 lb., properly spaced, are lowered together by means of a crane into the tanks. Between the anodes are then placed the cathodes, thin starting sheets of copper, 30 in. wide and 37 in. long, weighing about 8 lb. each. At the end of 10 days, with a current of 7000 amp., the cathodes have increased in weight to an average of 125 lb. each. They are then taken out of the tanks, carefully washed to remove adhering electrolyte and sent to the refining furnace for melting. A second set and later a third set of starting sheets follow the same procedure. At the third lifting of cathodes, 30 days from the time they were put into the tanks, the anodes of crude copper have so dissolved that only skeletons of the originals remain. These are known as scrap anodes.

MAKING CATHODE STARTING SHEETS

The cathode starting sheets are made from blanks, called starting blanks, of hard-rolled, polished copper ⅜-in. thick. These blanks become cathodes in regular electrolytic tanks, and in 24 hours so much copper has deposited on them that it can easily be stripped off in thin sheets, which, after being looped, become starting sheets. The copper deposits on both sides of the blank so that one starting blank makes two starting sheets. To prevent the deposited copper from adhering fast to the blanks they are covered with a thin film of grease or oil before electrolysis. They are grooved ½ in. from the edges, the deposited copper parting readily along the groove, giving standard size starting sheets without trimming. After stripping the copper on the edges of the blanks the latter are oiled and again put in the electrolytic tanks, being thus in continuous use.

After the third lifting of cathodes, the solution is siphoned from the tanks. The scrap anodes are washed to remove adhering slimes and are sent to the blister furnaces to be recast into 500 lb. anodes. The slimes are then pumped to the silver department where the gold and silver are recovered in pure condition. The semi-rare metals, selenium and tellurium, are also extracted to an extent corresponding to the limited commercial demand for them. Small quantities of platinum and palladium concentrate in the slimes and are recovered here. The lead, bismuth and antimony are shipped as crude metal to lead smelteries for further purification.

The electrolyte is an acidulated solution of copper sulphate containing 4% Cu and 12% free H_2SO_4. The total impurities, such as Ni, As, etc., are kept below 2%. This is accomplished by purifying a certain percentage of the electrolyte each day. At the Raritan works this is done by a series of crystallizations, whereby the copper in the solution is recovered as "commercial bluestone" and sold as such. The nickel is recovered as high-grade nickel sulphate (single salts). The acid after the removal of the arsenic is used over again in the electrolyte.

The operation of a tank house requires constant vigilance. The power house delivers to the tank house a given quantity of current for which the tank house is supposed to furnish an equivalent weight of cathode copper. Theoretical figures are all based on Faraday's law, but short circuits, bad contacts and leakage of current all tend to lower the efficiency and are carefully watched. Most refineries obtain an efficiency of 90% based on power consumption.

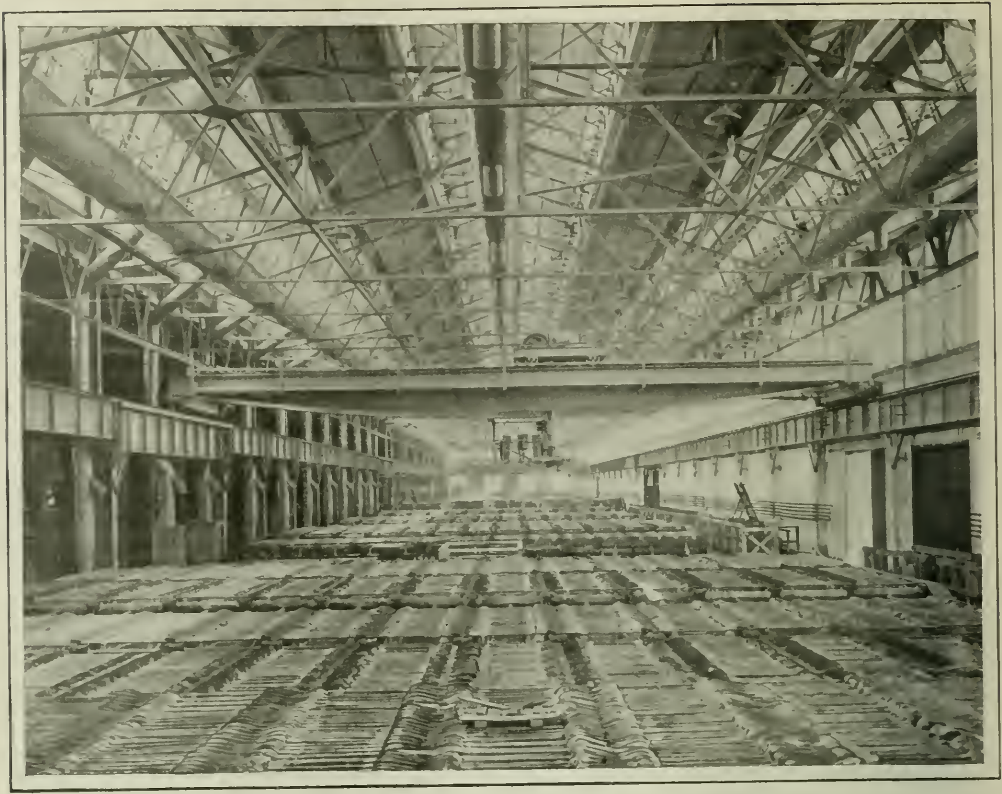
The cathode copper, containing 99.98% Cu, absorbs, when molten, reducible gases, more particularly sulphur, to such an extent that the melting becomes a refining process, refining from the gases absorbed during the melting period. The presence of oxygen, or rather copper sub-oxide, greatly increases the solubility of these gases in cast copper and it is for this reason that from 0.03 to 0.08% of oxygen will always be found in commercial copper.

The copper is melted in large reverberatory furnaces of 225 to 250 tons' capacity. The furnaces in normal times are usually lined with magnesite bricks up to above the metal line, with silica-brick for roof and sides. The fuel is bituminous coal and the gases on leaving the furnaces are conducted through waste-heat boilers. The melting or refining operation may be divided as follows: Charging, melting, oxidizing, poling and casting. All operations are so conducted that it takes about 24 hours to work the complete cycle of a charge.

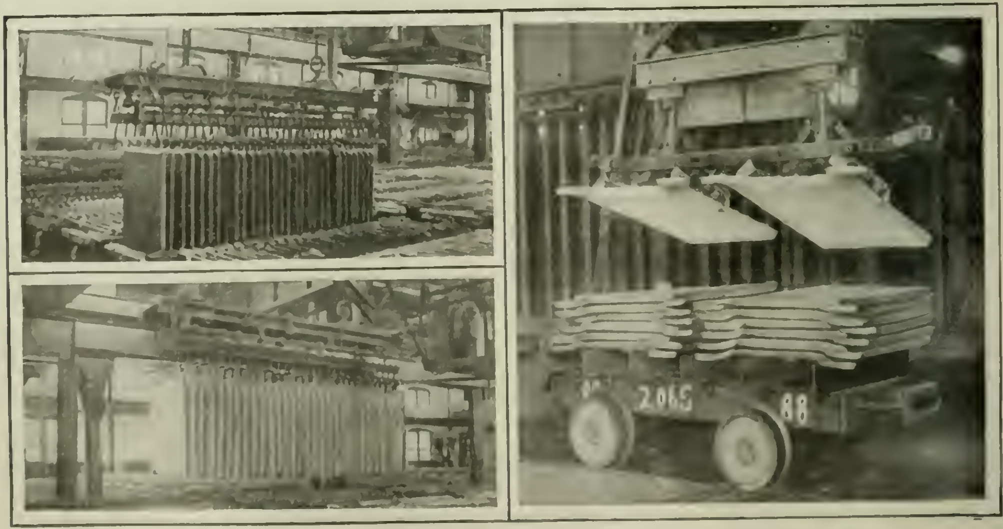
Charging was formerly done by hand, a laborious operation, but now all furnaces are charged with a charging machine. This picks up 40 cathode sheets, weighing about 5000 lb., at a time and puts them in the furnace much more compactly than could be done by hand, thus materially increasing the capacity. Charging usually takes two hours. The side doors are then closed, luted, and the fire increased to hasten the fusion of the copper.

In 10 to 12 hours so much copper is melted that the oxidation period can begin. In this period the molten copper is nearly saturated with cuprous oxide and brought to what is known as "set copper," containing from 4 to 5% of suboxide of copper. In this process all impurities are oxidized and all hydrogen, carbon monoxide and sulphur compounds removed. This is accomplished by blowing compressed air through iron pipes under the molten bath, also by "flapping" the charge. Flapping consists in striking the surface of the metal with the edge of the head of a rabble, in order to uncover the surface of the copper. The furnaceman watches the operation by taking button samples and observing the fracture, which is characteristic and well-defined in all stages.

After the charge is oxidized the slag formed is skimmed off, the bath covered with coke or charcoal, and the "poling" process begins. This consists of forcing the butt ends of green poles underneath the surface of the metal. This causes a violent action in the metal bath, and the carbon from the wood and coke quickly reduces the dissolved cuprous oxide. This operation takes two or three hours. When the suboxide of copper has been reduced to 0.3-0.6%, which can readily be told by the fracture of the button sample, the copper has reached the "tough-pitch" stage and is ready for casting.



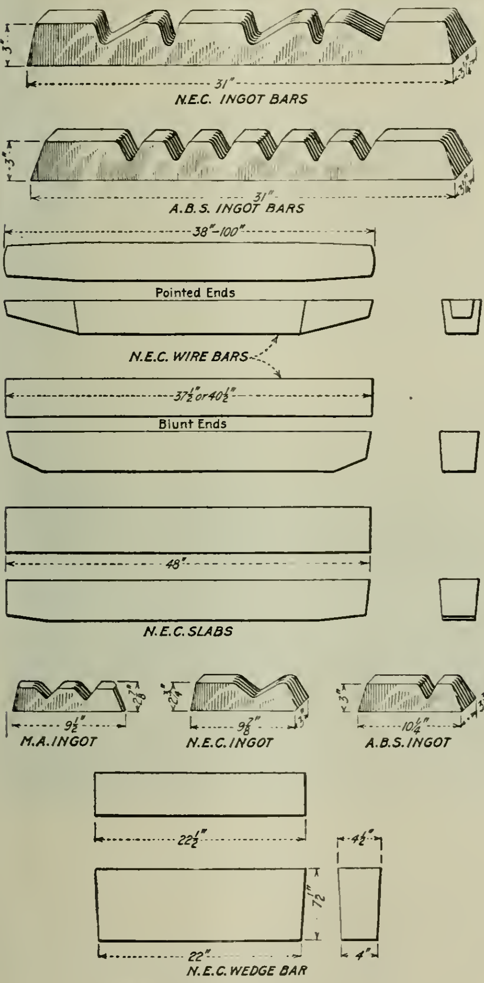
VIEW SHOWING THE INTERIOR OF EXTENSION TO NO. 2 TANK HOUSE



MECHANICAL HANDLING OF ANODES AND CATHODES AT RARITAN COPPER WORKS

Views on left show anodes (above) and cathodes (below) being conveyed by electric traveling crane, which raises and lowers entire anode or cathode contents of a tank in one operation. View on the right shows a mechanical device for loading anodes at the blister furnace

This operation consists of casting the molten copper into commercial shapes, wire bars, slabs, wedge bars, cakes, ingots and ingot bars. The molds, which are made of copper and sprayed with a bone-ash emulsion, are placed radially on a circular casting machine, known as the Clark casting machine. As the wheel turns around, the molds are filled with copper from the furnace. After the copper has set, the molds automatically tip, dropping the copper bars into a water bosh which pickles the copper and gives it the characteristic red color. The bars come up from the bosh on an endless belt and, after weighing, are ready for shipment. A representative analysis of refined electrolytic copper would be as follows: Cu, 99.92-99.97%; O, 0.02-0.07%; Ag, 0.001%; Au, 0.00001%; S, 0.003%; Fe, 0.0035%; Ni, 0.0015%; As, 0.0015%; Sb, 0.0015%.



COMMERCIAL SHAPES OF COPPER

Through all furnace operations much slag is made, mainly an oxide slag containing 40-50% Cu. This is smelted in a blast furnace. The slag from the latter containing less than 1% Cu is granulated and used for filling purposes.

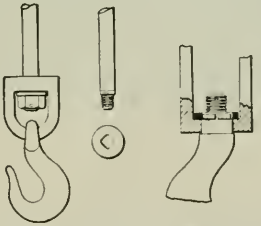
A variety of shapes suitable for different industrial purposes is made, and the illustration shows the general details. N. E. C. wire bars with pointed ends are made in 13 sizes and different weights vary from 135 to 770 lb.; minimum length of 38 in. up to a maximum of 100⅛ in.; widths of 3 21/32 to 5⅜ in., tapering to widths at other end of 3 3/16 to 4⅝ in.; depths vary from 3¾ to 5¼ in. The blunt-end type is made in two sizes, with weights of 135 and 175 lb.; lengths of 37½ and 40½ in.; widths, 3⅝ and 3 13/16 in., tapering to 3⅛ and 3 7/16 in.; depths of 3⅝ and 3 15/16 inches.

N. E. C. slabs are made in eight sizes. The only length is 48 in., except in three special sizes, and the width varies from 3½ to 5½ in. The weight varies from 190 lb. for a 2½ in. thick slab of 5 in. width to 420 lb. for a 5 in. thick slab, of 5½ in. width. N. E. C. circular cake is made 20 in. in diameter with weights varying from 200 to 500 lb. N. E. C. wedge bars weigh 225 lb. and have a length of 22½ in., tapering to 22 in., a width of 4½ in. tapering to 4 in. and a depth of 7½ in. N. E. C. ingot bars of 70-lb. size and A. B. S. ingot bars of 76-lb. size both have a length of 31 in. N. E. C. ingots of 20-lb. size are 9⅞ x 2¾ x 3 in. A. B. S. 22-lb. ingots are 10¼ x 3 x 3⅜ in. and M. A. ingots, 16-lb. size are 9½ x 2⅞ inches.

N. E. C. billets are made in diameters of 4 in. to 8 in., nine sizes, with a length of 15 in. to 50 in. The weight varies from 93 to 583 lb. N. E. C. square cakes are made in 11 sizes, the minimum being 14 x 17 in., weighing 151 lb. for 2 in. thick slabs, up to size 45 x 45 in., 6 in. thick, weighing 3864 pounds.

Fastening Crane Hooks

To fasten light crane hooks securely is a necessity and the nuisance and danger in smelting or other operations of having the nuts unscrew and come off entirely may be overcome in the following manner.



FASTENING LIGHT CRANE HOOK

A washer of annealed tool steel, faced true on both sides and with a square hole that fits snugly on the squared end of the hook stem, can be placed under the nut. The nut is secured by a small pin which prevents loosening.

North Butte Mining Co., during 1916, produced 560,673 wet tons of ore and 120 wet tons of precipitates and smelted 544,365 dry tons of ore and 89 dry tons of precipitates which yielded 24,498,181 lb. Cu, 1,047,063.56 oz. Ag, and 1,712.004 oz. Au. There was also mined 1625 tons of zinc ore which yielded 412,953 lb. Zn and 2510 oz. of silver. Copper was sold at the average price of 23.295c. per lb., silver at 66.371c. per oz., gold at $20 per oz. and zinc at 10.674c. per lb. Four dividends, amounting to $1,075,000 were paid during the year.

Smelting at Old Dominion Works, Globe, Ariz.

Improved smelting conditions were established at the Old Dominion reduction works this year, when it was decided to ship its concentrates and flue dust to Miami and smelt in the blast furnaces at Globe only the oxide ores from the company's mines and such custom ores as could be secured in the district. The necessary sulphide ore is brought from Bisbee.

Smelting conditions at the Old Dominion works at Globe, Ariz., were much improved when, in May, 1917, the company began shipping all its concentrates and flue dust to the reverberatory-smelting plant of the International Smelting Co. at Miami, Ariz. In its blast furnaces at Globe the Old Dominion Co. smelts the oxide ores of the company's mine and such custom ores as are obtainable in the district, a supply of sulphide being shipped from the Calumet & Arizona mines at Bisbee. This plan has eliminated all fines from the blast-furnace charge and made conditions much better for blast-furnace operations, with the result that the furnaces can be driven faster, two furnaces smelting approximately the same tonnage that three did when the jig and table concentrates were smelted at Globe.

SMELTING WORKS OF THE OLD DOMINION CO. AT GLOBE, ARIZ.
The power plant is in the left center and the stock bins in the background. The concentrating and sampling mills do not show in this view, being farther to the left

The smelting ore as hoisted from the mine is dumped from the skips into a receiving pocket, conveyed thence by belt conveyor to the crushing plant, and passed through a gyratory crusher, where it is broken to 3½-in. size, elevated and passed through the sampling mill; the custom ores are unloaded into bins and delivered by belt conveyor into the same system as the mine ores.

The sampling mill consists of a five-cutter Vezin system with the necessary crusher and rolls between the sample cutters; the ore is cut by the various cutters as it descends through the mill by gravity. The ratios of ore cut out for the sample are as follows: Cutter No. 1, 1:10; cutters 2, 3, 4 and 5, 1:5 each, the resultant sample being 32 lb. for every 100 tons of ore sampled. For two tests, made recently, to prove the accuracy of this mechanical sampling, two high-grade spotted ores were chosen, one an oxide and the other a sulphide. The rejects from each cutter were held, and in turn carefully sampled, original and duplicate samples being made from each. The accompanying tables give the results of the tests.

CHECK TEST ON MECHANICAL SAMPLING

Test No. 1, Sulphide Ore				Test No. 2, Oxide Ore			
Reject of Cutter No.		Ag	Cu	Reject of Cutter No.		Ag	Cu
1	Original	0.50	17.69	1	Original	2.70	11.46
	Duplicate	0.50	17.77		Duplicate	2.70	11.49
2	Original	0.65	17.58	2	Original	2.85	11.38
	Duplicate	0.65	17.65		Duplicate	2.85	11.46
3	Original	0.55	17.66	3	Original	2.75	11.37
	Duplicate	0.55	17.66		Duplicate	2.75	11.42
4	Original	0.60	17.79	4	Original	2.80	11.46
	Duplicate	0.60	17.83		Duplicate	2.80	11.40
5	Original	0.55	17.57	5	Original	2.80	11.45
	Duplicate	0.55	17.62		Duplicate	2.80	11.40
Average Original		0.57	17.66	Average Original		2.78	11.42
Average Duplicate		0.57	17.70	Average Duplicate		2.78	11.43
Sample Original		0.60	17.69	Sample Original		2.80	11.40
Sample Duplicate		0.60	17.67	Sample Duplicate		2.80	11.45

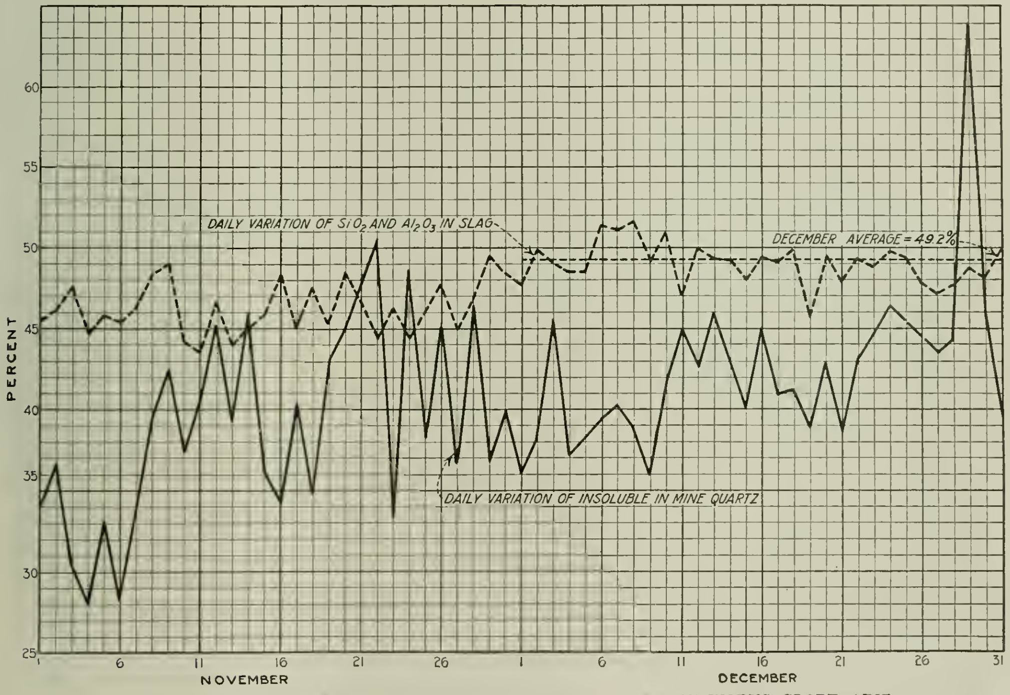
The rejects from the sampling mill are delivered into storage bins and taken from these bins by steam-locomotive haulage to smeltery bins. There is no mixing other than that which the ore receives by being loaded from storage bins into cars and emptied from cars into smeltery bins.

At the smeltery the coke, limerock, sulphide and oxide ores are placed in separate bins. The blast-furnace charges weigh about 2000 lb. each and consist of varying amounts of oxide ores, sulphide and limerock, according to the grade of the matte and the silica and alumina in the charge. In turn this charge is dropped from scale hoppers into side-dump cars and taken direct to furnaces. The relative amounts of the various elements in the charge are given in the accompanying table.

CONSTITUENTS OF THE BLAST-FURNACE CHARGE

	SiO_2	Fe	CaO	Al_2O_3	S	Cu
Mine ore	32.4	21.3	2.6	7.3	1.0	7.03
Lease ore	30.5	25.0	5.4	6.7		5.35
Custom ore	36.2	20.2	1.7	5.2	16.5	11.11
Sulphide ore	6.3	40.2	1.4	1.9	44.5	2.21

The method of feeding is to dump three coke charges and also three ore mixtures directly on top, so that the coke is underneath the charge mixture. In the accompanying table are given furnace data for two furnaces in operation from May 1 until June 30, 1917, under the new conditions mentioned above. The analysis of coke follows: H_2O, 0.14%; volatile matter, 2.1; fixed carbon, 78.64; ash, 19.12%. Limerock analysis is: Insoluble matter, 4.4%; Fe, 2.0; CaO, 46.9%. The composition of a typical slag is: Cu, 0.46%; SiO_2, 37.4; FeO, 34.1; CaO, 12.7; Al_2O_3, 8.5%. It is interesting to note how expert the foremen have become in changing their charge before too late to cause serious trouble. No analyses of the ores are available until long after the ore is smelted, and yet with a wide variation in the silica and alumina contained, necessitating a range sometimes from 5 to 20% limerock on the charge in the same 24 hours, the running of the furnaces and the silica and alumina in the slags is remarkably uniform, considering the conditions. The two curves given in the accompanying chart show the variation in the silica and alumina in the ores smelted and also the slag made over a period of two months.



DAILY VARIATIONS IN MINE ORE AND IN SLAGS AT OLD DOMINION WORKS, GLOBE, ARIZ.

These curves exemplify the skill of the Old Dominion furnace foreman in altering the furnace charges to compensate for wide variations in the composition of the mine ore

BLAST-FURNACE DATA AT OLD DOMINION

Width at tuyères, both furnaces	44 in.
Length No. 1	231 in.
Length No. 2	198 in.
Height of column	11 ft. 6 in.
Diameter of tuyères	4 in.
Number of tuyères, No. 1	44
Number of tuyères, No. 2	36
Air pressure	25 oz.
Cu.ft. of air per min	17,660
Tons smelted per 24 hours per furnace	360
Tons per sq.ft. of hearth area	5.0
Cu.ft. of air per ton charge smelted	72,474
Indicated horsepower-hours per ton charge	13.37
Coke to charge	12.5%
Fixed carbon	9.8%

The converting plant at the Old Dominion works consists of one stand of the Great Falls, 12-ft., upright type and one 10½ x 8-ft., horizontal type. The latter is seldom used. It is on this 12-ft. stand that L. O. Howard, formerly superintendent of this smeltery, made a record of over 75,000,000 lb. from one lining. Since then the linings have been averaging 24,000,000 lb. before patching becomes necessary. The converter slag is poured into the blast-furnace settlers. The bullion from the converter is transferred to an old matte ladle, lined with mud and placed on a truck; copper is poured directly from this ladle into molds, the molds being placed on trucks drawn by a motor; the tilting of the bullion ladle is done by steel cable attached to a small engine operated by compressed air.

CONVERTING DATA AT OLD DOMINION

	Cu	SiO_2	Fe	CaO	Al_2O_3	S
Analysis of ore fed	3.12	76.9	4.8	1.7	5.8	0.4
Analysis of slag	2.00	22.0	53.7	1.4	2.0	
Analysis of matte made	44.16		27.4			23.2
Air pressure				14.4 lb.		
Cu.ft. of air per min. per converter						7,083
Cu.ft. of air per ton matte						78,844
Cu.ft. of air per ton bullion						182,728
Cu.ft. of air per ton Fe slagged						289,762
Oxygen efficiency						55.93%

Caucasus Copper Co., closed for almost two years, resumed work toward the end of 1916. It is understood that the company's smelting works were producing copper at Christmas and that good progress has been made since that time in the work of restoration at the mines and smelting works. The total output of copper in the Caucasus in 1916 is reported by a British consul as 4700 tons.

Choice of a Blende-Roasting Furnace

By MARCH F. CHASE*

The blende roasting furnace must be selected to suit particular conditions, and it is therefore impossible to say that one furnace is better than another. However, the use of continuously rabbled muffled furnaces is increasing, owing to improvements in the design and construction of this type, and future development may be expected along the lines of the Ridge, Wedge, Huntington-Heberlein and similar furnaces.

PROBABLY more than 100 different types of furnaces have been tried for roasting blende. Of these not more than 15 distinct kinds are being used at present. In many cases the failure of a furnace has been due to a lack of understanding, on the designer's part, of the problem involved; in others, to the use of unsuitable materials. In designing any metallurgical furnace the engineer is apt to be handicapped in obtaining suitable material to use in the structure. Frequently this is caused by the excessive cost of what he would like to use, but more often it is due to the fact that there is not any ideal material for his special work. This is particularly true in the case of the construction of a blende-roasting furnace. Great difficulties have been encountered in getting refractories to withstand the conditions under which it is necessary to operate a roasting furnace, and undoubtedly some types of furnaces have been prematurely discarded because of failures due to the firebrick used. The same is true of the materials used to build the moving parts of mechanical furnaces.

CONSERVING THE HEAT OF ROASTING

Besides this there seems to have been a lack of appreciation of the importance of conserving the heat produced from the roasting reaction, and when attempts have been made to accomplish this, many of them, especially in muffled furnaces, have been without a thorough analysis of the problem. In some muffled roasters the fuel gases actually take heat away from the sulphur gases. However, the greatest trouble generally has been with the draft and air-intake regulation.

To roast blende it is necessary to bring each particle of ore to a temperature sufficiently high to ignite and burn it, and also to bring it in contact with sufficient oxygen to oxidize completely the metals and the sulphur. The temperature necessary is between 700° and 800° C., and the heat is supplied by fuel and the combustion of the sulphur. The oxygen contact with the ore is obtained by rabbling or stirring.

Theoretically, sufficient heat can be obtained by the oxidation of the sulphur, provided the sulphur gases are removed from the furnace at a concentration of 5% SO_2 or better. So far no furnace has been constructed to utilize fully this heat, and it has been necessary to apply external heat. This, while not being difficult in reverberatory furnaces of all kinds, has given a great deal of trouble in the mechanically raked muffles. The fuel requirements figured to bituminous coal vary anywhere from 8 to 35% of the ore charged. Under proper conditions a complete roast of an average blende can be had without the temperature of the ore ever being above 800° C. If the temperature during any period of the roasting is allowed to go much over this, many ores have a tendency to fuse and the roast cannot be completed. From many furnaces the fused concentrate has been taken, which showed an entirely unaltered core of blende. If the temperature is lower than 700° C. and the ore is still in contact with sulphur gases, sulphates are formed which are hard to break up. The ore should be kept at a temperature between 700° and 800° C. until it is completely desulphurized. This means that the air for burning the sulphur should be preheated before it is admitted in the final stages of the roasting process. Part of the heat for heating this air can be supplied from the hot roasted ore.

RAPID HEATING OF ORE INCREASES CAPACITY

In order to get the greatest capacity out of the roasting furnace per square foot of hearth area, the ore should be heated as rapidly as possible to the proper roasting temperature. In some of the old, hand-rabbled, muffled furnaces this result is obtained with a low coal consumption by taking the fire gases over the top hearth. The main objection to this has always been the high temperature of the sulphur gases as they leave the furnace. It is doubtful, however, if this objection is important, as the cooling can be so readily done afterward in an apparatus that is much cheaper than the roasting furnace itself.

To maintain proper roasting conditions it is necessary that the ore be completely and continuously stirred and rabbled. This has been the first big problem to confront the designer of mechanical furnaces of both reverberatory and muffled types. The natural material from which to make the rabbles or stirrers was iron. It was found, when ordinary cast iron was used, that the stirring rabbles burned out rapidly. This was overcome by cooling the rabbles either by removing them from the furnace periodically, thus causing intermittent rabbling in muffled furnaces—though the removal could be accomplished successfully in reverberatory furnaces—or by cooling by circulating air, water or steam through them, thus causing considerable reduction in the furnace temperature and an appreciable heat loss, especially when water was the cooling medium. Only recently has this latter method proved to be satisfactory when used in a muffled furnace. The problem was approached in two other ways. One was to make the rabbles of firebrick, as in the Spirlet, and the other to use a special iron mixture as in the Merton.

In addition to the material of construction, much depends on the shape of the stirrer and the way in which the stirring is done. Improper rabbling will cause high dust losses and also excessive hearth accretions. A certain amount of these cannot be avoided, but no doubt they can be materially reduced by certain interior flue constructions and by a good system of rabbling.

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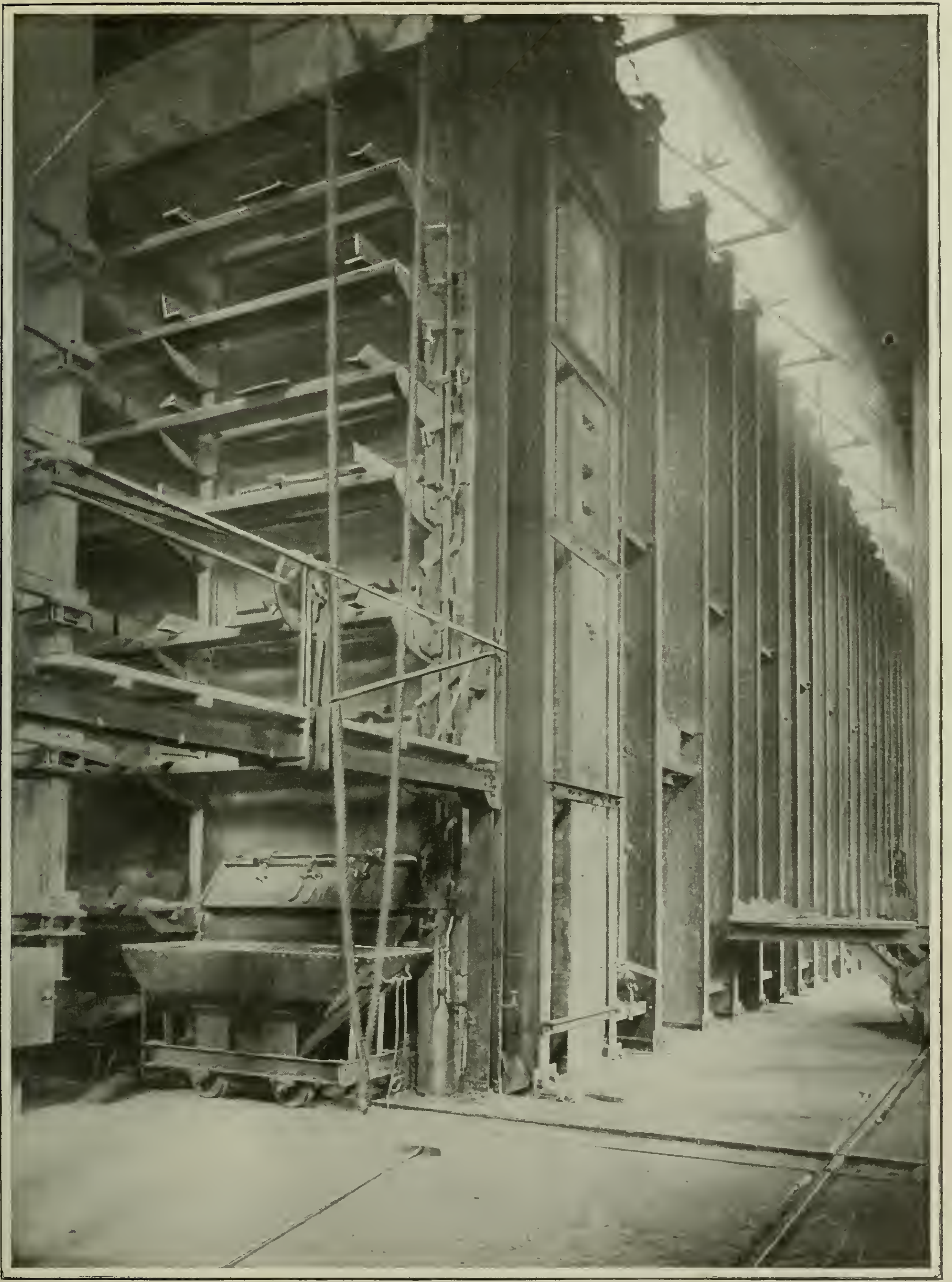
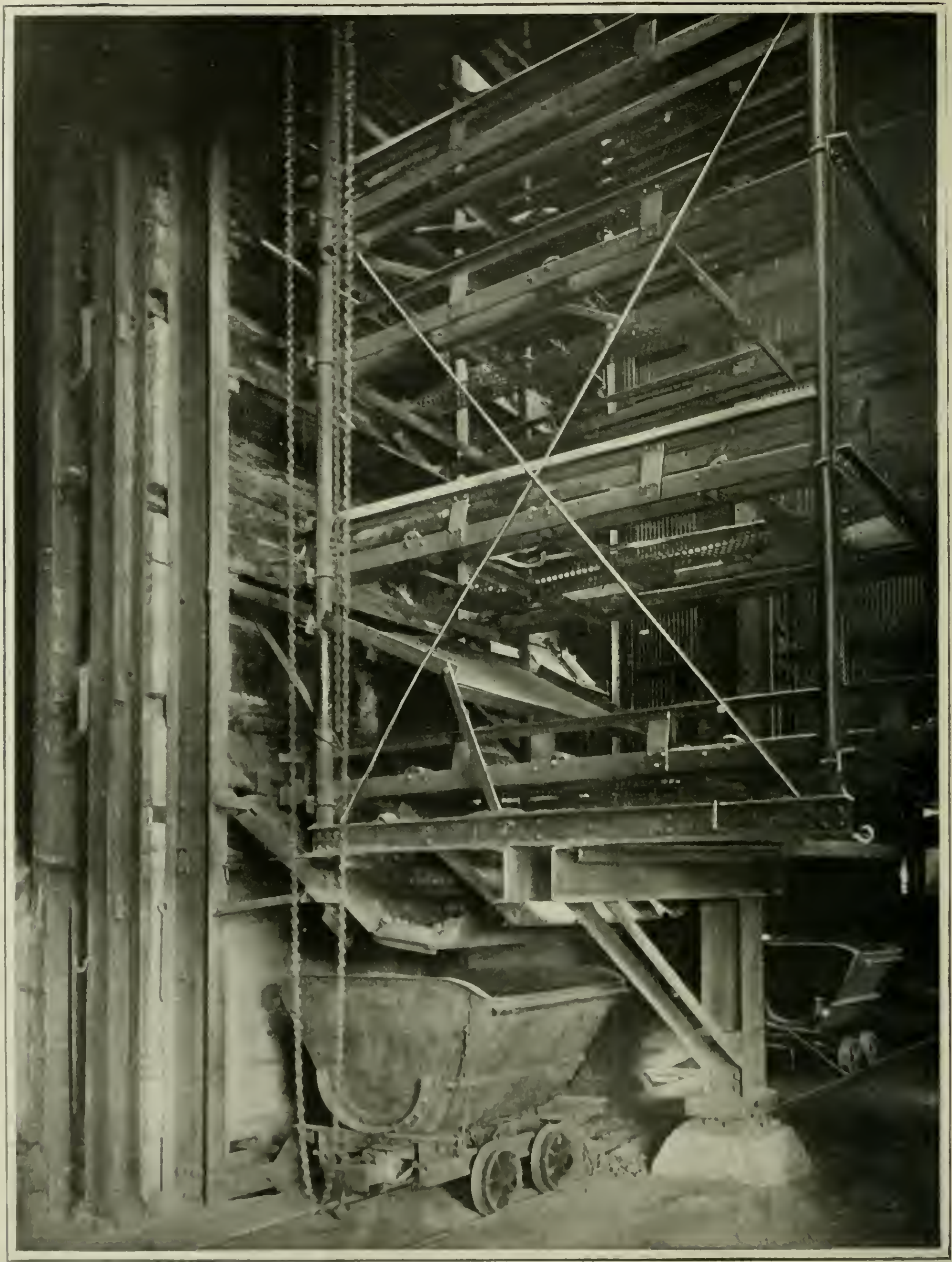


HEGELER ROASTING FURNACE, END AND SIDE VIEW



END VIEW OF HEGELER ROASTING FURNACE

In most furnaces the design of the movable parts has been such as to require the roof to be raised to a considerable height above the hearth. This is one of the chief sources of loss of heat in the Ropp reverberatory furnace. Here we have a roof arch spanning the firebox and the roasting hearths, and this, plus the rake mechanism, tends to bring the top of the arch so far from the ore as to rob the combustion gases of a part of their effectiveness. Hence the conditions in this furnace are such as to lead to a high fuel cost, although the labor cost is extremely low, only one man being required for 12 hours per furnace.

The Zellweger, Cappeau and Brown furnaces are more or less similar to the Ropp and have this same objection. All of these types of furnace have been modified more or less by different builders. The builders, however, have devoted themselves principally to working out the mechanical equipment of the furnace rather than to trying to conserve the heat. In this respect only slight changes have been made, such as the different methods employed to supply air for the combustion of the fuel gases and for the burning of the sulphur. In some cases considerable gain has been made in the capacity of the furnaces by these modifications. It may be said of all the furnaces of this general type that they have been extremely well worked out mechanically and can be operated economically with cheap fuel, preferably with natural gas. They are not expensive to construct, and under the conditions above stated, where the sulphur gases are to be wasted, a modified Ropp, such as those built in the Southwest, is probably the best reverberatory furnace. If fuel is expensive, then a type similar to the Merton, Ridge or Wedge should be used. The Merton or Ridge reverberatory furnaces take considerably less fuel than does the Ropp and the repairs are somewhat higher. The former furnaces are more expensive to build. They probably are more satisfactory, from the standpoint of fuel economy, than the straight-line furnaces as used in this country and have been used in Australia and Russia. One of the last big installations of reverberatory roasters was that recently completed in Siberia, where the Merton furnaces were used. The Merton, as first installed, had to be redesigned and strengthened mechanically, but the present furnace apparently is doing fair work. Any one of these furnaces, as now designed, if built of the proper materials, should be economical where fuel is high.

There is no record of any Wedge furnace being used for roasting blende where the fuel gases are directly in contact with the ore. However, there is no reason why it should not be as good a furnace for roasting blende, under these conditions, as either the Ridge or the Merton; both of these furnaces have been successfully used in this way.

DELPLACE VS. HEGELER FURNACES

There are a limited number of mechanical, muffled furnaces in commercial use at present, and fewer types of the hand-raked muffles. These latter are being gradually replaced by mechanical furnaces. The Delplace is an exceptionally good hand-raked furnace and is often considered superior to some of the mechanical roasters. In fact, De Lummen has figured that the Delplace furnace would roast for 50c. per ton less than the Hegeler. Unfortunately, in making this comparison De Lummen could not have had accurate data on the Hegeler furnace as prior to the war the working cost of a number of Hegeler furnaces was considerably under $2 per ton, but the fact probably remains that the Delplace furnaces are being operated more cheaply in some plants than the Hegeler or other mechanical furnaces are being operated in others, due consideration being given to the different labor and fuel conditions under which the operations are conducted.

In most cases, unless conditions are exceptional, the proper type of muffled roasting furnace to install would be a mechanical one. Of the mechanical furnaces the general kinds to choose from are: The Hegeler, Spirlet, Ridge, Wedge and Huntington-Heberlein. Of these five, the Hegeler, the Spirlet and the Ridge are being used to roast blende for spelter manufacture. The Wedge, as used at present, is a combination of the muffled and reverberatory types of furnaces, but there is no reason why it cannot be modified, in order to do away with the reverberatory feature, and become similar in type to the Huntington-Heberlein, which, although more or less in the formative stage, still has possibilities of success, in view of the operation of the Ridge rabble-cooling system.

If one were required to build a furnace free from any experimental features, the choice would be limited to the Hegeler, Spirlet and Ridge, regardless of the fact that other types appear to have the possibility of being developed into commercial furnaces.

NO STANDARD MODEL OF HEGELER FURNACE

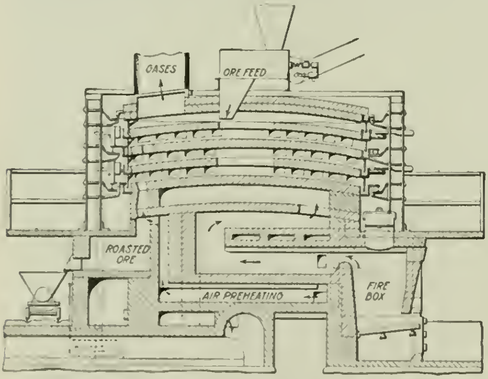
The Hegeler furnace is too well known in principle to require any detailed description. It has been used extensively—I might say almost exclusively—in this country and somewhat in Germany and Australia. It is a large-tonnage furnace, cannot be economically used on less than 30 tons per day and may be used up to 50 tons per day. The original Hegeler patent (U. S. No. 303,571) was applied for in 1882; since that time the furnace has been changed in many respects, and in hardly any two installations is it exactly alike. The name Hegeler, when applied to a roasting furnace, does not mean a certain definite structure; it refers only to a very general type. Almost every Hegeler furnace is different, not only in the minor points but also in many important features. For instance, there are used at the present time three totally different systems of firing and three systems of operating machinery, while there are almost as many air-regulating methods as there are furnaces. Besides these, many details, such as the design of the doors, location and size of drop holes, construction of arches and shape of rakes are different.

Every possible objection has been urged against the Hegeler furnace, among which may be mentioned these: It is difficult to regulate and expensive to build; it takes a comparatively large amount of room and is awkward in shape; it is difficult to arrange for easy and cheap handling of ore; it gives a fluctuating SO_2 gas and its fuel consumption is high. Regardless of all of these faults, if it is properly built, in the hands of trained men this furnace can be operated to produce a well-roasted product at a low operating and maintenance cost. Its size is such that it is not easy to control and, once it gets out of order, time is required to get it straightened out. It does take considerable space, and the SO_2 gas varies to such an extent as to affect the acid system, and on fixed draft it is almost impossible to get an average gas of much over 4%.

In chamber-acid system, if operating with fans, it is possible to get 5% or over as an average gas. There is often trouble with the air regulation, and at times a considerable portion of green ore is drawn, which has to be recharged. The hearth accretions are heavy, and the hearths must be kept continually chiseled. Much depends on the details of design and the specifications of materials, and neglect in many things, which might be easily considered minor, will lead to endless trouble in operation and high expense of maintenance. The efficient operation of a Hegeler furnace is largely a matter of skilled operators, of whom it takes eight when working eight-hour shifts. In the hands of inexperienced men the roasting results and cost will be extremely disappointing.

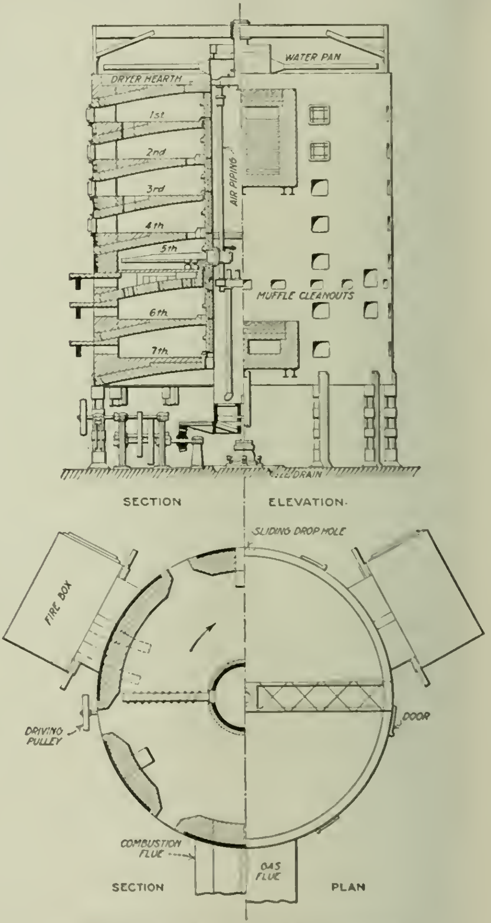
RIDGE WATER-COOLED RABBLES AND SPIRLET FIRECLAY RABBLES

The Ridge and the Spirlet furnaces were previously mentioned with the Hegeler as types of mechanical furnaces to use in roasting blende for spelter, and they merit a brief description. The former has five hearths: One for drying and heating the ore, three for roasting (the fourth being a muffled hearth) and one for cooling the ore and preheating the air. The ore is moved from hearth to hearth by rabbles hung on arms fastened to hollow, water-cooled columns, which require about 15,000 gal. of cooling water for every 24 hours of operation. There are four of these shafts to each furnace and each shaft is driven from the bottom by bevel gears. There are four arms to each hearth except the cooling hearth, where only three are used. The ore is fed continuously to the top or preheating hearth, traveling from the feed hopper to the opening of the first hearth, back along that hearth, and so on to the cooling hearth, where it is finally discharged. The discharge opening is to one side of the longitudinal center line and behind a brick wall which protects the gearing from the dust and the heat. The roasted product, when Broken Hill concentrates were used, reached a tenor of total sulphur as low as 0.75% on a 10% consumption of coal in the producers. The SO_2 content in the sulphur gases averages 6½ to 8¼%. About 10 hp. is required to operate one of these furnaces.



VERTICAL SECTION THROUGH SPIRLET ROASTING FURNACE

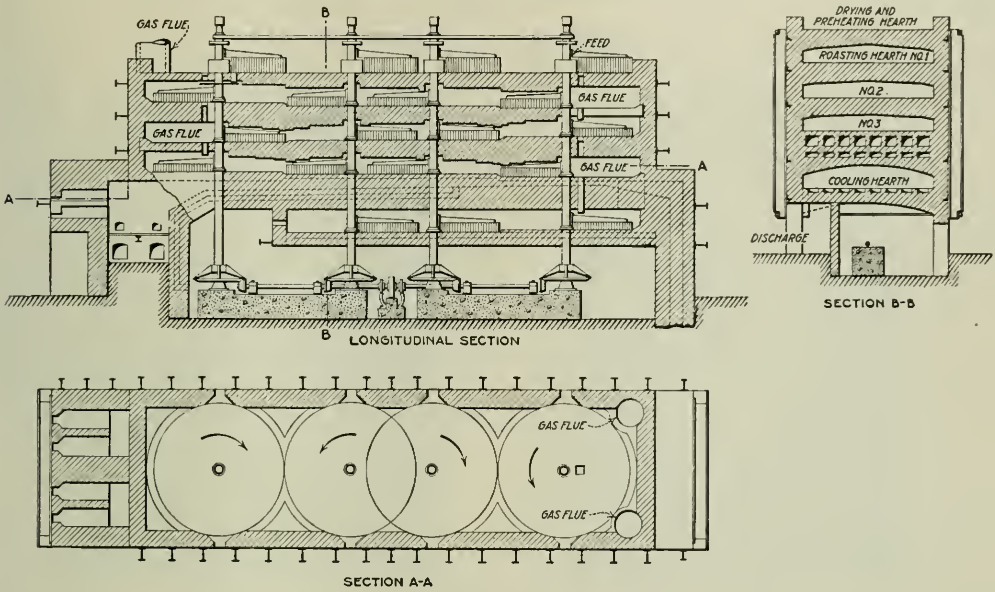
The Spirlet roasting furnace has several rotating hearths, projections from one making the rabbles for the hearth beneath. There are not any metal parts exposed to the hot gases, as the rabbles are made of special fireclay shapes which can be removed only by closing down the furnace and cooling it off. The working period for one of these furnaces is usually about three months, and then, because of wear and breakage in the rabbles, the furnace has to be closed down and cooled off before the rabbles can be removed. The last hearth is muffled and has the roasted ore discharging from the periphery into a hopper where part of the heat is extracted to preheat the air, the remainder of the heat in the air being obtained from the firebox. This furnace consumes about 10% of coal as fuel, requiring about 2 hp. to operate a five-ton furnace, and gives a gas high in SO_2 with a loss of 1 to 2% of zinc in the dust. The furnace is limited as to size, and there is considerable difficulty in changing the form of the rabble



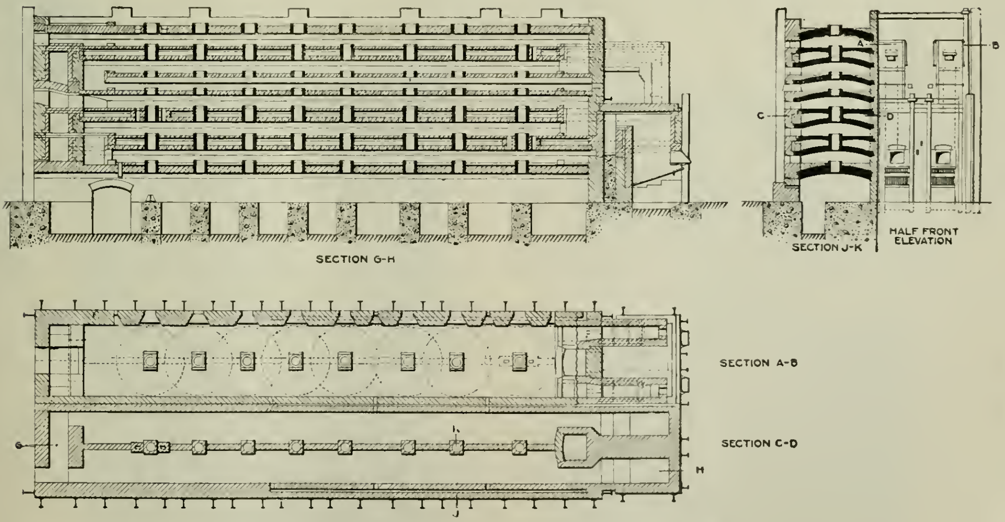
THE WEDGE MECHANICAL FURNACE

in case of changing the kind of ore charged to the furnace.

The Wedge furnace for roasting blende for sulphuric acid is, as stated, a combination of the muffled and the reverberatory, similar in principle to the Repath patent (U. S. No. 785,437). This idea was first used by the Vieille Montagne a great many years ago but was soon abandoned. While it has been suggested time and again, so far as my knowledge goes, the Wedge Mechanical Furnace Co. was the first to operate successfully a furnace on this principle. On the lower hearths the combustion gases come in direct contact with the ore. Up to the present time there have been a number of these furnaces built, but in every case except one the roasted blende has been used in a leaching process. There is no available data as to the amount of sulphur as sulphate remaining in the roasted ore. This is so important in the subsequent spelter-furnace work that until it is found that it can be kept below the allowable limit there will always be some doubt as to the usefulness of the furnace for roasting for spelter purposes. Fortunately there are two installations in this country



SECTIONAL PLAN AND ELEVATIONS OF RIDGE BLENDE-ROASTING FURNACE



MERTON MUFFLED SIX-DECK DUPLEX ROASTING FURNACE that will soon be operating on spelter ores, and before long the data will be available.

The Huntington-Heberlein furnace, which is a straight-muffled type of turret furnace, is now being tried in England. Its special features are the methods of air admission and certain mechanical details in the construction of the rabble holders and operating machinery.

In both of these furnaces attempts are made to conserve the excess heat generated in the upper hearths. One of the difficulties with furnaces of this type has always been the regulation of the air supply. In roasting, the air or gas must be continually removed from the surface of the ore. This is accomplished by having as high a velocity of the gas as consistent with minimum dusting and high percentage of SO_2. This requires that the muffles be low. In furnaces of this character a low muffle is difficult to obtain, and in addition there is always danger of unequal distribution of the gas current over the bed of the ore. In the Spirlet furnace this diffiuclty has been overcome by making a roof of each hearth to carry the rabble blades.

To determine the best type of kiln to use under any given set of conditions one must consider (1) the proper roasting of the ore and (2) the suitability of the gas for making acid. The first cost and the working cost are of less importance. Well-roasted ore is of the utmost importance to the smelter, as a high sulphur content directly affects the metal recovery, and a loss here could not be offset by any gain made in the acid systems by using a better gas.

From the standpoint of working efficiency a furnace should produce a high, uniform SO_2 gas, free from dust, and a low-sulphur roasted product free from lumps and fritted masses of ore. From the standpoint of economy the excess heat in the first stage of the roasting should be transferred to the final stages. In order to get these results a kiln must be constructed so that the following conditions are complied with: (1) The ore must be rabbled continuously; (2) the arches must be low, so that the gas traveling over the ore continually sweeps away the SO_2 in contact with it; (3) the ore must not fall through the ascending current of gas; (4) the air must be introduced hot; (5) the temperature of the different hearths must be readily controlled by regulating the air supply; (6) the ore should be cooled by air later used for roasting, and (7) the rabbles should be easily accessible and capable of being quickly changed.

The structure must take only a small amount of floor space to permit cheaply handling the ore to a battery of furnaces.

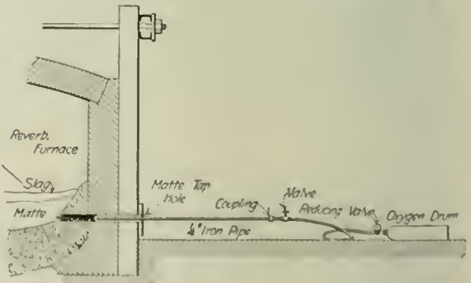
When judged in this manner we find that no furnace fully fills the required conditions, and the furnace that we choose, no matter what it is, will surely be far from fulfilling all of the conditions. The usual practice in choosing is to collect and tabulate all available data of operating furnaces, and then to attempt to allow for different operating conditions. There is great danger in doing this, as often the data are very incomplete and incorrect. This information is, of course, of value, but too much weight should not be given it.

Recently it was necessary to decide on a kind of furnace to be used in a large zinc-roasting plant; after careful consideration of all sorts and kinds of furnaces it was decided to erect three distinct types; one of these was a hand furnace and two were mechanical ones. The results of these tests were that the hand furnace was finally adopted temporarily. It was figured that the latter could be built quickly, and while the mechanical furnaces showed great promise of finally successful development, they also were far from being perfectly worked out, and the saving due to continuous operation at present would more than offset the total cost of the hand furnaces even if discarded within two years.

This illustrates the point which I wish to emphasize, namely, that the conditions under which the installations must be made have much to do with determining which furnace to use, and that it is impossible to say that one furnace is better than another. From recent reports of continuously-rabbled muffled furnaces it is quite safe to say that this type will be much more generally used in the future than it has been in the past. The great difficulty of maintaining the rabble arms has been overcome, and the past objection of the inability to cool the arms and maintain the heat of the furnace can no longer be urged against the types of roasters using this system. The advantages are so great over intermittent rabbling, as in the Hegeler, or the firebrick rabble of the Spirlet, that one can confidently expect the development to be along the lines of the Ridge, Wedge, Huntington-Heberlein or similar furnaces.

Opening a Frozen Taphole with Oxygen and Red-Hot Pipe

At the Steptoe plant of the Nevada Consolidated Copper Co. at McGill, Nev., a novel method is employed for opening a taphole. In the course of ordinary operations in the reverberatory plant the taphole in a furnace occasionally becomes frozen and the bar drawn without obtaining a flow of matte. The process of opening a frozen taphole with a star bit or diamond-point drill is an exceedingly laborious and time-consuming operation. The method shown in the accompanying illustration is a substitute for the hammer and drill and is quick and effective. The small ¼-in. pipe is first heated to a bright red heat and the oxygen turned on to maintain a pressure of about 60 lb. An active combustion of the hot iron pipe-end is immediately set up. The heat developed by this burning iron is utilized to melt its way through the frozen matte or slag in the taphole and the 60-lb. pressure is sufficient to blow back all melted material, thus cleaning the hole in a few minutes, instead of hours as formerly.



OPENING FROZEN TAPHOLE WITH OXYGEN

A Group of Distinguished Metallurgists

HERMAN GARLICHS

W. E. NEWNAM

H. R. HANLEY

JULIUS W. HEGELER

The Use of Reinforced Concrete in Metallurgical Work

By Frank R. Corwin*

During the last few years I have been studying the effect of heat and furnace gases on reinforced concrete to try and find a suitable structure to replace brick in roasting furnaces, which are always a source of trouble and expense. A number of articles have appeared from time to time in metallurgical publications with varying opinions as to its adaptability for this purpose, but my experience has been entirely satisfactory.

To give some idea of what can be expected of furnace hearths properly constructed of reinforced concrete, I wish to call attention to an article[1] written by Selden S. Rodgers and myself, in which mention is made of some concrete hearths that were built at the Great Falls plant in 1912. The roasters in which these hearths were built have been operated continuously since that time, except during the last year, when they have been operated intermittently because of curtailed production. The hearths are still in good condition and show no signs of wear. One furnace in particular was operated under severe temperature conditions, while making tests on air-cooled arms, but, with the exception of two small cracks, the hearths were not affected. Even though cracks appear, the operation of the furnace is not affected in any way, as the reinforcing rods are so arranged that the hearth is still held in shape, and the loose pieces of concrete cannot fall out. One of the advantages of this type of hearth over the brick is the monolithic structure, which does away with the breaking of arms and the shutting down of the furnace for repairs made necessary by the falling of the arches.

Another place where I have found reinforced concrete preferable to brick is around the center drums carrying the arms. In one of the new plants in the Southwest, considerable trouble was experienced by brick falling out around the drums, causing the breakage of many arms and a great deal of lost time. After the brick had been replaced a number of times, reinforced concrete was substituted and found to be so satisfactory that the new furnaces are being built of concrete. Fuel oil is used in these particular furnaces, and the flame plays directly on the concrete without any detrimental effect.

It has been my experience that whenever reinforced concrete does not withstand temperatures up to 1500 F., the trouble has been either in poor construction or lack of care in seasoning the structure when the furnace was first started. Special care must be given to the mixing and the concrete should be handled as quickly as possible when it is poured into the forms. It must then be allowed to set thoroughly before the forms are removed and, after removing the forms, dried out with a slow fire before starting the furnace. Extra time and care spent in the construction and subsequent seasoning will be well paid for in the life of the structure. I have tried a number of different mixtures but have obtained the best results with this one, originally used at Great Falls: Portland cement, 1 part; tailing sand, 2 parts; crushed slag, 4 parts. The crushed slag used was screened through a ¼-in. screen.

My experience in replacing brick with reinforced concrete in roasting furnaces has been so satisfactory that I have felt justified in recommending that a furnace be built throughout with reinforced concrete. The walls will be braced with circular steel bands to take the thrust of the arches, only a light steel shell being used. The shell will be constructed of No. 16 boiler plate, and put in place after the concrete walls have been constructed, a space of 4 in. being left between the steel shell and the concrete that will be packed either with slag or mineral wool for insulation. A great deal of heat will be retained in the furnace, which is usually lost through the walls, and should make it possible to roast low sulphur charges with less fuel. Aside from the many advantages that reinforced concrete has over brick in the actual operation of roasting furnaces, the actual cost of concrete hearths is one-half that of brick, and a furnace built along the lines suggested above would show a big saving in the original cost of construction, to say nothing of the low repair costs after the furnaces were operating.

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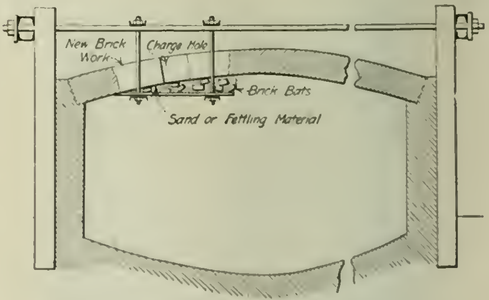
*Superintendent, Consolidated Arizona Smelting Co., Humboldt, Arizona.

[1] "Increasing the Efficiency of MacDougall Roasters at the Great Falls Smelter of the Anaconda Copper Mining Co.," presented at the August, 1913, meeting of the American Institute of Mining Engineers.

Replacing a Reverberatory-Furnace Charge Hole

A steel-and-sand support is employed at the Steptoe plant of the Nevada Consolidated Copper Co., at McGill, Nev., in replacing burned-out charge holes in the roof of a reverberatory furnace. The brick work around the charge hole is always the first to be destroyed in the course of the furnace campaign. After cutting back the burned brick far enough to obtain a suitable bearing, the use of the method shown in the accompanying sketch makes it possible to replace the brickwork around the charge hole in an interval of three or four hours, while with the older method of building a wooden "center" supported on the furnace hearth it was necessary to allow the furnace to cool off for several days. The hanging steel-and-sand "center" is dropped on the hearth of the furnace after the brickwork has been keyed up and the several parts are pulled out through the side doors before firing up the furnace again.



REPAIRING FURNACE ROOF AT McGILL, NEV.

Delivery of Roasting Furnace, necessary for carrying on large-scale tests at the Tucson station of the United States Bureau of Mines, has been delayed by strikes at San Francisco.

Granby Smelting Works at Anyox, B. C.*

By WAKELY A. WILLIAMS†

Metallurgical problems in connection with the smelting of the Granby ores at Anyox are discussed, as well as the selection of equipment. Plunger feeding of blast furnaces overcame early difficulties in this operation. Concentration of first matte by resmelting in the blast furnace is to be eliminated by extension of converting capacity, a 20-ft. Great Falls type converter having been recently ordered.

THE smelting works at Anyox, B. C., of the Granby Consolidated Mining, Smelting and Power Co., was built primarily to treat the ores from its Hidden Creek mines, but also with a view to handling other Granby and custom ores. Anyox is on the western shore of Observatory Inlet, in northwestern British Columbia; the mines and the smelting and power plants are all within a comparatively short radius of the town. There are five distinct orebodies developed by the Granby company, known as Nos. 1, 2, 3, 4 and 5; they are irregular copper-sulphide orebodies in metamorphosed sedimentaries—schists, slates and limestones—cut by dikes. Oxidation has been only slight and sulphides are found where the orebodies come to the surface.

When selecting the site for the plant, the three main considerations were: (1) Plenty of slag-dump room for future years; (2) sufficient ground for future enlargement of plant; and (3) availability of water power. Since the mines, smeltery and wharves had to be connected by railroad, minimum up-grades were provided from wharves to smeltery and practically level grade from the mines to the smeltery. It is estimated that there is room at the site selected for 12,000,000 to 20,000,000 tons of granulated slag. On account of the steep, glaciated hillsides, all natural benches are narrow and the one selected for the site was as wide and long as could be found in this vicinity. Falls Creek at the north end of the site presented the only near-by water supply available. An economical power arrangement was obtained by installing a high-pressure, water-pipe line from the dam to the power house which is at the foot of the hill near the mouth of Falls Creek. All timber and underbrush, and a layer of muskeg covering the surface of the ground to a depth varying from 2 to 8 ft., were removed, and all footings placed on rock or on a glacial-gravel foundation.

From the plans it will be noted that the ore bins are not directly back of the furnaces but are situated to one side, making an angle of about 80° with the line of the furnaces. The charge trains enter the feed floor between the furnaces and converters, and the sampler is at the end of the bins next to the furnace building. The arrangement is not exactly ideal, but, because of the length and narrowness of the bench, it was the best that could be designed under the circumstances, and in practice it has worked satisfactorily.

GENERAL VIEW OF SMELTING WORKS OF THE GRANBY COMPANY AT ANYOX, B. C.

The furnaces and converters are in one building. The building is a steel structure with wooden roof, having an asbestos covering. It is 80 ft. wide and 390 ft. long, having concrete retaining walls both in front of and back of the furnaces. The furnace-floor elevation is 119 ft. and converter-floor elevation 110 ft. above sea level. A common crane runway 40 ft. wide serves both departments upon which operate two Niles, direct-current, 500-volt, 40-ton, quick-acting cranes with main and auxiliary hooks of the same size. In the southern end of the building there were originally three furnaces. Later a fourth was added.

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*The second of a series of three articles dealing with the copper operations of the Granby Consolidated Mining, Smelting and Power Co., at Anyox, B. C. The first article describing the Granby company's Hidden Creek mine appeared in the "Engineering and Mining Journal" of Oct. 13, 1917.

†Superintendent of smelters, Granby Consolidated Mining, Smelting and Power Co., Ltd., Anyox, B. C.

The long axes of the furnaces are in line and parallel to the long axis of the building. The furnaces are of the rectangular straight-bosh type. The original three furnaces are 50 x 360 in. at the tuyeres, which are of 4-in. diameter and spaced 10.8 in. from center to center. There are two tiers of jackets. The lower jackets are 10 ft. 6 in. high and 4 ft. 6 in. wide and rest on heavy, water-jacketed base plates; the upper jackets are 6 ft. 8 in. high and 5 ft. wide. The furnace is supported by heavy-steel H columns and 20-in. box-type mantel beams. These are exceptionally well braced with heavy I-beams and girders. Jackets and tuyeres are of the welded type. The latter are of the Anaconda type with ball-and-socket joint. Furnaces Nos. 1, 2 and 3 measure 13 ft. 2 in. from the tuyeres to the top of the upper jackets, while on No. 4 furnace, which has a third tier of jackets, this distance is 18 ft. 2 in., the extra 5 ft. of height having been gained by lowering the settler floor. With this exception No. 4 furnace has the same measurements. Steel water-jacketed spouts, having a trap of 15½ in., discharge over a bronze-nose jacket and give excellent service. Cooling water which is ice cold the year round insures the permanence of a thick, protective crust which is never "hulled" through a campaign. The furnaces work under a 45- to 50-oz. blast and use 900 cu.ft. of air per min. per ft. of furnace length.

RECEIVING BINS AT ANYOX AND MEANS FOR UNLOADING OUTSIDE ORES AND FLUXES

Each furnace is served by one 16-ft. and one 8-ft. settler having a 9-in. chrome-brick lining. The brick stands 9 in. away from the shell, the intervening space being filled with lightly tamped backing, consisting of common bats crushed to ½ in., from which the fines have been removed by screening. At the tap holes, of which there are two, 18 in. of chrome brick is used without backing. The tapping block is a magnesite brick having a 1-in. hole, embedded in a plate of converter copper. Due to the frequency with which matte is tapped, a tapping bar is rarely needed. Aside from renewing brick at the tap holes, which is necessary about once a month, very little repairing of lining is necessary. The cooling spray has been abandoned. Slag flows from the 16-ft. settler to the 8-ft. settler, thence to the granulating launders. An appreciable amount of matte is recovered from the second settler. Granulated slag is deposited on the dump through launders lined with slag plates and having a fall of ½ in. to the foot.

The feed floor is at an elevation of 145 ft. The furnace tops are constructed of heavy, cast-iron lintels and columns, all well bound and braced. The side walls and ends are bricked with 18 in. of red brick, and the semicircular, steel hood is lined with firebrick. A steel down-take, 9 ft. in diameter, leads the gases from the furnace to the dust chamber.

Charge tracks, of 3-ft. gage and 56-lb. rails, run on either side of the furnace and continue out of the building to the converter-slag bins and sintering-plant bins. The Anaconda type of steel charge cars of five-ton capacity is used. Trains of 12 cars each are hauled by a 12-ton, Baldwin-Westinghouse, electric locomotive. There are two of these trains in service. Cars are dumped by overhead, horizontal, compressed-air cylinders running on trolleys, two to a furnace, one on each side.

The manner of charging[1] the furnaces is their most striking feature. The charging space is divided into three sections by the columns supporting the lintels. The original bevel plates were removed and in their place were built hoppers with horizontal bottoms and cast-plate sides. They are 2 ft. 6 in. deep and the bottom plate overhangs the top of the jackets 9 in. At the back of the hoppers, held under the charge floor, are heavy cast-iron plows operated by compressed-air pistons in cylinders working under 100-lb. pressure. The capacity of each hopper is 5000 lb. of charge and each section has two, making 12 in all per furnace.

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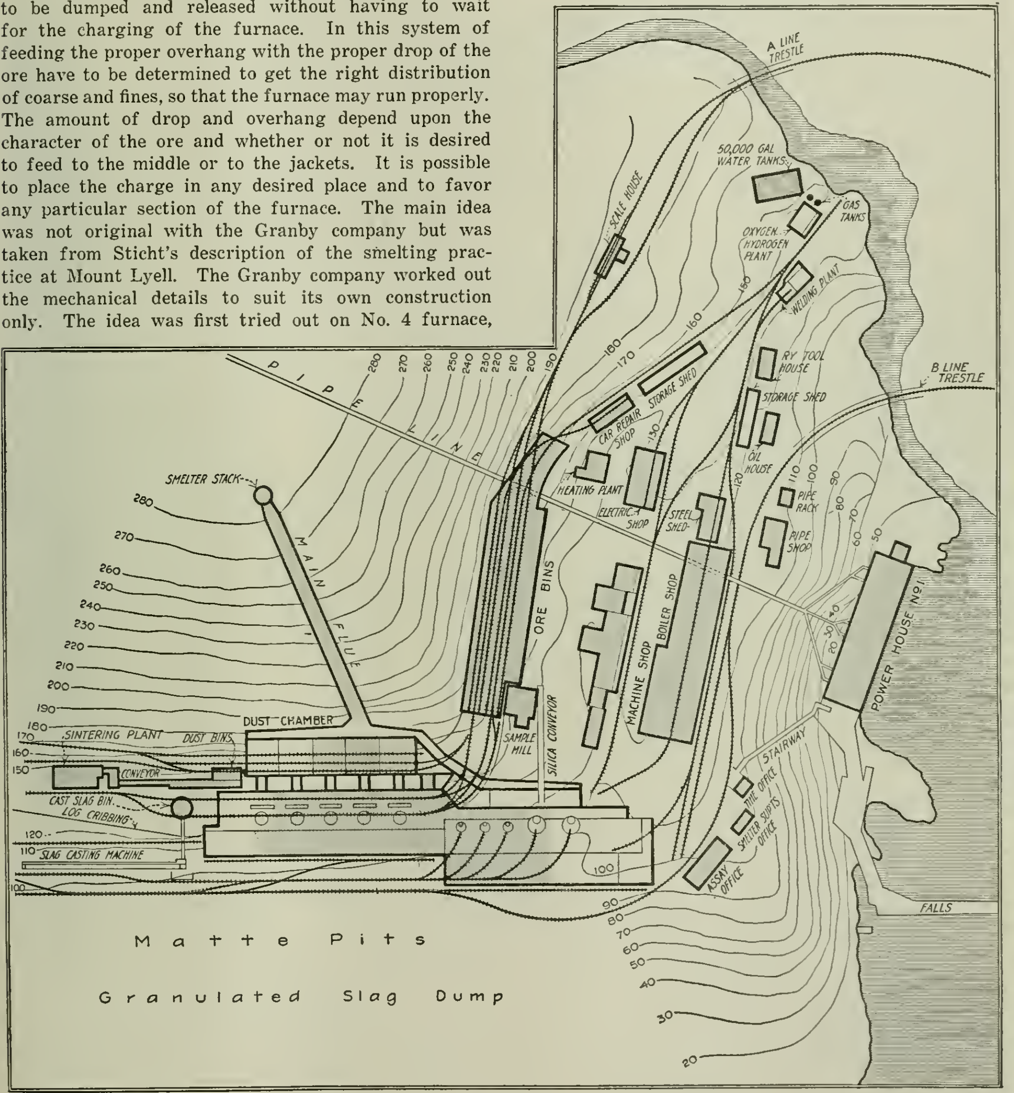
[1] "Eng. and Min. Journ.," Oct. 7, 1916, p. 661.

When a charge is needed in the furnace, air is turned on and the plow pushes the charge from the hoppers into the furnace. Any hopper can be operated independently and the amount charged at any one time can be controlled. This arrangement permits charge trains to be dumped and released without having to wait for the charging of the furnace. In this system of feeding the proper overhang with the proper drop of the ore have to be determined to get the right distribution of coarse and fines, so that the furnace may run properly. The amount of drop and overhang depend upon the character of the ore and whether or not it is desired to feed to the middle or to the jackets. It is possible to place the charge in any desired place and to favor any particular section of the furnace. The main idea was not original with the Granby company but was taken from Sticht's description of the smelting practice at Mount Lyell. The Granby company worked out the mechanical details to suit its own construction only. The idea was first tried out on No. 4 furnace, and as the experiment showed a tendency toward smoother running of the furnace and kept it in better shape than any of the others, it was decided to adopt this feed system on the three remaining furnaces.



LAYOUT OF GRANBY SMELTING WORKS AT ANYOX, B. C.

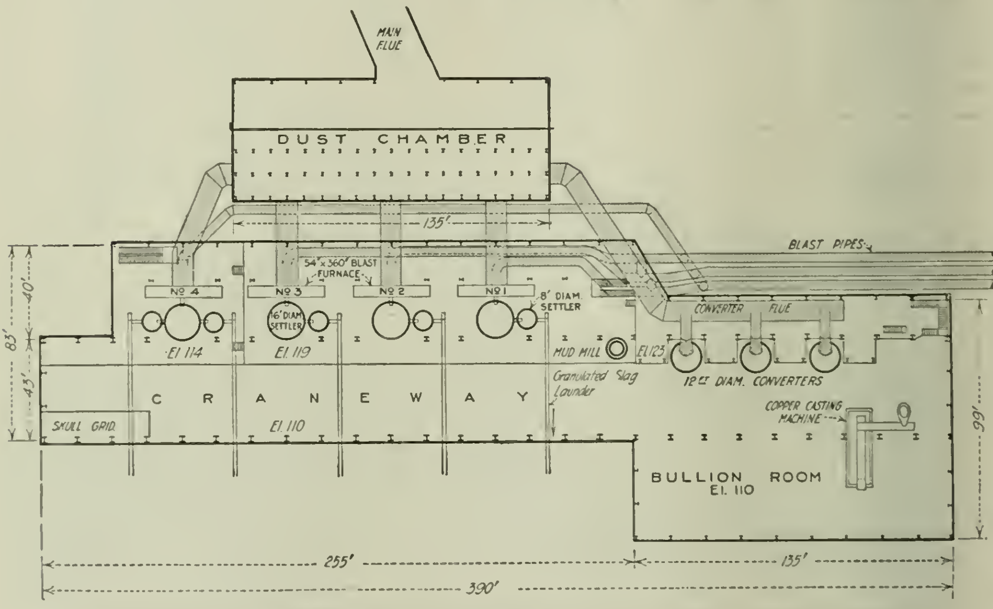
In the northern end of the building there are three 12-ft., Great Falls type, electrically operated converters, each having 12 tuyeres of $1\frac{15}{16}$ in. diameter. Punch rods are upset to $1\frac{1}{2}$ in. and tuyeres reamed with $1\frac{5}{8}$-in. bar. Blast pressure is 13 lb. and air consumption from 6000 to 7000 cu.ft. per min. per converter. Ladles of 85 cu.ft. capacity are used but are being replaced by ladles of 120 cu.ft. capacity. Converter slag at present is poured into the settlers of furnaces smelting the ore charge. Charges of copper weigh about eight tons and are cast into flat, bevel-edged bars measuring 30 x 18 x 3 in. A straight-line casting machine is used which dumps the bars into a cooling tank, after which they are conveyed to the casting floor. The blister copper averages 99.25% Cu.

The slag-skull grid is at the top of a steel bin having a sloping bottom and chutes for discharging the contents into railroad cars. The top of the bin measures 12 x 45 ft. and is laid with 12-in. I-beams running lengthwise and supporting 12-ft. lengths of 90-lb. rail laid crosswise and spaced 7 in. apart. Skulls are dumped on this grid and pieces not sufficiently broken by the fall are further reduced by hand. Part of one man's time is required for this work.

CHARACTER OF HIDDEN CREEK ORES

About 75,000 tons of ore are smelted per month, of which the Hidden Creek mine at Anyox furnishes roughly 65,000 tons, the remainder of the ore comes from outside sources. Nearly all the Hidden Creek ores smelted to date have come from No. 1 and No. 2 orebodies.

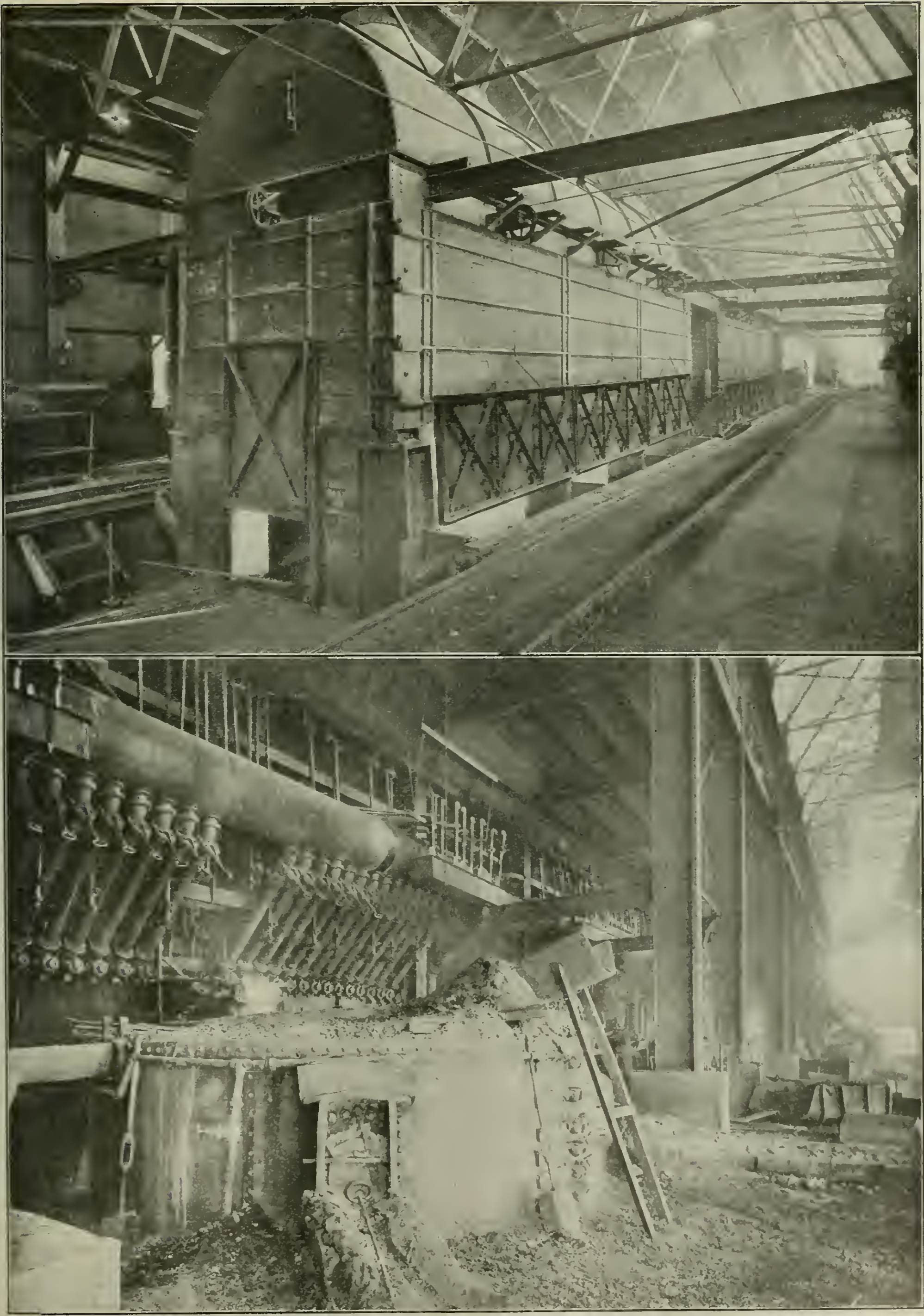
Orebody No. 1, as developed to date, appears to be nearly neutral as regards Fe and SiO_2 requirements for smelting, though the output to date has been less siliceous than the average of the orebody as sampled. An analysis of current production from orebody No. 1 is given in the table on page 712. The Fe occurs principally as pyrite, most of the SiO_2 as free quartz, and CaO is present mainly as calcite. Some of the combined SiO_2 is present on account of the admixture of waste rock which cannot be avoided without hand sorting. No. 1 ore carries a considerable proportion of fines; screening tests show over 25% passing a ½-in. screen. An intimate mixture of gangue and sulphides is typical, the particles of each being often granular and loosely cemented together, though this condition is not universal as both sulphides and gangue also occur in larger masses. Analyses show a tendency to variation in the composition of the ore shipped to the smeltery. This is caused by a variation of the character of the ore, not only from different stopes but also from different parts of the same stope. There is a steady fluctuation of ore composition but the degree of variation is fortunately becoming less. In the accompanying table A and B each represent the average of a month's run and illustrate the extremes in SiO_2 contents by months; C and D represent two extreme analyses by lots of 1000 tons.



PLAN SHOWING ARRANGEMENT OF BLAST FURNACES AND CONVERTERS AT GRANBY SMELTERY

Ore from the No. 2 orebody is more siliceous and aluminous than that from orebody No. 1. The average analysis of No. 2 ore for the last year is given in the accompanying table. The sulphide portion of the ore consists of chalcopyrite, pyrite and pyrrhotite; CaO seems to be present with the silicates rather than as calcite. Unlike No. 1 ore, it can be mined with the introduction of little waste rock, which is fortunate in view of the already high amount of combined SiO_2, as implied by the high Al_2O_3 and MgO content. Physically No. 2 ore is well adapted for the blast furnace, containing only about 8% fines, being hard and not given to crumbling. It is by comparison fairly uniform in character, fluctuating in analysis much less than the No. 1 ore. The table gives the average of analyses, E and F, for two different months and illustrates the extremes of the range of variation. There is another classification of Hidden Creek ores, a low-grade quartz schist, of which several thousand tons per month is used in the concentration of matte. A typical analysis is shown in the accompanying table.

Outside ores consist of custom ores and ores from the Granby company's Alaskan mines. The Midas mine, a Granby property at Valdez, Alaska, is shipping about 3000 tons a month of siliceous, aluminous sulphide ore. From the Mamie mine on Prince of Wales Island and from several custom shippers, a heavy magnetite ore to the amount of about 5000 tons a month is



FEED AND TAPPING FLOORS OF THE 54 x 360-IN. COPPER-MATTING FURNACES AT THE GRANBY WORKS, ANYOX, B. C.

received. Shipments of a copper-bearing, specular hematite from the White Horse district have been received; also miscellaneous siliceous ores from a number of different shippers amount to about 2000 tons a month. In most of these ores the gangue consists principally of natural silicates of CaO, Al_2O_3 and MgO. "Clean ores," those wherein the SiO_2 is predominantly quartz, or the CaO is calcite, are sparingly offered. An analysis of outside ores is given in the accompanying table.

Fluxes Mined by the Granby Company

Limerock of good quality obtained from the company's quarry at Swamp Point on the Portland Canal, analyzes: SiO_2, 5.0%; CaO, 50.0%; MgO, 2.0%. The Granby company operates several small quartz mines in the immediate vicinity of Anyox. One ledge carries about $8 in gold and silver. The quartz is full of cracks and fractures, is very friable and shatters so readily that by the time it reaches the smelter bins fully 60% will pass through a 1-in. mesh.

Coke comes from several sources. It contains from 18 to 26% ash, averaging 23%, and physically it will grade from fair to inferior. Clay suitable for smeltery use is found in abundance near the works.

Shipments of outside ores arrive on steamers or barges in amounts ranging from a few tons to 2500 tons. The amount taken for a sample and the method of procedure are varied to meet requirements. Hidden Creek ores are lotted in 40-car lots weighing approximately 1000 tons. An automatic sampler at the mine cuts out $\frac{1}{25}$ of the crushed ore which is then sent to the sampling mill at the smeltery. As the ore is usually smelted before its analysis can be obtained, a close examination is made, as it is dumped into the bins, for the purpose of estimating approximate percentages of SiO_2 and the general character of the silica, whether "clean" or "dirty," and if dirty, whether due to gangue or included waste. This inspection applies particularly to No. 1 ore and is extremely useful in detecting radical changes which might otherwise manifest themselves in a disarranged furnace.

Analyses of Furnace Charges and Products

No. 1 and No. 2 ores are treated in equal proportions and ordinarily such a half-and-half mixture requires flux of a basic nature. The basic ingredients used consist of matte, limerock or oxidized iron ores. It was the former practice, while smelting about 45,000 tons of ore a month, to convert the first fall of matte. The amount of matte thus made in excess of what the converters could handle was poured out, sent to the bins and resmelted on the regular ore charge in amounts ranging from 5 to 15% of this charge. The addition of resmelted matte usually called for more SiO_2 in the charge which was supplied with quartz, thereby increasing the proportion of free SiO_2. The accompanying table gives a typical analysis of the charge, slag and matte; the proportions used in such a charge are: No. 1 ore, 43.6%; No. 2 ore, 43.6%; matte, 8.7%; quartz, 4.1%. The Fe oxidized is, 69%; coke to charge, 3.8%; matte fall, 23.4%. This characteristically pyritic charge ran well as long as the ores remained fairly clean and not too unsteady in composition. By hard driving the three converter stands were just about able to produce the required amount of copper from an average 16% Cu matte when smelting about 45,000 tons of ore a month. Later, however, increased ore tonnage made it necessary to supply converter matte of a higher grade. This was accomplished by devoting one furnace to matte concentration, and part time only is necessary when three furnaces are in operation; but with four furnaces in operation it takes one furnace full time to regrade matte from the other three.

Under present practice the half-and-half mixture of No. 1 and No. 2 ores is smelted with limerock or oxidized iron ores or both. The addition of these basic materials to the charge is subject to frequent changes in much the same way as quartz is raised and lowered in ideal pyritic smelting of heavy sulphides. The analysis of a charge typical of the present practice is given in the accompanying table, the components of which are: No. 1 ore, 44.4%; No. 2 ore, 44.4%; magnetite ore, 5.6%; limerock, 5.6%. The Fe oxidized is, 63.0%; coke to charge, 5.6%; matte fall, 21.1 per cent.

The use of "ready" bases such as CaO and oxidized Fe for flux, instead of matte wherein the Fe must be oxidized to become available, is dictated by the increase in proportion of silicates in the ores and the disturbing degree to which they fluctuate in analysis. This is especially the case where Al_2O_3 is one of the variables and too close an adherence to pyritic conditions is bound to cause trouble. Slags commonly carry about 10% Al_2O_3 but occasionally go to 12% or beyond, the effect of the higher Al_2O_3 content is to increase coke consumption, decrease oxidation and render the furnace more susceptible to irregularities of an unfavorable nature. Limerock is nearly always in the charge, because, aside from its beneficial effect on diluting and increasing the fluidity of the slag, it reduces resistance to the blast and seems to keep the crusts undercut thereby mitigating the evils of incrustation.

ANALYSES OF ORES, FURNACE CHARGES AND PRODUCTS

Analysis of	Cu %	Insol. %	SiO_2 %	Fe %	FeO %	CaO %	S %	Al_2O_3 %	MgO %
Ore No. 1 (current)	2.00	23.9	20.8	30.8		5.4	30.7	4.0	1.9
Ore No. 1 A.	2.80	17.3	14.7	33.3		5.2	34.2	2.5	0.6
Ore No. 1 B	2.19	27.4	23.4	29.5		5.5	29.1	3.9	1.6
Ore No. 1 C	2.40	12.0	10.4	34.9		5.0	38.8	1.3	
Ore No. 1 D.	1.64	31.0	27.3	28.2		3.4	28.9	5.7	
Ore No. 2 (current).	2.13		29.2	27.8		3.5	21.0	8.0	4.4
Ore No. 2 E	2.32	34.6	26.9	27.5		3.7	20.7	6.8	4.1
Ore No. 2 F	2.13	40.2	32.4	25.4		3.0	17.3	8.7	4.0
Quartz-Schist Ore	0.79	52.9	46.2	19.8		4.0	16.1	5.7	2.7
Outside Ores:									
Midas.	4.3	47.6	37.3	19.4		1.5	17.6	8.5	6.1
Magnetite	1.8	21.4	14.0	47.0		5.0	3.5	5.0	5.5
Hematite	3.6	14.6	11.7	50.0		1.7	0.9	4.0	2.1
Custom siliceous.	5.0	59.3	36.4	10.9		2.2	3.8	5.8	7.8
Swamp Point Limestone			5.0			50.0			2.0
Smelting Results with 8.7% of Matte on Charge:									
Charge	3.14		22.5	30.3		3.8	26.2	4.0	2.1
Slag	0.28		37.0		44.4	6.3		6.6	3.4
Matte	16.0								
Present Practice with no Matte on Ore Charge:									
Charge	2.05		23.0	28.9		6.3	24.6	6.1	3.3
Slag	0.18		35.6		38.1	9.8		9.4	5.1
Matte	11.0								

Magnetite ore in amounts ranging from 5% to 15%, usually forms part of the sulphide-ore charge. There is no trouble in effecting the proper reduction of Fe_3O_4 in spite of presumably unfavorable furnace conditions, namely, rapid running and oxidizing atmosphere in the focus. Furnaces have run steadily on a charge consisting of sulphide ores 87½%, magnetite ore 12½%, and 5% of good-grade coke, with satisfactory results. Some Fe_3O_4 escapes reduction and finds its way into the matte, but rarely causes tap hole troubles in the settlers.

Various outside ores of a siliceous-aluminous nature are sometimes smelted in small quantities in the regular charges. Usually, however, a special charge is made up for their disposal and smelted in one furnace only.

LOCAL QUARTZ USED IN CONCENTRATING MATTE

In concentrating first matte to converter grade, local quartz is the main source of silica. As before stated it seems to run to fines and greatly increases incrustation troubles, but fortunately, in this regard, the ratio of concentration is not required to be high. Hidden Creek siliceous ores frequently replace part of the quartz and help to coarsen the charge. Limerock also forms part of the charge. Converter matte averages between 20 and 25% Cu, and slag from matte concentration will average: Cu, 0.30%; SiO_2, 37.0%; FeO, 45.0%; and CaO, 8.0 per cent.

In furnaces Nos. 1, 2 and 3 the charge column is carried about 12 ft. above the tuyeres; in furnace No. 4, which is 5 ft. deeper, a 15-ft. charge column is carried. Less incrustation, smoother running and longer campaigns seem to be the rule with this furnace—attributed partly to the greater fall and consequent better spreading of the charge.

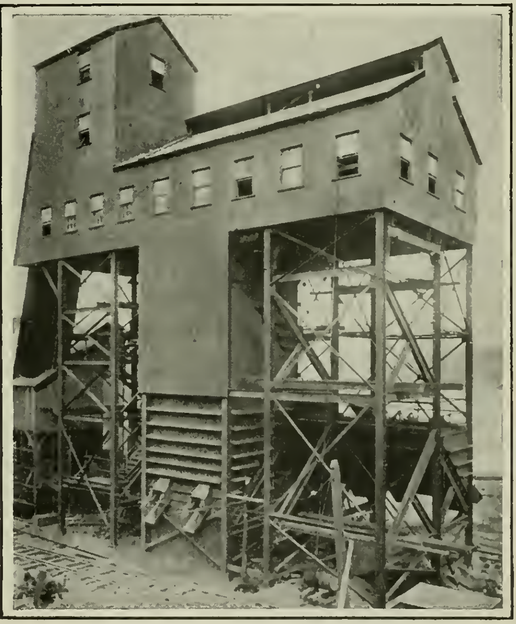
Under average conditions of ore charge, a furnace will take about 900 cu.ft. of air per min. per ft. of furnace length at 48 oz. pressure. A matte-concentrating furnace runs more openly and receives sufficient blast at lower pressures. Numerous analyses of gas issuing from the 12-ft. ore column as well as from the 15-ft. ore column show little if any free oxygen. The volume of blast going to the different furnaces is ascertained by means of Pitot tubes. Each blast pipe has one of these tubes inserted at a suitable point between the common main and the bustle pipe and is connected to a meter reading the number of cubic feet of air per minute.

An ore furnace smelts on an average about 850 tons ore per day but sometimes exceeds 1000 tons. The amount of matte produced is greater and its disposal at times a serious factor, especially when rapid running and low oxidation combine to cause a prolific fall. Furnace crucibles are lined on the bottom and sides with chrome brick. The breast jacket, which is made of converter copper, cast around pipe coils, did not give much life until the practice of bushing the outlet with 2 in. of chrome brick was introduced. This protects the metal against the cutting effect of the matte and, by renewing the brick whenever the furnace is down, an unlimited life of the breast jacket appears possible.

Low-grade matte from the ore furnaces goes to beds situated on the slag dump in front of the building. On furnaces Nos. 1, 2 and 3 a system of brick-lined launders spanning the crane aisle permits the matte to run directly from settler to bed. The maximum distance thus traversed by molten matte is about 200 ft. The No. 4 furnace being at a lower level, has insufficient fall to dispose of matte in this fashion and requires the use of ladle and crane to get it into a launder leading out of doors. There are four matte beds holding several thousand tons each, separated by walls of flue dust. After cooling off a bed with water, it is broken up to some extent with a few shots and reclaimed with a back-haul, drag-line scraper-digger, as already described in the *Journal.*[2]

The grade of matte converted over a period of 12 months averaged 21% copper. Converter-slag analyses

GRANBY SAMPLING MILL



SINTERING PLANT AT ANYOX, B. C.

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[2] "Eng. and Min. Journ.," Dec. 25, 1915, p. 1050.

were: Cu, 2.0%; silica, 25.0%; FeO, 64.8%. The blister copper averaged 99.25% Cu. Siliceous flux is mostly quartz, while cooling material, of which a considerable amount is used, is derived from furnace cleanings, sweepings, converter flue dust and siliceous mine ore. The converting department is being enlarged by the addition of 135 ft. of building to house two 20-ft. Great Falls type converters. The copper-casting machine will be enlarged, and a straight-line machine for casting converter slag is also to be installed. Converter slag will be skimmed into slag-pot cars instead of ladles and will be taken to the slag-casting department, cast into slabs and returned to the blast furnaces. It is intended to send to the converting department the first smelting matte irrespective of grade, using the large converters for concentration and finishing in the 12-ft. converters, thus allowing all four furnaces to operate on ore.

There is a large tonnage of concentrating ores in the various mines of the company, and a great deal of experimental work has been done with these ores during the last two years. There is being installed at present a 100-ton experimental flotation unit to obtain further data with respect to the handling of these ores.

FLUE DUST, SETTLING AND SINTERING

The 9-ft. downtakes of the blast furnaces lead into a settling chamber, 225 ft. long, 50 ft. wide and 30 ft. high; this is a steel structure with brick walls, having three rows of hopper bottoms each served with tracks for dust removal. This chamber has deflecting baffles at each downtake for the purpose of reducing air currents and distributing the gases; and it will also have suspended wires to give a better settling of flue dust. The back wall will have holes leading to a breeching, after the manner of steam plants, thence to a 20 x 20-ft. flue 400 ft. long running up the hill to a reinforced-concrete stack 22 ft. in diameter by 153 ft. high. The elevation at the base of the stack is 280 ft. and the elevation at the top of the stack is 433 ft. above mean tide. The top of the stack, measured above the feed floor, is 288 feet.

The converter stacks will lead directly to a brick-and-steel chamber, 25 x 20 ft., having two rows of hoppers with tracks below for dust collection. Baffles and breeching are the same as in the big chamber, and the flue leads to the main flue and thence to stack.

Flue dust is made amounting to about 4% of the ore smelted and a sintering machine of the Greenawalt type has been installed for handling this material. The dust is brought in cars drawn by an electric locomotive, dumped into concrete bins feeding to a 24-in. conveyor belt which leads to a bin directly over the mechanical mixer—in this case an ordinary cement mixer. The flue dust is moistened to the proper degree and elevated to bins over a specially constructed charge car. There is one bin for crushed limerock and one for the material to be sintered—either flue dust or concentrates. The limerock is laid on the grates first and flue dust over this until the pan is full. The sintering charge is then ignited, down draft being used. When the material is sintered, the pan is turned over on its trunnions, the product falls on breaker cars, and thence into bins from which charge cars take it to the furnaces. The fines are returned to mixer. The pan is 8 ft. wide, 12 ft. 6 in. long and 9 in. deep, and has a capacity of 100 tons per 24 hours.

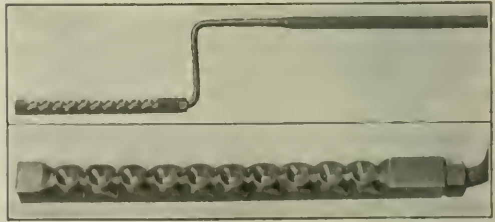
ORE STORAGE AND SAMPLING

The furnace-charge bins are of heavy wood construction, with two ore alleys underneath and chutes on both sides of the alley to deliver into the charge cars. On the outside of the regular charge bins there is a row of sample bins. The charge-bin structure is 72 ft. wide by 320 ft. long and is suitably divided into pockets. There is storage for 525 tons of coke, 2575 tons of secondaries, 2340 tons of flux and 8600 tons of ore. The bins are served on top by five lines of track all leading to the main high line and everything coming to the bins is weighed over 80-ton track scales. Weighing hoppers for coke and limerock, and track scales for ore comprise the weighing system for furnace charges.

The sampling mill is a heavy, wooden structure having five floors served by man elevators and is well lighted. It is situated at the furnace end and alongside the bins. The design is such that the sample will feed to the main crusher from the sample bins by means of a 30-in. conveyor belt. All crushers are of the Blake type and the samplers are of the improved Snyder type. Ore is fed by belt to an 18 x 36-in. breaker, crushing to 3 in., and is then elevated to the top of the mill where a 60-in. sampler takes a 10% cut. This sample is crushed to pass through a 1-in. ring by a 10 x 16-in. crusher. Another 10% cut is then taken which goes to 14 x 40-in. rolls and is crushed to ½-in. size. A 10% sample is again taken and goes to 10 x 18-in. rolls, where it is crushed to ¼-in. size. From this product a final 10% cut is taken for samples to pipe sampler or to sampling floors. The large elevator has 8 x 14-in. buckets and the reject elevators 7 x 9-in. buckets. The mill is designed so that all rejects go to a conveyor belt and thence out over the receiving bins, and by a system of chutes to any desired bin. The final sample is taken to the assay office and is dried and bucked down for analysis and assay.

Dip Mold for Bullion Samples

At the smeltery of the Ohio & Colorado Smelting and Refining Co., at Salida, Colo., the dip mold shown in the accompanying illustration is employed for taking samples of bullion. The mold, developed and successfully used at this plant, will take 10 clean gum-drop samples from a kettle of bullion at one dip, each weighing approximately one-half assay ton. The buttons are weighed up by the assayer without trimming.



DIP MOLD FOR BULLION SAMPLES

Quality of Iron for Anode Molds

The life of anode molds made from cast iron is greatly dependent upon the percentages of sulphur and phosphorus contained in the iron. The proportion of these elements is directly controlled by the grade of pig iron selected. In casting molds a charge is usually made up as follows: Equal quantities of pig iron and old molds are used, and the coke amounts to from 8 to 12% of the charge; in wheeling in the charge the men figure one-quarter of the entire bulk to be the correct amount of coke.

A mold's unfitness for further use is usually due to one of two causes: (1) The iron is "soft" and the grains of carbon large, and the mold becomes burned out at a point where the molten copper first strikes the iron, forming a groove so deep that final shape of casting is unsuitable; (2) a much larger number of molds are lost through breaking, due to the iron being in a condition known as "hot short" or "cold short," or by the expansion and contraction strains produced by sudden heating or cooling. Phosphorus causes iron to be hot short, and sulphur, cold short.

MOLD SERVICE IN TONS CAST

In figuring the life of a mold in tons of copper metal cast, the number of new molds put into use each month is considered as the number used up. The records of the service of molds in use in an Eastern refinery, were kept on a basis of the entire production of anode copper in the plant and the replacement of broken molds. A comparison of two periods will show the wide variation. In one month 138 molds were used for a production of 9745 tons, or an average of 70.5 tons per mold. Another month's average showed far more favorable results, being 5988 tons cast with 13 molds put out of commission, or an average of 460.6 tons per mold. These represent the extremes. An average of eight months reported shows that 576 molds were used in producing 60,604 tons of anodes, or an average of 105.2 tons per mold. Still further figures representing the rapid change in duration of service are shown by the mold costs per ton of copper produced, for three consecutive months, which were as follows: $0.119, $0.196 and $0.205, showing how these charges nearly doubled on account of corresponding increase in breakage.

VARIATION OF PIG IRON ANALYSES

The same brand of pig iron was used during the period in which the above records were made, but analyses of five different shipments showed considerable variation which undoubtedly corresponded with the variation in life of the molds; silicon varied from 3.82 to 4.44%, averaging 4.06%; manganese varied from 0.35 to 0.42%, averaging 0.385%; sulphur from 0.035 to 0.065%, averaging 0.0472%; phosphorus 0.608 to 0.96%, averaging 0.814%. In a single instance where a mold broke after being used for only two charges, or casting about 10 tons of anode copper, the parts of the mold were drilled for a sample and the drillings analyzed, showing: Sulphur, 0.097%; phosphorus, 1.01%; silicon, 2.82%; manganese, 0.23%, which amply illustrates the influence of high sulphur and phosphorus. In this case the quantities of these elements were even higher than the pig iron used. This may be accounted for by a possible irregular bad batch of iron going through the cupola, or high sulphur and phosphorus scrap being used, or, as far as sulphur is concerned, possible absorption from the coke.

SPECIFICATIONS FOR PIG IRON FOR COPPER MOLDS

It was, therefore, evident that it was necessary to use iron of certain specifications, and after several trial shipments the following, regarding quantities of sulphur and phosphorus, were decided upon: Quantity of phosphorus present not to exceed 0.25%, and sulphur not to exceed 0.025%. Amount of silicon was specified to be not less than a minimum of 2.25%, and not more than 2.75%, although the silicon does not seem to be as important an element as either of the others, but controls the hardness of the iron and fluidity in pouring. It is undesirable in large quantities and a certain minimum amount is necessary to produce fluidity. Manganese is not so important in the life of molds but acts as a deoxidizer and reduces the amount of sulphur.

Results from using iron of the above specifications showed a distinct increase in the life of the molds, amounting to more than a hundred per cent. Records for one month after introduction of the above pig iron showed an average of 208 tons of anode copper per mold, which, in comparison with the previous average of 105 tons for an eight-month period, is decidedly favorable. It was further provided that any iron which, in the purchaser's opinion, seriously fails to meet the above specifications may be rejected at seller's expense or, if accepted, may be paid for at a price proportional to the service of the iron.

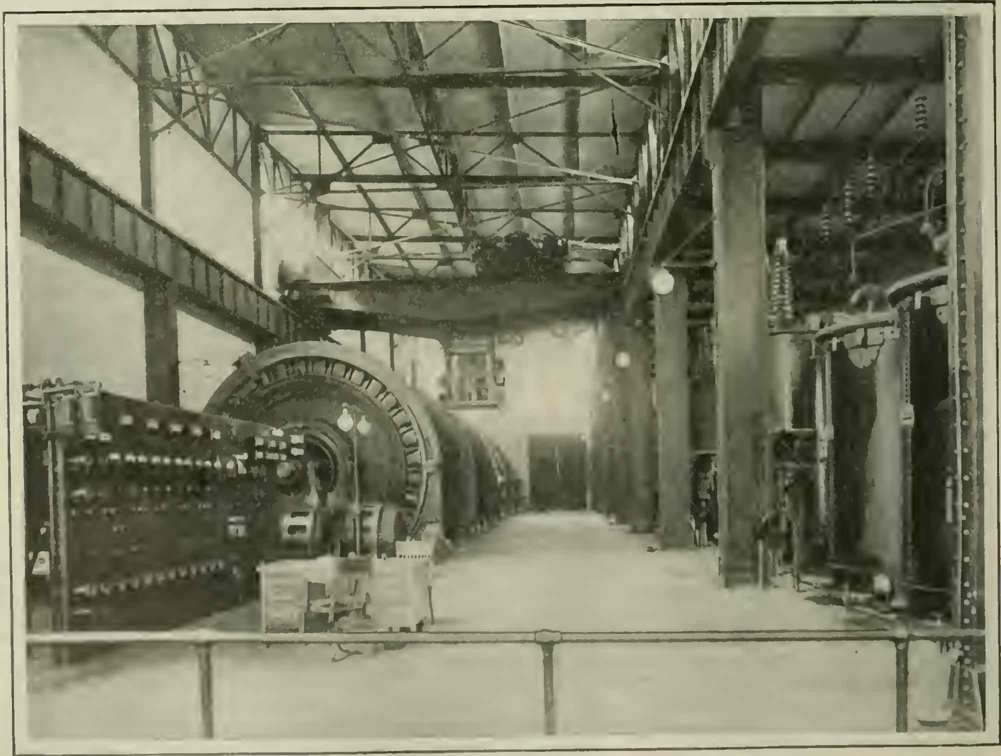
Smelting a Copper-Nickel Ore in an Electric Furnace

Smelting experiments made in an electric shaft furnace on a copper-nickel sulphide ore from the Black Forest were described in *Metall und Erz, 1916*, by A. von Zeerleder. According to a recent issue of the *Journ. Soc. Chem. Ind.*, the ore contained 1.3% Ni, 44% Cu, 14.7% Fe, 4.5% S, and 45% SiO_2, and had hitherto been neglected mainly on account of the low nickel content. The furnace product gave, on solidification, a nickel-copper matte, below which was a layer of a heavy compound of iron, nickel, and silicon, containing only a small quantity of sulphur and copper. Experiments made on a larger scale in a Girod electric furnace of 300-kg. capacity gave a matte with 4.9% Ni, 4.1% Cu, 30.5% S, and 60% Fe, and a ferro nickel with 13.8% Ni, 0.72% Cu, 8.37% Si, 1.32% S, and 75% Fe. A recovery of 91.3% of the total nickel and 77.4% of the total copper in the original ore smelted was made in these combined products. Refining of the ferro-nickel to a degree sufficient to allow its use in the manufacture of nickel-steel can be carried out without difficulty. The addition of 5% of iron scale and an equal quantity of lime suffices to reduce the sulphur contents to a harmless amount.

Nitrate of Soda Production in Chile for the half-year ended June 30 is estimated at 1,463,900 gross tons. There were 122 oficinas in operation and 52 idle. Exports for the half-year were 679,000 tons to the United States and 526,000 to Europe or 1,205,000 tons, against 1,330,000 tons last year.

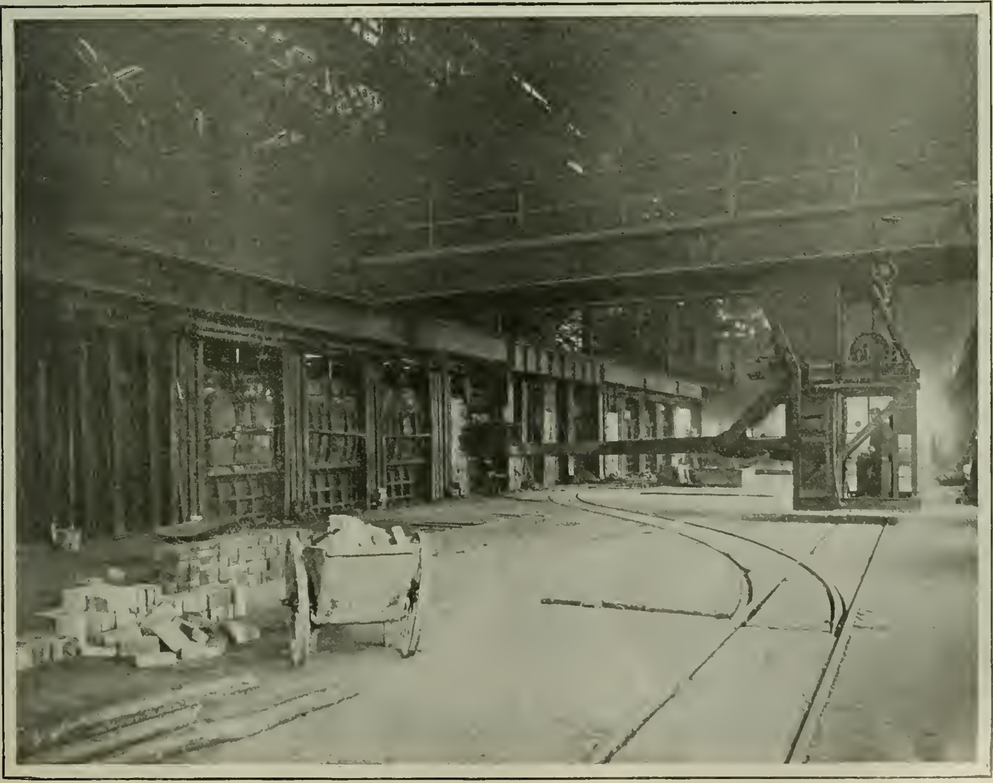
Photographs from the Field

ELECTROLYTIC ZINC REFINERY OF THE ANACONDA COPPER MINING CO. AT GREAT FALLS, MONT.—CAPACITY OF 6,000,000 LB. MONTHLY BEING INCREASED TO 10,000,000 LB. PER MONTH



ELECTRIC-POWER SUBSTATION FOR ZINC PLANT AT GREAT FALLS, MONT.

GENERAL VIEW OF ELECTROLYTIC COPPER REFINERY OF THE ANACONDA COMPANY AT GREAT FALLS, MONT.—CAPACITY, 20,000,000 LB. PER MONTH



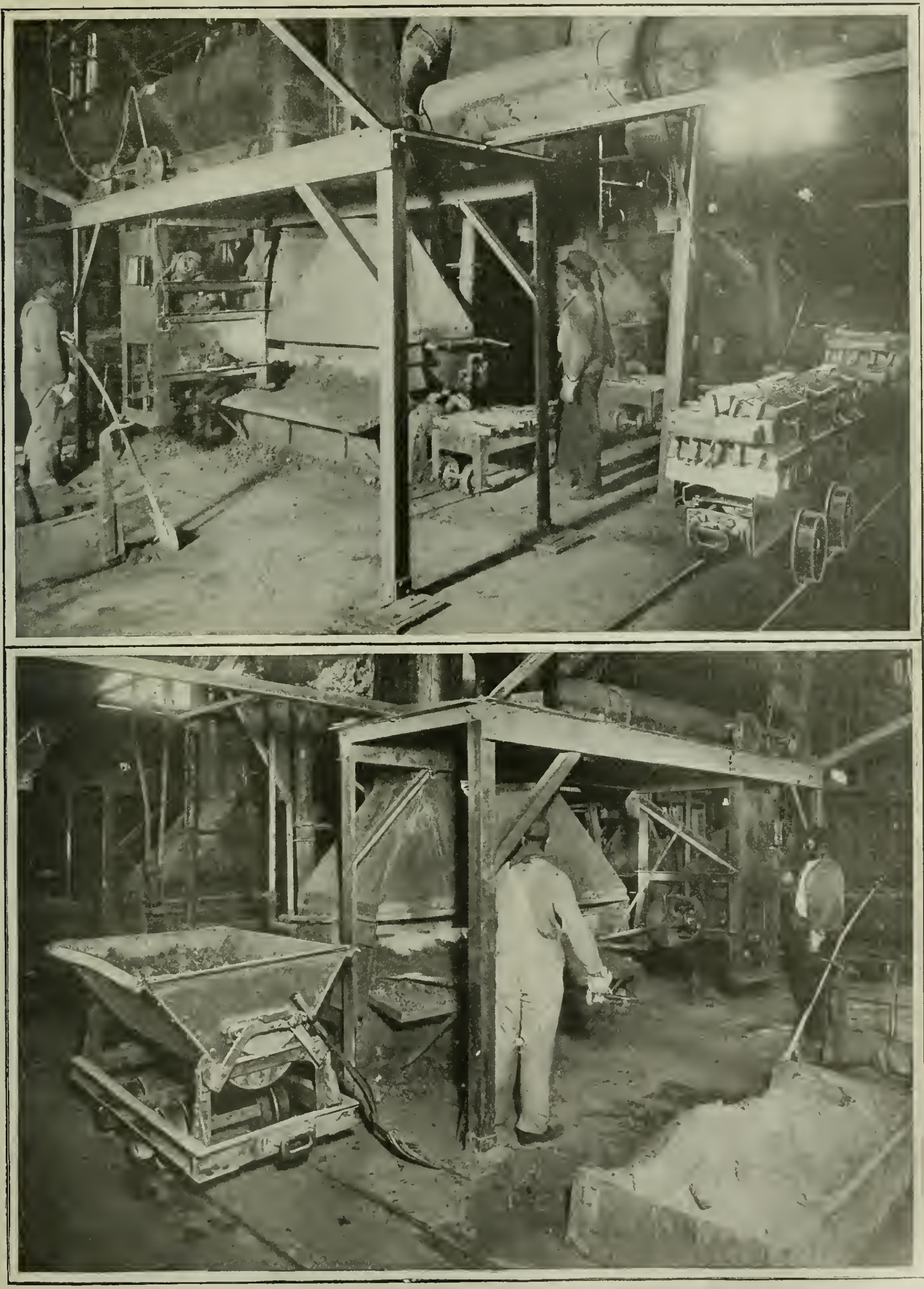
REFINING FURNACES AND CHARGING MACHINE IN THE ANACONDA REFINERY AT GREAT FALLS, MONT.

LEAD SMELTING WORKS OF THE ST. LOUIS SMELTING AND REFINING CO., COLLINSVILLE, ILL.

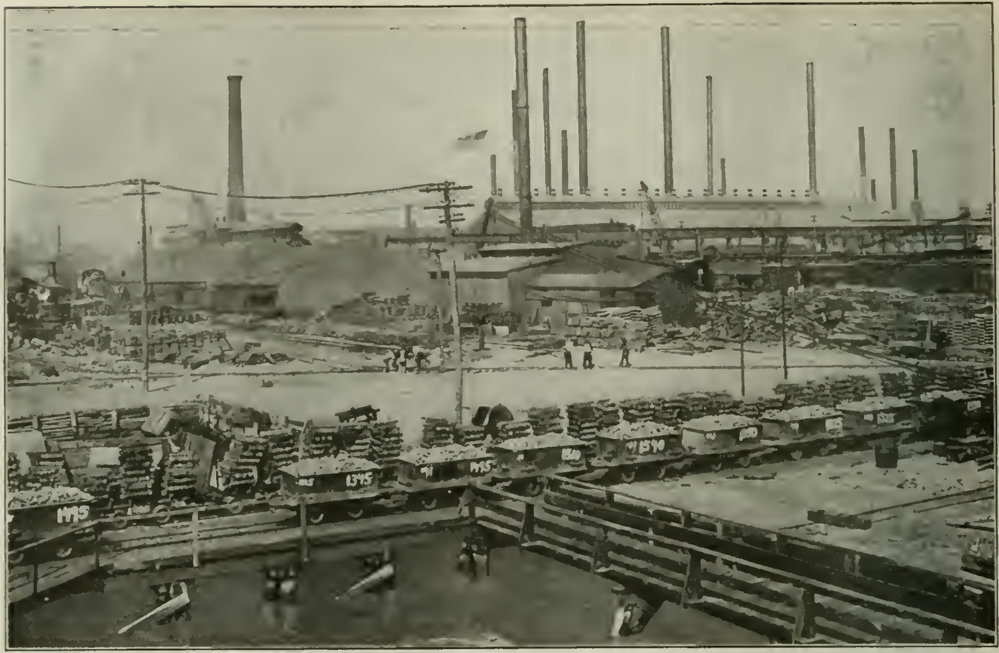
Formerly the lead in the Mississippi Valley was treated as nonargentiferous, but in recent years several companies have put in desilvering plants. The Collinsville plant desilverizes about 1 to 2 oz. of silver per ton, and produces an especially pure lead for the manufacture of white lead. Galena concentrates of over 68% lead are treated by the Newnam hearth process, which overcomes the disadvantages of the old-style Scotch hearth. The great drawback of the open hearth is the extremely severe working conditions owing to the intense heat and exposure to fumes. The leading advantages cited for the mechanical hearth used at this plant, and shown on the opposite page, over the old hand hearth are the following: Cool and sanitary hoods, mechanical rabblers and lead-well attachments that mold clean lead direct from the hearth basin with little attention on the part of the furnacemen. Other advantages of the Newman mechanical hearth for higher grade concentrates are: No flux required for treatment; expulsion of 95% of the sulphur; retreatment of all dust and fume produced, leaving gray slag as the only product to be sent to the blast furnace; large reduction in slag and matte produced; total extraction of 82 to 84% of lead contents of 70% concentrates, the extraction increasing with the lead tenor, practically eliminating any retreatment of mattes. Dwight-Lloyd machines are used as auxiliaries when concentrates lower than 68% are treated

LIBERTY LOAN MEETING OF EMPLOYEES OF McGRAW-HILL PUBLISHING CO., INC.

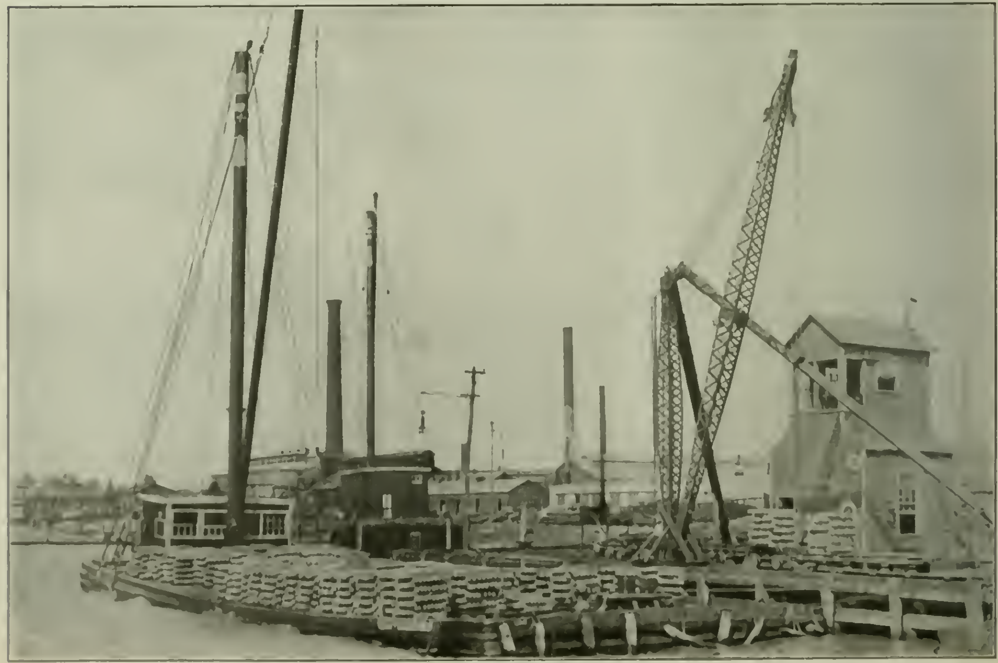
At this meeting there was unfurled a service flag with 42 stars, showing that 42 members of the company have entered military service. Since the meeting four stars have been added



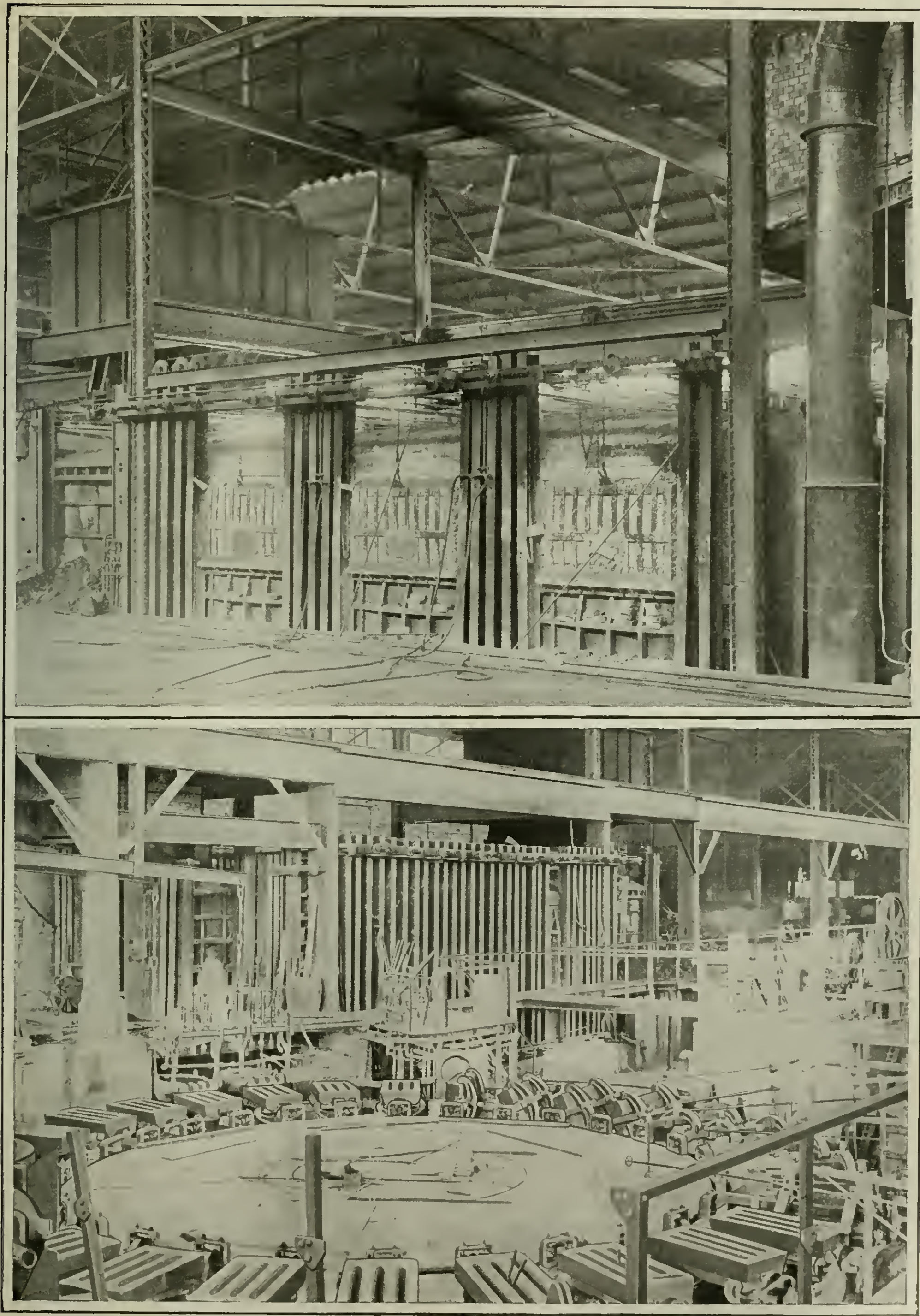
TWO VIEWS OF THE NEWNAM MECHANICAL HEARTH USED AT COLLINSVILLE, ILL.



VIEW OF RARITAN COPPER WORKS AT PERTH AMBOY, N. J.
Carloads of ingots and bars ready to be lightered to New York and thence shipped to Europe



LIGHTER, "ANACONDA NO. 2," LOADED WITH 800 TONS OF REFINED COPPER AT THE RARITAN WORKS FOR TRANSFER TO ATLANTIC LINERS



CHARGING AND CASTING SIDES OF REFINING FURNACE AT THE RARITAN COPPER WORKS

Events and Economics of the War

The systematic disclosure of German duplicity at Washington is continued by Lansing; Bernstorff now stands revealed as the head of numerous plots against American munitions plants and Canadian public works. The coal situation is far from satisfactory; a shortage is reported from many districts; the Fuel Administration maintains that this is only apparent, as more coal has been shipped this year than last. Dealing in 20 staple foods by all save small dealers will be licensed by Hoover beginning Nov. 1; sugar licenses are in prospect, says Hoover, unless Americans exercise greater economy. Government supervision of the foreign-language press has begun. The President has set Oct. 24 as Liberty Loan day by proclamation. The powers of the trading-with-the-enemy act are vested in various agencies of the Government. Railroads in the East are seeking higher freight rates from the Interstate Commerce Commission. Work is to be rushed on 787 ships for the Navy.

In Belgium the British continue their methodical drive, advancing materially at each shock. In Russia Kerensky has appointed a coalition cabinet and the Russian Congress has agreed to act as an advisory body to the provisional government. The Germans have landed troops on Oesel and Dagö islands in Riga Gulf, preparing it is said to move against Petrograd; a recent mutiny in the German navy is reported to have taken place; von Capelle, navy chief, is to resign; the Reichstag discusses peace. Argentina has stated that she will not break with Germany if her flag is respected.

Government Interference with Industry

The United States is not the only country wherein the government has interfered with the regular operation of the wheels of commerce and industry under the guise of regulating things for the most efficient conduct of the war. Complaints and criticisms come from Great Britain that are very similar to those that are being voiced here, while the course of things in Germany is manifestly very much troubled. The following interesting communication appeared in *The Evening Post* of New York under caption of "Special Correspondence from Zurich, Switzerland," dated Sept. 10, 1917:

> A question which is nowadays being asked in business circles here is whether Germany is committing economic suicide. This question is forcibly suggested by developments in the "militarizing" of shops and factories in order to save workmen, credit, coal and raw materials.
>
> The industrial production in each branch begins to be concentrated in certain factories. Germany is divided into dozens of military-commander districts called "Armee Corps Bezirke." The military authorities appoint those factories in each branch which they consider best fitted to take over the production of other factories which they decide to close.
>
> They create in such military commander districts, in one branch after the other, so-called Zwangs-Syndikate, compulsory unions of manufacturers. One fine day the owner of a factory receives a military order to send his workmen, raw materials, and often also part of his machinery to some competitor and to cease production.
>
> He receives from the military authorities a guarantee that this competitor who takes over his business in this manner will pay him the lost profit. The manufacturer can be glad if his former competitor appoints him as sales agent of the "Zwangs-Syndikate." Otherwise he himself is without work, and the military authority may send him anywhere to dig trenches or peel potatoes in a hospital kitchen. The "Armee Corps Kommandant" has full liberty to declare which factory is best fitted for being the concentrated producer of a district and which factory must be closed. There is no appeal from his decision.
>
> The Berlin Chamber of Commerce complains that in hundreds of cases of such compulsory industrial concentration, the advice of this competent body was not once sought by the Armee Corps Kommandant. But the compulsory syndicates not only concentrate production and shut down factories; they also distribute the produce to the retail consumers. In the moment when, for example, the soap factories are concentrated they sell directly to the retail trade, and the chiefs as well as the staff of wholesale soap dealers are sent to munition factories, to field work or other military slavery.
>
> It appears that military commanders are highly pleased with the results of this system, and in many cases it has already been stated that factories manufacturing valuable export articles for neutrals were closed. One consequence of this is the damage to Germany's exchange market. In the instructions sent to the owners of compulsorily closed shops and factories it is expressly declared that also after the war the reopening of the businesses will not be allowed without military permission. Much of the national resources in the way of industrial organization, adaptation of the individuals to local markets, special knowledge of the wishes of customers, special qualification for doing better work, are thereby destroyed from one day to the other.
>
> Small towns, where the workmen, owning a plot of ground and living in their own houses, can work more cheaply and so form a valuable asset in international competition through low prices, become depopulated from one day to the other. Industrial secrets become worthless; the special training of a staff of workmen and employees, perhaps the work of many years, is destroyed. Even the factories which enjoyed the favor of this military system gain no advantages. Their output is controlled; they cannot maintain the quality of the product; it is diminished automatically by the lack of competition. The trademarks, made so well known to the public through heavy expenses in advertising, become worthless, for all products sold by the compulsory state syndicates are sent out without trademarks and without any individual sign of the manufacturer.
>
> Perhaps these military commanders believe that they are acting in the national interests of Germany. They have the militaristic mentality, and believe that the destruction, or, better said, the suicide of German wealth, is a small sacrifice compared with the value of a military victory. But it is certain that the majority of German manufacturers and German merchants think otherwise. Here in Switzerland it is observed that German manufacturers with branches in neutral countries concentrate their production in the neutral countries, and gradually liquidate their German business. Their attitude is a silent criticism of the system of the military authorities. In the time of peace this economic suicide will have the worst consequences.

Trading With the Enemy

The Trading-with-the-Enemy Act, recently signed by the President, was framed on the broad, legal ground that in time of war all commerce between territories of belligerents is contrary to public policy, save as specifically permitted by the Government. The provisions of the Act apply to all persons in Germany or in territory occupied by her forces; to persons in countries allied with Germany; to persons outside of Germany but doing business therein; natives or subjects of Germany, residing outside of it and doing no business there, are not affected except as the President may proclaim.

Among the things specifically prohibited are the following: Dealing in property and extending credit on it as security; making new contracts or completing those existing on Apr. 6, 1917; drawing, accepting, paying, presenting for acceptance or payment, and indorsing evidences of dept; paying, satisfying, compromising or securing debts. A subject of Germany cannot with knowledge or reasonable cause for knowledge be carried into the United States, or out of it; or between ports of other countries on American vessels. Communication with Germany by mail, wireless or otherwise is forbidden.

The powers vested in the President by the act have been put into effect by proclamation. The President has created a board to censor all means of communication with foreign countries; censorship of the foreign langauge press is vested in the Postmaster General. The Exports Administrative Board is replaced by a new body, the War Trade Board, which will supervise exports and imports and consider licenses to trade with enemy firms. It will consist of Vance C. McCormick, chairman, representing the Secretary of State; Dr. Alonzo E. Taylor, representing the Secretary of Agriculture; Thomas D. Jones, representing the Secretary of Commerce; Beaver White, representing the Food Administrator; Frank C. Munson, representing the Shipping Board; and a representative of the Secretary of the Treasury; yet to be named. All but the Treasury representative are now members of the Exports Administrative Board, whose work hereafter will be done by the Bureau of Exports of the War Trade Board.

Foreign insurance companies in the United States are to be licensed by the Secretary of the Treasury. Patents, trademarks and copyrights are expressly excepted from the prohibitions declared and may be secured by Germans, as heretofore, provided Germany grants a reciprocal privilege to Americans. If conditions prevent Germans from filing applications therefor, a period of 14 months is allowed after the war in which such action may be taken. Licenses to use German-owned American patents may be issued. Supervision over enemy patents is assigned to the Federal Trade Commission.

The President's order defines the powers of the alien property custodian to act as trustee for all enemy property within the United States or to issue licenses exempting enemy companies from his supervision. An appointment for this position will be made soon. The custodian may require a transfer to himself of any property held for or debt owed to an enemy or enemy ally, and any person so holding any property or so owing any money may transfer the same to the custodian with his consent. Property or money so transferred to the custodian will be held until the end of the war and then dealt with as Congress shall direct. All funds or ready money may be invested in Liberty bonds and held in such form. The President has delegated to the Attorney-General the power to direct the payment of claims against enemy property in the hands of the custodian, upon the consent of all persons interested. All corporations, trustees, etc., issuing shares, etc., must, within 60 days after the Act became law, transmit to the custodian, sworn lists of shareholders, officials, directors, etc., with a statement of the extent of their interests in the corporation.

Navy To Purchase Own Supplies

The Navy will continue to maintain its own purchasing system instead of merging it with the War Industries Board, it has been decided. The question involved, was whether or not the Board's plan of noncompetitive, secret bidding which applies to the Army and other branches would apply to the Navy. Representatives of the latter claim that this method as practiced by the Board is costing the country millions. The New York *Sun* cites the following cases:

> The War Industries Board refused to give specifications or accept bids from a well-known manufacturer's agent here for a $3,000,000 order on the ground that he was a "middleman" and the board has a rule against dealing with "middlemen." A few days later an order was placed with the manufacturer direct for precisely the same material, at a difference in price of nearly $800,000 in favor of the manufacturer. The samples upon which the order was placed were precisely the same. The only difference was that the Government order was for $7,000,000 instead of $3,000,000.
>
> A second case involves the direct purchase of $2,000,000 worth of shoes by the War Industries Board. The bulk of this supply has been purchased at prices ranging from $4.74½ a pair. Identically the same shoes from identically the same manufacturers would have been had, according to the navy representatives, for $4.65 a pair if the agents had been able to bid.

Railroading in France

Within 20 days after the War Department delivered designs for special locomotives and cars for the troops in France, the first of 680 engines and the first of 6000 cars were ready for shipment, according to a statement from Washington. The engines weigh 166,500 lb. and are of the eight-wheel-drive type, having great traction. They are lighter than the American standard as French roads cannot carry the latter. The cars are only 36 ft. long owing to the sharp curves of the French roads. They have French couplings so that they can be used in the same train with French cars. All equipment will be made inconspicuous with battleship-gray paint.

It is understood that five engineer regiments, composed largely of railway men, will handle the new equipment. Flanged wheel rims have been provided for many American motor trucks and trailers so that they can be used on the line. This scheme was tried by Pershing's forces in Mexico with good results. At the main American army base, among other equipment will be a complete railway-repair shop for all classes of rolling stock, fitted for work on both American and French engines and cars. Trained railway mechanics of long experience on American roads will do the work. Construction of the shops is said to be well advanced.

Electrical Engineers Wanted for Naval Reserve

The Secretary of the Navy has authorized the commissioning of 100 graduate electrical engineers as lieutenants, junior grade, in the Naval Reserve. In general, candidates must be citizens of the United States, between 25 and 35 years of age and graduate electrical engineers. They must have had not less than three years' employment in electrical work since graduation and must be of character and physique required for officers of the regular service. Pay and allowances are approximately: $2200 at sea; on shore, $2480. There is an additional allowance of $150 for uniforms in time of war. Eighty-five nominations are to be made by each of the following agencies: Naval Consulting Board, National Research Council, American Institute of Electrical Engineers. Upon receipt of the 255 nominations thus made certain forms will be sent each nominee to execute and upon receipt of the executed forms a Board of Naval Officers will select 100 for appointment. The officers so selected will be given a month's training and instructions on shore in naval methods, customs, regulations and instructions. Pay will begin on date of appointment. Upon completion of this training they will be ordered to the active fleet as electrical officers of ships for a period of at least six months. After this they will be assigned to duty as the exigencies of the service may demand, excepting such as may be unfitted for the Naval Service. The Provost Marshal General has stated that anyone subject to draft may be released from compliance to accept such an appointment.

Higher Interest Rate on Deposits Not Advised

The expediency of raising the rate of interest on deposits from 3% to 4% has been referred to the Comptroller of Currency by a number of national banks. The purpose is to reduce the inconvenience that might arise from large withdrawals of deposits for investment in Liberty Bonds. In reply the comptroller has stated that 4% is a decidedly high rate for national banks to allow on deposits under existing conditions, and has suggested that the banks take no step in this direction until they can determine exactly what will be the effect of the offering of Liberty Bonds upon their deposits. The banks have been further reminded that they can readily obtain funds for their legitimate needs at favorable rates from the Federal Reserve bank of their district, against which money they will not have to carry reserve as for deposits. National banks, furthermore, generally have the opportunity of being designated as temporary depositaries for the purchase money of Liberty Bonds sold through them.

Commandeering a Plant

An Eastern mill was recently commandeered and compelled to handle Navy work exclusively. It received the following notification:

> You are hereby ordered to postpone deliveries under any commercial contracts you may now have until all the material due the Navy has been delivered. If such action becomes necessary the department will direct the cancellation of such contracts.
>
> You will understand this to be a commandeering of your facilities for the Navy, thus relieving you from any claims on account of default in delivery under your commercial contracts.
>
> It is assumed that this order will be taken by you as sufficient authority, but you are advised that should such action become necessary, the department will be compelled to use such means as are necessary to secure compliance with these directions.

The company in question has no redress. Until all orders for the Navy are ready for delivery it cannot engage on any orders for its customers.

Lift Steel Embargo Against Japan

Japan is to be allowed sufficient steel to keep her shipyards at full capacity, it is reported from Washington. In return she will divert a number of vessels now building into the transatlantic trade with the stipulation, however, that they shall make alternate voyages to Japan. It is practically agreed that the boats shall be sent via Panama to Atlantic ports and thence with cargoes to Great Britain and France; after making the return voyage to this country, they shall go to Japan carrying ship steel. Japan has hitherto maintained that she could spare little tonnage without great inconvenience to herself. It is likewise announced from Amsterdam that the Nederland Steamship Co. has acquiesced in the American conditions for granting bunkering facilities. These provide that the company's vessels for every voyage between Java and the United States shall make a return voyage with cargoes exclusively American or partly Canadian.

Wages Raised in Central Coal Field

Bituminous coal miners of the central competitive field have won their fight for a general wage increase. An additional 10c. a ton will be paid for pick and machine mining, as against the miners' first demand for 15c.; day labor will be advanced $1.40 a day instead of $1.90 asked; pay for yardage and dead work will be increased 15% instead of 20% demanded. Trappers will get 75c. a day raise and other boys $1. The agreement is to last throughout the war. Operators consented to the new wages on the condition that they be absorbed in higher coal prices. The agreement presages a wage raise throughout the industry, as the central-field scale serves as the basis for all other districts.

Letter Postage Rates Increased

The Post Office Department has issued these instructions:

> Postmasters shall on and after Nov. 2 see that postage is paid at the rate of 3c. an oz. or fraction thereof on letters and other first-class matter, except drop letters and foreign mail.
>
> Postal cards are required to be prepaid 2c. and therefore the 1c. postal cards must have a 1c. postage stamp affixed to them in addition to the 1c. stamp impressed on such cards.
>
> Post cards (private mailing cards) bearing written messages must have 2c. postage prepaid on them.

These increases are in accordance with the provisions of the War Revenue Bill recently signed by the President.

May Penalize Car Diversion

As a means of keeping freight cars in active service, charges ranging from $2 to $5 a day on those diverted or re-consigned by shippers will be made by the railroads, if the Interstate Commerce Commission grants their appeal. Without a heavy charge, the railroad attorneys told the Commission, shippers hold loaded cars and change destinations and consignments at will, thus contributing to the congestion of the lines. One of the greatest factors in last winter's coal shortage, these attorneys contended, was the practice of shippers in using coal cars for storage.

Industrial News from Washington

By Paul Wooton, Special Correspondent

Globe-Miami Strikers Will Accept Labor Commission Award

The President's labor commission has concluded the hearing of the side of the striking miners in the Globe-Miami copper district of Arizona. The state leader of the strikers and President Moyer of the International Union of Mine, Mill and Smelter Workers have unreservedly placed the adjustment of the Arizona difficulties in the commission's hands with an unconditional agreement to abide by any decision the commission may make for maintaining peaceful labor relations in that state, at least during the period of the war.

The commission is now hearing the side of the operators and the views of other parties interested When this is completed it will formulate a plan of settlement through the coöperation of all persons concerned which it is hoped will satisfy all sides. The striking unions concluded the presentation of their case to the commission by making an unqualified offer to go back to work immediately upon the agreement of the operators to submit the dispute to arbitration by the commission, and to continue at work pending the arbitration. The strikers expressly stated that they were eager to do away with any delay which might be the cause of the slightest decrease in the normal production of copper for the use of the nation.

Circumstances Attending Passage of Explosives Bill

The Explosives Bill became a law under most unusual circumstances. It was signed by the Vice-President and the President after the Senate had adopted a resolution agreeing to reconsider the vote by which the conference report had been adopted. To understand the situation thoroughly, it is necessary to have in mind the history of the legislation. The bill was reported favorably by the House committee after brief consideration. It passed the House shortly afterward, but the Senate committee rewrote the entire bill, embodying in the law certain of the rules and regulations which had been drafted tentatively by the United States Bureau of Mines. This bill passed the Senate. In conference, the appropriation was reduced from $400,000 to $300,000. The price of the license was reduced from 50 to 25c. The conferees also eliminated the provision which authorized the investigation of any explosion which may have taken place since the beginning of the war. Numerous other minor changes were made, but it was this last change that met the determined opposition of Senator Walsh of Montana, the chairman of the Committee on Mines and Mining. He was anxious that the North Butte disaster be investigated under the authority of the Act.

The conferees had reached their agreement and their report had been accepted by each House during Senator Walsh's absence from Washington. On his return he introduced a resolution providing that the Senate reconsider its vote, so that disasters since the outbreak of the war might be investigated. The Senate adopted the resolution, but the House laid it on the table after Representative Foster, the chairman of the House Committee on Mines and Mining, had urged the House not to return the papers to the Senate as requested by Senator Walsh's resolution.

This action on the part of the House was called to the attention of the Senate by Mr. Walsh, who asked that action be taken to uphold the dignity of the Senate in view of the declination of the House either to comply with the Senate's request or to communicate reason for the refusal. Senator Walsh then introduced a resolution, which was agreed to, directing the secretary of the Senate to advise the President that the signature of the Vice-President was affixed to the bill inadvertently while there was pending before the Senate a motion to reconsider the vote by which the report of the Committee on Conference was adopted. This controversy not only threatened to prevent the passage of legislation deemed to be highly important but has given rise to friction between the two committees on mines and mining, which is likely to affect future legislation.

Gifford Urges Business Organization on Nation-Wide Basis

Creation of national organizations to cover all lines of industries was urged by Walter S. Gifford, director of the Council of National Defense and its advisory commission, at the war convention of the Chamber of Commerce of the United States, which was held at Atlantic City. Commenting on Sec. 3 of the Food Control Act, which has stripped so many of his committees of their membership and has left the Council of National Defense a mere skeleton, Mr. Gifford said:

> Any broad-minded man would have to admit that Sec. 3 of the Food Control Act is intended for the good of the people. It is really because the business men had failed to organize in time of peace and to be in a position to coöperate as organizations with the Government that we have Sec. 3. It is because the Government was forced to organize business as best it could that the situation demanded the passage of a law to prevent possible abuse in what was the only method of procedure that the circumstances permitted.

Mr. Gifford expresses his view of the need of national organization in the following language:

> Each industry would best serve the Government if it were organized on a nation-wide basis with complete representation of all members of the industry. Organization along state lines or by localities is admirable for chambers of commerce and local civic associations, but our industrial life is not so divided. Industries are not largely affected by state lines. A national organization by industries is the form that will best serve the Government both in time of war and in time of peace.
>
> I hope that men of vision in industry will feel it their duty to assist in organizing the business of this country more completely than it has ever been done. The vision of organized business must be far-sighted and broad. Business

men should know more about business than the Government, no matter how able that Government may be. But remember that the day when business can move along feeling that its own interests are apart from and distinct from the interests of the people has gone by. The war has shown not only that public utilities are essential to the well-being of the people and therefore must be regulated to prevent abuses, but that coal, iron and copper mines and other lines of industry, in short, all vital business, must be carried on for the good of all the people.

Statistical Department Organized by War Industries Board

Arrangements have been completed whereby the United States Geological Survey will coöperate with the War Industries Board in furnishing statistics and other data concerning war minerals. The Survey will make further studies of the situation. The Board is building up a statistical department, which, besides being a clearing house for the statistical sections of various Government bureaus, is gathering data along many lines to be able to forecast future needs with accuracy and to have at hand correct information as to available resources. It will keep track of Government contracts in essential articles of primary importance and will thus be able to distribute orders more intelligently, it is thought. The statistical division also expects to be of decided help to the Priority Committee in giving it advance notice of impending shortages.

Prices Fixed for Steel Products Agreed Upon in Conference

Prices approved by the President last week on certain semi-finished and finished steel products were in line with those announced for plates, shapes, bars, pig iron, coke and iron ore in a statement dated Sept. 24. The new list of prices was issued after a two days' conference between the War Industries Board and committees and members of the American Iron and Steel Institute. The maximum prices of iron ore, iron and steel and their products, as announced to date, are given in the accompanying table. They became effective immediately upon announcement and are subject to revision Jan. 1, 1918.

PRICES FIXED FOR IRON ORE, IRON, STEEL AND THEIR PRODUCTS

Commodity	Price Agreed On	Base
Iron ore	$5.05 per long ton	Lower Lake ports
Pig iron	33.00 per long ton	Foundry and malleable valley furnaces
Steel bars	2.90 per 100 lb.	Pittsburgh and Chicago
Shapes	3.00 per 100 lb.	Pittsburgh and Chicago
Plates	3.25 per 100 lb.	Pittsburgh and Chicago
Blooms and billets, 4 x 4 in. and larger	47.50 per long ton	Pittsburgh and Youngstown
Billets under 4 x 4 in.	51.00 per long ton	Pittsburgh and Youngstown
Slabs	50.00 per long ton	Pittsburgh and Youngstown
Sheet bars	51.00 per long ton	Pittsburgh and Youngstown
Wire rods	57.00 per long ton	Pittsburgh
Shell bars, 3 to 5 in.	3.25 per 100 lb.	Pittsburgh
over 5 to 8 in.	3.50 per 100 lb.	Pittsburgh
over 8 to 10 in.	3.75 per 100 lb.	Pittsburgh
over 10 in.	4.00 per 100 lb.	Pittsburgh
Skelp, grooved	2.90 per 100 lb.	Pittsburgh
universal	3.15 per 100 lb.	Pittsburgh
sheared	3.25 per 100 lb.	Pittsburgh

The new list of prices was accompanied by the following comment by the War Industries Board:

> The prices enumerated have been fixed by the President on the assurance of those representing the steel industry that these prices equitably adjust the relations of the steel interests to each other, and will assist them in fulfilling their obligations to give the country 100% of production at prices not to exceed those heretofore announced. Measures will be taken by the War Industries Board for placing orders and supervising the output of the steel mills in such manner as to facilitate and expedite the requirements for war purposes of the Government and those nations associated with us, and to supply the needs of the public according to their public importance and in the best interest of all, as far as practicable. A spirit of coöperation was manifested by the steel men, and no doubt is entertained that every effort will be made to bring the production as nearly as possible up to the extraordinary demands resulting from the war.

The alloys and iron ore committees of the Iron and Steel Institute, who participated in the conference are constituted as follows: Alloys—J. A. Farrell, E. A. S. Clarke, A. A. Fowler, E. G. Grace, E. J. Lavino and E. H. Gary, the last-named being an ex-officio member. Iron Ore—H. G. Dalton, Frank B. Richards, Harry Coulby, C. D. Dyer, W. T. Shepard, G. H. Woodward, Leonard Peckitt, Frank Billings and Amasso S. Mather.

Lode Mining at Fairbanks, Alaska

Lode mining in the Fairbanks gold district of Alaska will remain practically at a standstill until the completion of the Government railroad to Fairbanks. Commenting on conditions in the Fairbanks district, J. B. Mertie, Jr., of the United States Geological Survey, says:

> The cost of power and supplies has increased so greatly that most of the operators either have closed their mines or are operating on a scale little more extensive than prospecting. Most of the operators having high-grade gold ore do not care to continue work under present conditions, which allow them only small profits, and the owners of lower grade ore cannot afford to operate at all. The general policy of all concerned is to await the coming of the Government railroad to Fairbanks, the expectation being that this will effect a general decrease in operating costs. Cheaper power perhaps is the most urgent need of the lode mines and the railroad, by making available the coal resources of the Nenana and Matanuska coal fields, would help materially. A central power plant utilizing perhaps the low-grade Nenana coal may prove the ultimate solution of the difficulty.

With reference to pyrites, Mr. Mertie's investigation leads him to the conclusion that the only sulphide ores which have been found in lodes of commercial importance in Alaska are stibnite and galena.

More Data Sought from Geologists

As the returns on the census of geologists reach the United States Geological Survey, requests for additional information are being sent out to those indicating that they have specific knowledge of the following minerals: Chromite, platinum, potash, manganese, tin, iron pyrites, mica, graphite, arsenic, antimony and bismuth. In this way the Survey expects to collect valuable information with regard to developing greater domestic production of the minerals mentioned.

Experimenting with Phosphate in Northwest

While plans are being made for shipping high-grade superphosphates from the Pacific Northwest into the Middle West, A. E. Wells, superintendent of the Salt Lake City station of the United States Bureau of Mines, believes that none of the material has been manufactured on a commercial scale. The work thus far, he says, has been carried out only in an experimental way in preparation for future operations.

Editorials

This Special Smelting Number

WITH this issue we are repeating our venture, instituted last year, of issuing in the autumn a number of the *Journal* especially devoted to the interests of smelters. Our readers who are exclusively engaged in the mining and milling of ores will forgive us for this preëmption of an issue, for earlier in the year they had special issues devoted to their own subjects.

Smelters will find in this issue, just as they did a year ago, a collection of noteworthy, metallurgical papers. The present issue has a distinctive feature in its attention to branches of metallurgy that are not commonly discussed. Thus there has long been great interest in the subject of zinc-oxide manufacture, but there has been scarcely anything in technical literature about it. Mr. Cregan, in his article on "Zinc-Oxide Furnaces," which is a paper of eminently practical character, fills this gap in a highly satisfactory way.

With regard to blende roasting the same complaint respecting deficiency in the literature cannot be made, for, in fact, the literature on that important subject is extensive. However, it is not very satisfactory, barring the noteworthy article of Mr. de Lummen that we published not very long ago. Previous literature on this subject has been largely confined to descriptions of furnaces, without any analysis of their relative merits and the factors that should determine the choice of a furnace. March F. Chase, who was for many years in charge of the works of the Mineral Point Zinc Co., at Depue, Ill., and has later been engaged in metallurgical work in the vicinity of St. Louis, is a recognized expert on this subject. We asked Mr. Chase to contribute an article on "What Is the Best Blende-Roasting Furnace?" He did not think that he could write exactly under that caption, but has closely approximated to it under the caption of "The Choice of a Blende-Roasting Furnace." Our metallurgical readers will find this a thoroughly refreshing and valuable contribution upon this important subject. In introducing two new contributors, like Mr. Cregan and Mr. Chase, into the field of metallurgical literature, as we have done in this issue, we feel that we should have made good, even if we had done nothing else.

However, in presenting the paper by K. C. Li, on the "Metallurgy of Antimony," we have filled another gap in metallurgical literature. It is proper to say that Mr. Li's paper was presented originally to the Institute of Metals and was published in its proceedings, but for our present publication Mr. Li revised it and supplied new drawings and photographs, which greatly increase its value. Mr. Li is one of the leading officers of the Wah Chang Mining and Smelting Co., at the head of which is H. Y. Liang, who is well known to American metallurgists, as he was a visitor in this country a few years ago. Mr. Liang studied in the Royal School of Mines, in London, and then went to France and engaged in antimony smelting under Herrenschmidt, who had developed the modern metallurgy of antimony. That which is commonly described in the textbooks is as archaic as copper smelting in Orford blast furnaces. Having learned the business in France, Mr. Liang went to China and instituted smelting there on a scale which eventually made his company the chief producer of antimony in the world. Europe and America borrowed the germs of some of its other metallurgy from China, zinc smelting, for example. It is fitting, therefore, that China should have borrowed antimony smelting from Europe. And to complete the comparison, while China, to which the world owes the inception of zinc smelting, now comes to Europe and America to learn modern practice, we must go to China to get the best practice in antimony smelting which China learned from France.

The copper metallurgists get their share of this number in the excellent article by Mr. Krejci on "The Development of Copper Converter Practice"; in the article by Mr. Williams describing the new Granby smelting works at Anyox, B. C.; in the article describing smelting at the Old Dominion Works in Arizona; and in the article describing electrolytic refining at the Raritan Works at Perth Amboy, N. J.

We regret that lead smelting does not receive its full share of attention, owing to disappointments at the last moment, but some excellent photographs show the working of the Newnam mechanical hearth at Collinsville, Ill., which is one of the most striking and perhaps pathfinding among recent developments in the metallurgy of lead.

We must not omit to call attention to the prophetic article by E. P. Mathewson, one of our past masters in metallurgy. In corresponding about this article, we asked Mr. Mathewson to let himself out, and he has done so, describing freely and frankly visions that no one except the big-minded metallurgist would have, and visions that no one except a metallurgist of assured position would tell about. We think it is the duty of metallurgists of that standing to unfold themselves, in order to afford inspiration for the coming generation, and it is gratifying that men like Ricketts and Mathewson are generous enough to do so. Mr. Mathewson will forgive us if we say that we do not indorse his ideas that involve the subjects of sociology and economics, but his expressions deserve thoughtful consideration, and perhaps we can all find that we can stand on some middle ground without sacrificing our traditions.

Congress Thinks Well of Perpetual Motion

THERE is a law known to scientists as the law of the conservation of energy, which is one of the fundamental laws of nature, like the law of gravitation and the law of supply and demand. There is no use in arguing about them. They are laws, immutable, inexorable, a part of nature itself. The law of the conservation of energy finds expression in thousands of ways. One of the ways is that nobody can get anything useful without spending something for it. There have been many thousands of inventors who have thought they could get power without spending anything for it, have thought that they could contrive motors that would run perpetually without any expense, but Nature with her troublesome old law forbade.

However, dreamers still dream (and fakers still fake) and now comes Garabed T. K. Giragossian, an Armenian inventor, of Boston, who believes he can extract from the air a mysterious power that will drive aeroplanes or battleships. Mr. Giragossian, without revealing his secret, made a decided impression upon members of the Senate and House of Representatives, and the two bodies, which together comprise Congress, adopted a resolution for an investigation of Mr. Giragossian's ideas by a committee of scientists approved by the Secretary of the Interior.

Congress is learning something at least. When, a few years ago, it was considering the discovery of the North Pole, it did not refer the matter to a committee of scientists, but (if our recollection be correct) simply voted that Doctor Cook did it. But the Giragossian matter shows progress. Some day it may even refer the drafting of revenue bills, and such things, to a committee of scientists.

Silver Production of the World

The silver production of the world in 1916, as nearly as can be ascertained from the available statistics, was 175,933,024 oz. fine, a slight decrease from 1915, but a considerable gain over 1914. The war conditions affected production in two ways: In one direction by increasing the demand and the prices, in the other by diminishing the supply of mine labor and by interfering with production in a few countries. Possibly a greater portion of the decrease from some previous years was caused by the internal troubles of Mexico, usually the second producer of the metal.

SILVER PRODUCTION OF THE WORLD

(In Troy Ounces, Fine Silver)

	1914	1915	1916
United States	72,455,100	74,961,075	74,414,802
Canada	28,406,711	26,625,960	25,669,172
Mexico	27,546,752	39,570,151	38,250,000
Central America	2,754,868	2,920,496	3,127,500
South America	10,448,557	13,687,464	14,650,000
Total America	141,611,988	157,765,146	156,111,474
British India	236,440	284,875	262,500
China	..	18,230	21,500
Japan	4,836,228	5,079,552	5,194,800
Chosen	16,864	21,876	33,900
Dutch East Indies, Indo-China, etc	52,847	48,032	56,650
Total Asia and Oceanica	5,142,379	5,452,565	5,569,350
Transvaal	901,763	996,379	954,600
Rhodesia	150,794	185,233	171,200
Congo and other Africa	5,993	4,770	6,500
Total Africa	1,058,550	1,186,382	1,132,300
Europe	9,240,025	9,276,930	8,954,400
Australasia	3,573,077	4,295,757	4,165,500
Total for the World	160,626,019	177,976,780	175,933,024
Value at av. N. Y. Price	$88,040,027	$88,425,981	$115,518,726

Figures for foreign countries are based largely on the statistics collected by the United States mint, where no direct official figures can be obtained. China is omitted in 1914, not because there was no production, but because no figures could be secured. Estimates for 1915 and 1916 are probably low

The first table herewith gives the production by countries in troy ounces of fine silver. The figures are taken from official sources wherever possible, and in other cases are estimated as closely as possible and checked by export reports and other authorities.

The second table gives the silver production of the world for 10 years past, in ounces.

SILVER PRODUCTION FOR 10 YEARS

(In Troy Ounces of Fine Silver)

1907	183,446,268	1912	250,915,189
1908	212,585,573	1913	223,582,706
1909	227,289,440	1914	160,626,019
1910	240,213,965	1915	177,976,780
1911	254,201,239	1916	175,933,024

The total reported production in 1916 was less than that of 1915 by 2,043,756 oz., or 1.2%; but it exceeded that of 1914 by 15,307,005 oz., or 9.5%. It was less by 78,268,215 oz., or 30.7%, than that of 1911, which was the heaviest in recent years. The increase in output from 1907 to 1911 was steady and quite normal. There was a slight check in 1912 and a somewhat greater one in 1913, probably due to the low prices which prevailed in those years partly, and partly also to the interruption of mining in Mexico, which at one time was the largest producer. The sharp fall in 1914 was due to the outbreak of the great war, which for a time demoralized production of all kinds, and especially stopped the working of copper mines in this country which are large silver producers also. The output in Australia was also cut down by labor and other troubles at the Broken Hill mines. The year 1915 showed a very considerable recovery and though 1916 fell back again a little—chiefly owing again to the troubles in Mexico—the difference was not great.

The great demand for silver this year and the consequent extraordinary rise in prices, still high in spite of the recent decline from the maximum, is now stimulating production everywhere. The causes of this demand have been heretofore referred to and it is only necessary to say briefly that the demand for the East has kept up well, while that in Europe has very largely increased, owing to the coinage of great quantities of silver money, which is largely taking the place in ordinary circulation of the gold which has been absorbed by the governments for war purposes.

In fact, the coinage demand in 1916 was unprecedented and it is certain that a larger part of the metal was coined and went into circulation as money than ever before. A collateral to this is that the demand for silver for use in the arts, while good in the United States, was light in all European countries. There are reports that some of the heavy coinage is being hoarded, but these rumors cannot be verified.

Silver is peculiar among all the prominent metals in that a large part of its production is as a byproduct, in connection with other metals, as lead, copper, gold, etc. Comparatively few mines are worked solely or chiefly for the silver contents. Its production is consequently less affected by the direct demand for it, depending largely on that for the other metals, and there have been years when supply seemed to exceed the demand. In 1916, however, the conditions were reversed and the demand was—for a part of the year, at least—in excess of the supply. It was a year when the advantage was with the sellers rather than the buyers of silver.

The new tax bill, especially as it relates to mining companies, continues to be obscure and probably will so remain until we get some Treasury decisions.

What a serious thing to say is that! That Congress so bungles vital legislation that industries are thrown upon the mercy of bureaucrats, with no redress except the tedious course through the courts! In the meantime we get nothing but glimmerings as to the operation of the new law. What are capital and earned surplus employed in the business, remain unanswered questions. About the only thing we can surely see is that companies of large capitalization, like Anaconda, are better off than those of small, like Utah. The clause that permits a deduction from earnings to be made on account of depletion of the mine also affords some hope for the correction of inequities.

The liquidation in the stock market is ascribed to grave concern respecting the new tax law more than to any other one cause. It is not so much a dislike of the high taxation as it is of the inequitable and unscientific system that was evolved in star-chamber proceedings and enacted by Congress without adequate discussion. The President could take no more important step, as a war measure, at the present time than to appoint a committee of experts to redraft the tax law in a scientific way and have it ready for Congress to adopt as an amendment when it meets next December.

BY THE WAY

The young bride had just spent a week at her new home in one of the older Western mining camps. The ground had been located and relocated several times, and in every direction monuments could be seen The bride was heard to remark that until she had come to the West she "had no idea how sentimental mining people were," and thought it "perfectly fine that so many monuments had been put up in memory of the old prospectors and miners."

It sounds simple when you hear it, but some of the simplest solutions are seldom thought of in an emergency. At a mine in the tropics a heavy rain caused a river to rise so rapidly that two miners, neither of whom could swim, were marooned from camp. While the foreman was rigging up a device to rescue them with a wire rope, pulley and "bosun's chair," one of the men disappeared. Within 10 min. he strolled into camp in a semi-nude condition, carrying a queer-looking object. Upon being pressed for an explanation Manuel grinned and exhibited his "water wings," saying, "at the village of my birth in Andalusia, Spain, all the small boys do this whenever they get a chance." He had slipped off his shoes and overalls, tying up the legs of the latter with his shoestrings. Wetting the cloth and inflating his pontons, all he had to do was start far enough upstream and propel himself to the desired point.

Another South African venture is in prospect for American capital. Sir Abe Bailey, who recently formed the Anglo-American Rhodesian Exploration Co., with a capital of £250,000 to acquire all his Rhodesian assets, has started for New York with the intention of increasing its capital to £1,000,000. The new company's head office is at Salisbury, with branches at Bulawayo, Gatooma, Victoria, and Penhalonga. "Apparently," says the London *Fiancial Times*, "judging by the title of his new enterprise and the fact that he is visiting the United States before paying his promised early visit to England, Sir Abe is about to preach the gospel of Rhodesia's coming greatness to Yankee capitalists; that he will receive a friendly welcome by the latter is foreshadowed by the successful launching of the Rand-American Syndicate formed early last year by Isaac Lewis. The Syndicate's program has been delayed by the postponement of the Transvaal Mining Leases Bill to another session of the Cape Parliament, but the indications are that American finance is going to have a big finger in the South African pie after the war, if not before." With breathless anticipation—and hands on our pocketbooks—we await the arrival of Sir Abe.

Some extravagant person night-lettered that the following was overheard at the recent St. Louis A. I. M. E. convention: The engineer, "Yes, Blank lost all his money in a wildcat mine." His wife interrupted, "I didn't know you had to mine for wild cats." The wife of another engineer butted in with: "Oh, yes you do, but it never pays. When I was a little girl in southwestern Virginia I rambled upon Angel's Rest Mountain one day, looking for berries. Suddenly I saw the cutest little kitten ever. Instead of coming when I called it ran into a hole in the ground. Determined to have that kitten, my sister and I commenced mining with a stick. Pretty soon we struck the mother lode almost at grass roots and collected some rich samples. We each promised faithfully, hope-to-die cross-our-hearts never to tell a soul, but it was not necessary. When we were about 100 yd. from home something informed mother what had happened and she ordered us to bury our clothes before coming to the house. You see, our kitten was a 'wood pussy,' which is another kind of a wild cat."

Recently in driving a heading in the Bonne Terre mine of the St. Joseph Lead Co., at Bonne Terre, Mo., an odor of gasoline was noticed. As the heading advanced, it became stronger until finally the emanations from a drillhole took fire from the open flame of a miner's cap-lamp. This fire was easily extinguished, but further drilling brought out so much more "gas," that another big fire occurred and was extinguished with difficulty. As this occurred in a porous dolomite with a heavy sandstone below and on an anticlinal structure, visions of a gas field were conjured, further heightened when a churn-drill hole sunk to this horizon produced about 100 gal. of gasoline—and then petered out—but it was clean, straight gasoline. A quiet investigation of the neighborhood developed the fact that a blacksmith shop had been run for years immediately over the "gasoline drift" and that it had been equipped with an old gasoline engine supplied from underground tanks. With gasoline at 10c. per gal., a slight but steady leakage was not noticeable and would never have been detected, but for the unique outbreak of a gasoline fire in a new rock drift in the mine directly under the old tank.

Saving for the Liberty Loan

The pledge of "ability and purpose to save money to win the war" is the sum and substance of the loyal citizen's duty in the matter of the Liberty Loan. Commenting on the advantage of saving the money to buy the bonds over the plan of some persons to raise the money by selling other securities, the *Sun* says:

"The sellers (of securities) may use the money received from the sale of their holdings in subscribing for the Liberty Loan; we wonder if they realize what a mistake they make to subscribe with money got in this way.

"It is better to borrow money with which to subscribe to the Liberty Loan than to disturb past savings already invested. The borrowing should in every case be done with the idea of repayment from current income in as short a time as is compatible with the personal circumstances of the borrower.

"The ideal way to subscribe to the Liberty Loan is not, as so many persons seem to think, to pay cash down for the full amount of the bonds. The ideal way to buy a Liberty bond is to pay a little cash down and save the rest from current income—if possible, before the next Liberty Loan offering; if not, as soon as may be. Those who pay cash down in full for Liberty bonds merely transfer money already accumulated to the credit of the Government, but they do not pledge their saving power, they do not enlist their willing and continuous effort in the task of saving, they do not set themselves any work to do in the work we all must do if we are to win the war.

"Those who borrow money with which to buy Liberty bonds, but with no idea of repaying the principal in a definite time, merely tie up some one else's money. They are excusable, perhaps, if they know that the other fellow would not have bought Liberty bonds with it. Even then they do not enlist their own saving power nor his. Those who borrow in anticipation of future savings are in the same excellent class with those who pay a little cash down and undertake to save the rest to meet instalments. The net result is the same; their saving power is brought into action.

"Those who sell what they have to get cash to buy Liberty bonds do a destructive thing. They are guilty of a kind of financial sabotage. There is not and cannot be defence for men who by their acts do their best to wreck existing investments. Their acts cannot be defended on the ground that the Government's colossal investment requires them. It does not. Proper saving by the American people combined with a judicious use of our credit facilities will foot the war bill with no difficulty whatever.

"The most critical point in relation to the Liberty Loan, and the one point which makes relevant recent occurrences in the stock market, is the method of subscription. Neither the total amount of the subscription nor the actual number of subscribers is of such moment at this time as that the American people as a whole shall understand in what way and by what means they ought to take the bonds.

"The test of the real usefulness of an individual's subscription is the engagement of his saving power. If, in buying Liberty bonds, he has not pledged his ability and purpose to save money to win the war, he has not done his full bit! This lesson must be driven home in the general consciousness. When it comes home, we shall have no trouble about the total subscriptions or the number of subscribers. Anyone can save. And anyone who can save can subscribe."

Suspension of Assessment Work

Denver Correspondence

In reporting adversely on the Shafroth resolution providing for the suspension of assessment work on unpatented mining claims during the war Secretary Lane stated that so far as he had been advised there was no general demand or necessity for relieving the owners of mining claims from performing the usual labor and improvements on their claims. He thought that to grant the exemptions proposed might inure to the benefit of claimants who are holding public lands under mining locations for speculative purposes. This statement was made despite the fact that there were on file with the Committee of Mines and Mining urgent appeals from nearly all portions of the mining regions of the West, asking for this legislation. The adverse report of the Interior Department would mean the defeat of the Shafroth resolution[1]. Therefore Congressman Taylor prepared a substitute wherein assessment work is waived for the present year only.

Secretary Lane has stated that he is inclined to favor the resolution as amended. Just why he is inclined to favor the suspension of assessment work this year and not next, should the war continue, is not clear, but in any event it is probably all that can be expected at this session. Any effort to extend the time will probably jeopardize any legislation in this direction. The justification for the Shafroth resolution should be clear to any mining man. Following the declaration of war a large number of miners, probably more than from any other industrial group in Colorado, enlisted or quit their jobs in the mills and shops and as skilled mechanics sought employment in the United States navy yards. When the conscription law passed, another large exodus took place, for miners volunteered in order to choose the various branches of the Army and Navy under which they preferred to serve. A still further loss came with the selective draft. The situation has been further aggravated by industrial disturbances where strikes were threatened or actually took place, and since employment in other lines of industry could readily be obtained a large number of men left the mines for fear of being involved in labor troubles. At Leadville and Cripple Creek and in the San Juan there are mines where a hundred more men could find employment, if they could be obtained, at a higher wage and under more favorable conditions than ever before.

In Colorado alone there are over 5000 unpatented claims, requiring annually half a million dollars' worth of labor as assessment work. This work is never classed as productive, is seldom even considered development work, and is frequently nothing more than surface exploration and practically valueless so far as production is concerned. With the acute labor shortage now prevailing, assessment work means just that much labor diverted from production of metals vitally essential to the successful prosecution of the war. For this reason not only in Colorado, but also throughout the metal-mining states mining organizations are practically unanimous in urging the passage of the Shafroth resolution or some other similar legislation, and the action of the Interior Department and the United States Bureau of Mines in reporting adversely on the measure after it had passed the Senate was a surprise as well as a disappointment.

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[1] This account was written before the passage of the Shafroth bill reported in the issue of Oct. 6

Hollow Magnetite Electrodes

An invention relating to the manufacture of magnetite electrodes, and particularly of hollow magnetite electrodes, by a casting operation has been patented by Arthur P. Scott. The process, described in the specification of U. S. Pat. 1,226,121, May 15, 1917, involves the preparation of molten magnetite in a suitable type of electric furnace. The bottom of the furnace is provided with a protective conducting layer of magnetite, prepared from "purple ore" or leached Rio Tinto cinder. In order to prevent penetration of the magnetite conducting layer by the arc, broken anode scrap is added to the ore charge. This does not go into solution as readily as raw ore and settles to the bottom. The lining of the furnace itself is of some substance, such as magnesite, that is not attacked by the magnetite.

In melting the ore the graphite electrode is lowered into contact with the magnetite bottom and a charge of purple ore is thrown in around the electrode, which is raised as fast as the ore is melted and becomes conducting. When a clear fluid bath of sufficient quantity has accumulated, a little more ore is thrown on the surface as a temperature check and to limit the formation of ferrous oxide. When this is absorbed the bath is ready to pour. The whole operation takes from one to 1½ hours.

For casting the hollow electrodes a mold of gray cast iron is used, split diagonally along its major axis, and the two halves are drawn together during casting by pivoted bolts and keys. For convenience the mold is mounted on trunnions which permit its rotation in a vertical plane. Before casting, the mold is heated to about 350° C. At a lower temperature the chilling effect is great and the electrode is liable to crack during annealing. At a higher temperature there is a tendency to adhere to the mold, but it is safer to risk moderate sticking, with a danger of rupture in stripping, than to have the mold too cold. A coating of lime or bone ash, applied with an air brush after each casting, helps to prevent sticking in hot molds.

In casting, the molten magnetite at a temperature of about 1590° C. is poured directly into the preheated mold. The mold is allowed to stand undisturbed for one minute after filling and is then quickly inverted to discharge the molten interior, leaving a shell of solid magnetite on the interior of the mold. The mold is then laid on a horizontal stripping table, the keys are quickly knocked off, and the upper half of the mold is removed. An iron spatula is thrust into the anode, which is lifted out of the lower half of the mold and taken to an annealing shelf. The anode, at a temperature of about 1100° to 1200° C., is buried in a bed of pulverulent nonconducting material, such as infusorial earth, and allowed to remain for about four days, when it is cool enough to be removed and handled with safety.

Foreign Trade in Lead and Zinc

Imports of lead and zinc during June, July and the first seven months of 1917, are reported by the Department of Commerce as follows:

Articles and Countries	June Contents, Lb.	July Contents, Lb.	Jan.-July Contents, Lb.
Lead Ore:			
Canada	214,630	317,759	7,972,527
Salvador	155	1,700	3,117
Mexico	1,127,476	1,092,526	10,614,752
Chile			1,194,749
Peru	19,767	149,569	348,072
Italy			46,719
England		8,528,583	8,609,804
German Africa	2,657,945		4,405,145
France		55,410	120,102
Panama		6,084	6,084
Others			2,491
	4,019,973	10,151,631	33,323,562
Lead—Base Bullion and Bullion:			
Dutch East Indies			102,874
Peru		8,730	50,385
Canada			1,165,931
Mexico	7,610,683	6,214,098	39,418,182
	7,610,683	6,222,828	40,737,372
Lead—Pigs, Bars, etc.			
Panama	7,998	3,710	45,450
Barbados	247		2,814
Colombia			3,155
Haiti	450	1,000	38,502
Canada		10,024	327,782
Guatemala			52,400
England			80,188
Mexico	265,720		2,287,809
Peru			10,012
France			89,086
Chile			8,769
Jamaica		13,446	13,446
Others	772	3,832	7,086
	275,187	32,012	2,966,499

The gross weight of lead ore imported in June was 11,259 long tons, and in July, 10,260 long tons.

The actual tonnage of zinc ore imported in June and July amounted to 18,864 and 13,767 tons, respectively. The countries of origin and the metal contents were as follows:

Countries:	June Contents, Lb.	July Contents, Lb.	Jan.-July Contents, Lb.
Canada	520,000	878,962	4,753,962
Australia	6,228,646		23,427,162
Mexico	8,387,181	6,531,129	63,734,385
Spain			12,166,840
French Africa			1,245,000
Italy		2,822,400	2,822,400
	15,135,827	10,232,491	108,149,749
Zinc in Blocks, Pigs, etc.:			
Costa Rica	802	783	7,003
Panama	6,287	1,688	24,493
Cuba	16,791	31,913	233,935
Mexico			3,318
Ecuador			7,580
Canada	1,519		17,186
Brazil	1,168		5,513
Colombia	3,000		6,000
Jamaica		2,165	2,165
Others		274	1,762
	29,567	36,823	308,955

Imports of zinc dust amounted to 145,600 lb. in June, 92,796 lb. in July, 1917, and to 509,633 lb. during the first seven months. Of the July imports, 44,800 lb. came from Canada, 44,975 lb. from Japan and the remainder from Cuba.

Exports of lead and zinc were as follows (in pounds):

	June Contents	July Contents	Jan.-July Contents
Lead:			
Pigs, bars, etc., produced from domestic ore	13,241,999	6,270,671	64,753,454
Pigs, bars, etc., produced from foreign ore	1,483,825	179,369	12,064,658
Zinc:			
Pigs, etc., produced from domestic ore	23,847,236	15,289,279	189,748,276
Pigs, etc., produced from foreign ore	2,908,251	4,480,007	65,257,013
Sheets, etc	2,342,261	2,436,590	15,177,270

Personals

R. C. Canby has gone to Miami, Arizona.

G. H. Morgan was recently commissioned a lieutenant in the army and is now in Washington, D. C.

F. Julius Fohs, petroleum geologist, of Tulsa, Okla., has opened an office in New York at 60 Broadway.

A. C. Spencer, of the United States Geological Survey, is examining pyrite deposits in New England.

John T. Fuller returned recently to New York from seven months' examination work in northern Brazil.

C. M. Weld, of New York, has returned to Cuba to resume the professional work on which he was engaged last August.

Adolf Knopf has been put in immediate charge of the United States Geological Survey's investigations dealing with tin.

Waddill Catchings, president of the Sloss-Sheffield Steel and Iron Co., has been in Birmingham, Ala., on one of his regular visits.

P. S. Smith, administrative geologist of the United States Geological Survey, is examining sulphur deposits in Culberson County, Texas.

John C. Greenway, manager of the Calumet and Arizona Mining Co., has resigned in order to enter the Service. He sailed for France last week.

T. E. Rice, manager of the Pittsburg-Lorraine mine of South Lorraine, Ont., has been summoned for military service in the, American army.

Harry F. Fay, of Boston, president of the Mayflower-Old Colony and Contact companies, has been making his annual inspection of these properties.

J. C. Metcalf, engineer at the Melba mine, on the Mesabi Range, has been appointed assistant engineer with Pickands, Mather and Co., at the Duluth office.

Frederic Royce, engineer for the Breitung interests at Negaunee, Mich., has joined the staff of the Johns-Manville asbestos properties at Asbestos, Quebec.

J. B. Umpleby, of the United States Geological Survey, has been given charge of the section of metalliferous deposits during the absence of **F. L. Ransome**.

A. F. Kuehn has been appointed consulting engineer for the Burma Corporation. The technical committee formerly in charge of the operations of this company has been dissolved.

Ambrose Monell, president of the International Nickel Co., has resigned to accept a commission as colonel on the staff of the commander of the American aviation forces abroad.

R. M. Draper, superintendent of the Chrome plant of the United States Metals Refining Co., has resigned. He is succeeded by **C. L. Colbert** from the company's smeltery at Midvale, Utah.

Robert C. Stanley, general superintendent of the Bayonne works of the International Nickel Co., has been elected a director of that company, taking the place of Mr. Monell, who lately resigned.

W. A. Bostwick, who has been assistant to the president of the International Nickel Co., has been elected president to succeed Ambrose Monell, who resigned in order to enter Governmental Service.

Lloyd M. Kniffin, assistant superintendent of the United States Metals Refining Co.'s plant at East Chicago, Ind., has been transferred to the Boston office. He is succeeded by **W. D. Kilbourne.**

Albert E. Hall, formerly at the Massey mine in Ontario, who has been with the Hampden Corundum Wheel Co., Chicopee, Mass., as superintendent of concentration, will shortly join the National Army.

H. W. Edmondson has resigned as manager of the Madison Mining Corporation, operating tungsten properties at Silvermine, Mo. He has been commissioned a captain in the Engineer Officers' Reserve Corps.

Myron L. Fuller, heading three parties from the Associated Geological Engineers, has completed a summer's fieldwork in West Virginia. **Clyde T. Griswold** was engaged during the summer on geological work in Wyoming fields.

Richard Roelofs, general manager of the Cresson Consolidated Gold Mining and Milling Co. at Cripple Creek, Colo., will retire soon. He will remain affiliated with other Carlton-MacNeill interests and will be succeeded at the Cresson by **A. L. Bloomfield**, of the Golden Cycle mill.

Noel J. Ogilvie has been appointed to succeed the late Dr. W. F. King as superintendent of the Geodetic Survey of Canada. Mr. Ogilvie has done important work in connection with international boundary surveys and was recently in charge of the geodetic survey of the British Columbia coast.

Stephen Royce, for five years chief engineer on the Gogebic Range for Pickands, Mather and Co., has resigned to take up general examination, exploration and geological work with **Dr. C. K. Leith** of Madison, Wis. He will continue to handle the exploration work of Pickands, Mather and Company.

C. W. Merrill, a distinguished metallurgical engineer of San Francisco, has joined the ranks of dollar-a-year men in Washington, being engaged with Hoover and Requa in the Food Administration. Mr. Merrill is giving his attention especially to chemical problems that have a bearing on the food question.

Obituary

Dr. E. F. Roeber, editor of "Metallurgical and Chemical Engineering," died of heart trouble in East Orange, N. J., on the morning of Oct. 17. He was taken ill about June 1, last, and was removed to Battle Creek, Mich. He failed rapidly, however, and was brought back to his home, where he died.

John McBride, federal mediator in the Globe-Miami copper strike and ex-president of the American Federation of Labor, died Oct. 9 in Globe, Ariz., from injuries received when a runaway horse kicked him through a plate glass window. He was at Globe in company with the Secretary of Labor and other members of the Federal labor commission investigating labor conditions in Arizona.

Theodore E. Schwarz died at Brookline, Mass., Sept. 30, aged 62 years. He was born in Boston, entered the Massachusetts Institute of Technology and was graduated as a mining engineer with the class of 1876. He went to Colorado immediately after graduation, taking charge of a tunnel at Georgetown. With increasing experience he was given more important positions, and had charge of many valuable mining properties. In 1890 Mr. Schwarz opened an office in Denver as consulting engineer, where he remained until 1908, when failing health obliged him to retire and he removed to Brookline to live. He was a member of the American Institute of Mining Engineers, Sons of the Revolution and the Colorado Scientific Society.

Societies

University of Manitoba—Classes in mineralogy, assaying and petrology for the benefit of prospectors and others interested in mining, which were held last year for the first time and proved highly successful, will be resumed this season under the direction of J. S. De Lury. Dr. Wallace, who was formerly associated with him in the work is now in command of the training school for officers.

Mining and Metallurgical Society of America, New York Section, held a meeting on Oct. 11 at the Columbia University Club. The speaker of the evening was W. F. Durand, chairman of the National Advisory Committee for Aeronautics, National Research Council, Washington, D. C. His topic was "The American Air Service," in discussing which he reviewed the development of the air fleet intended for military use in France. The meeting was preceded by a dinner at 7 p.m.

Industrial News

Walter A. Zelnicker Supply Co., St. Louis, has secured the services of J. C. Bryan, formerly with Manning, Maxwell & Moore, Inc. Mr. Bryan will be associated with the equipment department.

Asbestos Protected Metal Co., of Pittsburgh, announces the appointment of Ole K. Olsen, 822 Perdido St., New Orleans, as sales agent for Louisiana and the southern portion of Mississippi.

Morse Bros. Machinery and Supply Co. has dismantled the Junta mill at Telluride, Colo., and shipped the material to Denver, over 20 carloads being obtained. This plant was in operation only three weeks.

Trade Catalogs

Link-Belt Electric Hoists. Link-Belt Co., Chicago, Ill. Book No. 246. Pp. 44; 6 x 9 in.; illustrated.

Casings for Link-Belt Silent Chain Drives. Link-Belt Co., Chicago, Ill. Book No. 342. Pp. 6; 6 x 9 in.; illustrated.

Turbine Pumps for High Head Service. Worthington Pump and Machinery Corp., 115 Broadway, New York. Bulletin W-602. Pp. 32; 6x9 in.; illustrated.

"Turning Waste Into Profit." Prestolite Co., Inc., Indianapolis, Ind. Book No. 5. Pp. 20; 8½ x 11 in. Illustrated. Devoted exclusively to the possibilities of reclaiming broken machinery and metal parts by oxyacetylene welding.

Wire Rope, Armored Rope, Fibreclad Rope, Cordage. Waterbury Co., 63 Park Row, New York. General Catalog and Price List. Pp. 220; 3½ x 6 in.; illustrated. This is a neat cloth-bound catalog of pocket size, describing the products of this concern. Much valuable information is given as to the correct practice in the use of wire rope with particular attention to lubrication and splicing. Many useful tables are included as well as a dictionary of words and phrases relating to cordage.

Industrial Heating as a Central Station Load—Part Two—a 64-page book, 7 x 10-in., published by the Society for Electrical Development, Inc., of New York. It is issued with the purpose of pointing out and developing the field of general industrial heating. It takes up applications of electrical heat, such as arc welding and heat-treatment of steel. The book includes a list of classes of applications, their temperature range, lists of heating equipments furnished by various manufacturers and a bibliography of publications written on the subject.

New Patents

United States patent specifications listed below may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

Catalysis—Process of Effecting Catalytic Reactions. Otto Christian Hagemann, Yonkers, and Charles Baskerville, New York, N. Y. (U. S. No. 1,238,137; Aug. 28, 1917.)

Concentrating Carnotite Ores. Herman Schlundt, Columbia, Mo. (U. S. No. 1,240,607; Sept. 18, 1917.)

Copper-Nickel Pyrrhotite—Treatment of Copper-Nickel Pyrrhotite. Woolsey McAlpine Johnson, Hartford, Conn., assignor to the Continuous Zinc Furnace Co., Hartford, Conn. (U. S. No. 1,238,298; Aug. 28, 1917.)

Drying or Roasting—Improvements Relating to Drying or Roasting Apparatus of the Rotary Chamber Type. Oswald Elsworth, Newcastle-on-Tyne, England. (Brit. No. 104,939.)

Excavating-Machine. George Henry Dunlop, Auburn Victoria, Australia. (U. S. No. 1,236,691; Aug. 14, 1917.)

Excavator. Cornelius G. Hastings, Glendale, Calif., assignor to Hastings Tunnel System Co. (U. S. No. 1,240,445; Sept. 18, 1917.

Flume—Albert C. Norton, Denver, Colo. (U. S. No. 1,237,544; Aug. 21, 1917.)

Furnaces—Improvements in and Connected with Crucible Furnaces. Frederick Samuel Wigley, Birmingham, England. (Brit. No. 105,146.)

Furnaces—Improvements in and Relating to Furnaces. Alfred Smallwood, London, N., England. (Brit. No. 106,818.)

Grinding and Tumbling Mill. Frank H. Ensign, Toledo, Ohio. (U. S. No. 1,238,662; Aug. 28, 1917.)

Hoisting-Engine Alarm. William J. Lilly, Butte, Mont. (U. S. No. 1,239,409; Sept. 4, 1917.)

Leaching Valve. Veunia Smith, Santa Monica, Calif. (U. S. No. 1,238,209; Aug. 28, 1917.)

Pump—Fritz W. Machlet, Elizabeth, N. J. (U. S. No. 1,237,668; Aug. 21, 1917

Pump—William S. McFerren, Chambersburg, Penn. (U. S. No. 1,238,036; Aug. 21, 1917.)

Refractories, Production of. Paul R. Hershman, Chicago, Ill., assignor to the Mineral Products Co., New York, N. Y., a corporation of West Virginia. (U. S. No. 1,210,569; Sept. 18, 1917.)

Tunnel Shield. Cornelius G. Hastings, Glendale, Calif., assignor to Hastings Tunnel System Co., a corporation of New York. (U. S. No. 1,240,446; Sept. 18, 1917.)

Editorial Correspondence

SAN FRANCISCO—Oct. 13

Conditions on Comstock Lode continue to be favorable. Two companies, both situated at Virginia, Storey County, have been recently permitted by the California commissioner of corporations to raise funds through sales of stock. The Ophir Silver Mining Co. is allowed to sell 48,410 shares on the San Francisco stock exchange, and the Sierra Nevada company to sell 6650 shares purchased at a delinquent sale at a price not less than 15c. The Union Consolidated, reported previously to have struck good ore, has been delayed in extraction on account of an accident in the shaft. This also caused delay in the Ophir's production and hampered work. Repairs can readily be made.

BUTTE—Oct. 13

Dedication of Pioneer Monument commemorating the discovery of gold in Montana took place at Gold Creek in Powell County on Oct. 6. A number of pioneers and the Montana Geographical Society were present, and Granville Stuart, the only survivor of the group of pioneers who made the discovery, told the story of the journey made 60 years ago, resulting in the finding of gold. The monument erected on the spot of discovery consists of a plain marble shaft, 16 ft. high, designed by Edgar S. Paxson, who also was present at the unveiling. The monument is the gift of Mrs. Mary E. Morony and was erected in honor of her father, Capt. James H. Mills.

Boston & Montana Development Co. is doing considerable amount of work on its properties in the Elkhorn district in Beaverhead County. It has driven about 6500 ft. of openings for the development of two veins from a tunnel 950 ft. below the apex. A large fault was encountered about 2500 ft. from the portal of the tunnel and a lot of work has been done in an effort to find the faulted veins. One of them, known as the Idanah, has been recovered and a drift has been run on it a distance of 350 ft., for all of which distance the ore is in place. The other, a parallel vein, called the Park, has not yet been found, although the fault has also been gone through in that portion of the property and the engineers think it is but a matter of a short time when the Park vein will also be recovered. The ore in the Idanah vein is said to show good average contents in silver, lead, gold, zinc and copper. The company is also pushing construction work on 37 miles of railroad from a junction with the Union Pacific at Divide, Mont., to the mines in the Elkhorn district, and will be completed and equipped within a year. A large mill has also been contracted for and will be built early in the spring. The company owns about 1000 acres of mineral land in that district, and half as much more in another district, known as French Gulch. It also owns timber lands and water power sites. The railroad being built is only a small portion of the line that has been projected. The original plan was to build a main road from Divide, through the Big Hole river valley, famed for its agriculture and stock raising, and two branches, one to the Elkhorn and the other to the French Gulch mines, but the breaking out of the European war put an end to the financing which had been arranged for in London.

DENVER—Oct. 13

American Mining Congress is again active in Colorado and a campaign has been inaugurated to rejuvenate the Colorado chapter and increase the active membership to two hundred. The directors of the congress have appointed John T. Burns, an experienced organizer and a Westerner, as assistant to J. F. Callbreath, the National Secretary, with instructions to organize the West to the point of efficiency. Mr. Burns is now canvassing the mining camps of the state and is securing the coöperation of most of the substantial mining operators and engineers. These men believe that it is to the best interests of Colorado to have a live, well organized chapter, which can act in union with simliar organizations, in adjoining states, in national matters. The Colorado chapter will coöperate with all other Colorado bodies engaged in furthering the interests of the mining industry, with a view to dealing with questions of national legislation favorable to mining. The congress is not completely satisfied with what it has accomplished in connection with the organization of the Bureau of Mines, but is now ambitious to take another important forward stride and secure a department of mining in the national Government.

SALT LAKE CITY—Oct. 13

Power Facilities for East Tintic district are being increased by the Utah Power and Light Co. This part of the camp of Tintic is to have a new drainage and development tunnel, to be driven over a distance of 5½ miles from Goshen Valley to a point near Silver City; and the Utah Power and Light power line is to be extended from the Tintic Standard, seven miles easterly, so as to afford power for the projected tunnel. Also a heavier line is to be laid between Knightsville and the Tintic Standard over a distance of 8000 ft., and the line to Homansville is to be improved. Since the coming into prominence of the Tintic Standard, the East Tintic district has been receiving more attention, and the question of better transportation is being agitated.

Car Shortage has caused the National Council of Defense to action in regard to Utah coal mines, and the mines have in prospect a temporary relief, with the hope of more permanent help. One thousand west-bound cars have been ordered by the National Council of Defense—in response to an appeal of Sept. 27 by the public utilities commission of the state—to stop in Utah for loading with coal on the Southern Pacific and Western Pacific railroads, and this number with 350 additional cars provided by the Southern Pacific, will afford for one week at least rolling stock commensurate with the capacity of Utah coal mines. The utilities commission has further requested of the National Council of Defense that a regular supply of cars be arranged for. In this matter, W. W. Armstrong, fuel administrator for the state, is to confer with the National Council as to the authority of the utilities commission to order empty cars within the state to the mines for loading. In connection with the question of the Utah coal supply, a statement by A. H. Cowie, vice president and general manager of the Utah Fuel Co. is of interest, giving the coal production of Utah for 1916 as 3,621,935 short tons, with the possibility—with adequate transportation—of raising this for the present year to 5,000,000 short tons and placing the increase by Utah coal mines immediately available at from 50,000 to 75,000 tons monthly.

WALLACE, IDAHO—Oct. 13

Report of Labor Conditions by W. J. A. McVety, state labor commissioner of Idaho, who was recently sent to the Cœur d'Alene district, has just been made public. Mr. McVety includes also with his findings the report of G. Y. Harry, commissioner of conciliation of the department of labor, who was here at the same time and for the same purpose. The mine managers met in conference in response to an invitation from Mr. Harry. The invitation requested that they meet himself, Mr. McVety, and C. O. Young, organizer of the American Federation of Labor. In his report to the secretary of labor, Mr. Harry states that the managers were willing to meet himself and Mr. McVety, but did not wish Mr. Young in the conference. He says that "in view of the fact that there has been no miners' union of any consequence in this district since the great riot and upheaval of 18 years ago and that the mines have been running on the open-shop basis, I found the managers adverse to having any dealings or doing any business with the unions," and he might have added that they were justified in that position, but he didn't. He then says that both he and Mr. McVety "placed before them the wishes of the Government, both national and state, with reference to labor conditions," but he does not outline those conditions. He does say, however, that they were "assured by the gentlemen present that they would meet at all times with their wage scale the rising cost of living, and see that fair and equitable conditions were maintained in the mines of the district regardless of any demands on the part of the local unions." He also found that there were four locals of the International Union of Mine, Mill and Smelter Workers, comprising a membership of 500 to 600, while there are about 6000 men working in the district. Immediately after this conference Mr. Harry says he conferred with men representing the district council of the miners' union and that "I recommended to them that so long as the existing standards were maintained that they make no demands at this time." Mr. Young, of the A. F. of L., and Mr. McVety "both participated in this conference and coincided in the recommendations which I made." Mr. Harry learned the next morning that the district council "decided to recommend to the unions that they let conditions rest as they are and make no efforts to change them until next spring." As the mining companies had given assurance that they would adjust the wage scale to the high cost of living and maintain fair and equitable conditions, the "change" here mentioned must refer to a demand to unionize the mines in the spring, a meaning that may be implied in the closing sentence of Mr. Harry's report, in which he says: "I believe that we can feel safe as to the continued operation of the mines in this district at least until next spring." In his report to the governor, after quoting in full with his approval Mr. Harry's report, Mr. McVety says: "I informed the mine operators at the conference that the Wallace field was virgin territory for organization work on the part of labor, and if the wrong organization succeeded in getting a footing, trouble was bound to follow. I asked what attitude the operators would assume if the present labor organizations put on an active campaign for membership, and E. R. Day, manager of the Hercules, answered they proposed to maintain the open shop and no discrimination." If we forget the official titles of the gentlemen making these reports, one would infer that they were prepared by union organizers rather than by representatives of the governments of the United States and the State of Idaho.

PHOENIX, ARIZ.—Oct. 11

Destruction of Two Plants producing munitions metal has caused the Arizona chapter of the American Mining Congress to petition the Federal Labor Commission now in the state to investigate the matter. The shaft and shaft-house of the Mammoth Molybdenum mine at Mammoth and the mills of the Union Basin Zinc mine at Golconda are the plants referred to. Both were destroyed by fire recently, entailing a combined loss of over $200,000. The local chapter has also requested from the Treasury Department, a broader secret service operation in the state for the protection of industrial plants.

DULUTH, MINN.—Oct. 12

Scarcity of Shipping Facilities, owing to boats failing to get back on their return trips as rapidly as they did last year, combined with the later opening of the season this year than last, makes the total ore shipments from the head of the lakes, so far during 1917, almost 2,000,000 tons less than they were at this time a year ago. September shows a falling off from the corresponding month last year, but September, 1916, was an extraordinarily good month for shipping conditions. The total tonnage, up to date, shipped from the head of the lakes is 33,000,000 tons, against 35,000,000 a year ago.

Report of County Mine Inspector, W. H. Harvey for the year ended September, 1917, shows there were 115 mines in operation out of a total of 138. Out of the 14,479 men employed, 6860 were underground miners, 3060 were openpit men, 2236 men were employed in stripping and 2323 were surface men. In 1916, a total of 19,916 men were employed. Although the number of men employed this year is less, the ore shipments from St. Louis County have been greater by 5000 tons than last year, with a total of 35,902,516 tons. The number of tons shipped from the underground mines was 11,347,693 and from the openpits, 24,554,823 tons. During this period there was 10,441,738 cu.yd. of stripping removed. The average pay per day in all the mines has been from $2.90 for common labor in the openpit to $4.42 for underground work, and steam shovel and locomotive men receiving from $3.71 to $7.31. The Pioneer mine, of the Oliver Iron Mining Co., at Ely, holds the record for the greatest shipments from an underground property for the year, which was 438,383 tons, and the Hull Rust of the same company, at Hibbing, holds the record for pits, having shipped 6,500,000 tons.

CALUMET, MICH.—Oct. 13

Annual Report of Mines Inspector of Houghton County for year ended Oct. 1, showed total number of men underground was 16,423. This compares with 16,520 in 1916, 16,005 in 1915 and 12,954 in 1914. In 1908 the figure was 17,224, in 1909 it was 17,974, and in 1910, 16,250. Under the circumstances and with all the hue and cry of shortage of men, the fact remains that while every mine needs more men underground, the working figure is better than the average. The percentage of casualities is 0.0029. Of the 48 men killed in the mines, Champion lost 7 and Calumet six.

JOPLIN, MO.—Oct. 13

Electric Power Was Crippled for many mines when a further break occurred in electric machinery, this time a turbine being reported out, in addition to the burnt out generator reported a week ago. The story of last autumn and winter threatens to be repeated, when one break followed another from midsummer until February this year. The company orders new equipment and adds enough new business to absorb the additional current to be generated before the equipment arrives. As last year, so this year. Fifty per cent. of electric power is off.

TORONTO—Oct. 11

Order Prohibiting Assessment Work in Rickard Township has been withdrawn by the government of Ontario owing to the timber rights granted along the Abitibi River. A considerable number of prospectors have gone into the district and many claims east and north of the original discovery have been staked.

Labor Conditions in Northern Ontario have been settled but situation in Porcupine remains bad, and with little hope of improvement. One of the unfortunate things is the fact that there are now three different scales of wages in the camp and unless this is adjusted, while there is no probability of a strike this fall or winter, there is every chance that there will be one in the spring. The Hollinger is paying a flat rate of $4 to everybody underground, the McIntyre recently raised the muckers to $3.50 a day, and the Dome and the rest of the camp are paying muckers $3.25 a day. The situation is further complicated by the system of bonuses being paid in Cobalt, where with silver over 90c. the men are receiving a bonus of $1 a day, drillers receiving $4.50 and muckers $3.50 to $3.75. Men are leaving Porcupine daily to go to Cobalt and also to the Sudbury camp where wages have again been raised. The McIntyre with a $5 cost and a $10 ore can stand these wages together with the high prices of supplies, and the Hollinger with an $8 ore and a large tonnage can also stand it, but the Dome is in a bad shape as a consequence of these conditions. The larger part of the mill tonnage is coming from the open pits and is running around $2.50 a ton with costs of $2.40. With the approach of winter, difficulties of keeping the pits open will be increased and it will not be economical to operate them. If all the tonnage were taken from underground, the tonnage would be cut to about 600 tons a day and the costs would be about $5. As the grade of the ore would be only a little over $6, the margin of profit would be small and the mine would be gutted by the time normal conditions returned. The mine to run at capacity should have 650 men and they have only about 200. This condition presages a shutdown of the mill, and the confining of operations to development only. In the case of a shutdown, which seems inevitable, milling will in all probability not be resumed for at least a year, but during that time the mine would be put in splendid shape, and a large amount of development caried on at greater depths.

The Mining News

ALABAMA

Clay County

LECROY GRAPHITE AND MINERAL CO. organized with an authorized capital of $250,000. Headquarters will be in Birmingham. The officers are H. W. Myers, president, and J. Frank Steel, vice-president. Mine is situated four miles from Holland and reported that capacity will be 300 tons per day.

Colbert County

NITRATE PLANT site at Sheffield has been approved of by President Wilson according to Washington report. Will be constructed by the Government with part of $20,000,000 appropriation.

ARIZONA

Cochise County

CALUMET & ARIZONA (Warren)—Production for September amounted to 5,020,000 lb. copper.

INSPIRATION (Miami)—Production for September amounted to 2,250,000 lb. copper.

SHATTUCK ARIZONA (Bisbee)—Production for September amounted to 1,566,446 lb. copper, 233,800 lb. lead, 26,028 oz. silver, 419 oz. gold.

Gila County

GILA COPPER SULPHIDE (Christmas) issued notice of redemption of 6% convertible gold bonds dated April 1, 1913, and due April 1, 1918, to the amount of $80,000. Payment to be made at par after Oct. 1 unless bonds are sooner converted into shares of capital stock.

Greenlee County

ARIZONA COPPER CO. (Clifton)—Mines remain idle and company plans to operate smeltery as custom plant.

Mohave County

STEFFY CUSTOM MILL (Chloride)—Installing jigs and rolls. F. E. Steffy, superintendent.

MERRIMAC (Chloride)—Bonded to J. C. Rankin, will resume sinking with 50-hp. engine and compressor now being placed on foundations. J. P. Ryan, superintendent.

KEYSTONE (Chloride)—Remodeled mill being turned over to test machinery. Will commence running on dump ore, having several months' supply on hand. F. W. Sherman, superintendent.

EMERALD ISLE COPPER CO. (Mohave)—Orebodies of sedimentary gravel with silicate and carbonate of copper opened by pits and shallow shafts. Claims copper content, 75%. Experimental sulphuric acid leaching plant of 10-ton capacity installed about a year ago showed 86% extraction using 70 lb. acid per ton, precipitating on scrap iron, cement copper, 77.6% Cu. Changed to electrolytic equipment on account cost of iron and chemicals; installing six-cell unit; power obtained from Desert Power and Water Co. Reports show 80 to 86% extraction; production 500 lb. cathode copper daily at 15c. a pound.

Pinal County

RAY SILVER LEAD (Ray)—At present shipping over 1000 tons monthly to Deming smeltery. Two new hoists installed and 80 men employed.

QUEEN CREEK COPPER (Superior)—Station cut on 300-ft. level. Sinking continued under contract to the 450-ft. level. On the 300-ft. level it is planned to crosscut to the footwall and drift on the vein.

PINAL CONSOLIDATED (Price)—Jack Davis and T. C. Wear, of Ray, sold option in Pinal Consolidated, situated about 14 miles southwest of Ray, to F. C. Armstrong, president of Arizona Hercules Copper Co. When wagon road to Price is repaired, shipments of silver-lead ore will begin.

BROKEN HILLS (Ray)—New York interests purchased 420,000 shares. At 120-ft. depth considerable exploratory tonnage of commercial ore opened. New hoist ordered to facilitate sinking. When wagon roads completed and mining equipment installed extensive development will be undertaken. W. R. Gordon, in charge.

Santa Cruz County

ARIZONA-EUROPEAN (Patagonia)—Commercial orebodies encountered and shipments being made. James Ritchie, manager.

HARSHAW (Harshaw)—This and several other old silver producers being overhauled to begin shipments again, owing to high price of silver.

RED FOX (Alto)—Shaft being sunk to 500 ft. Taken over on lease and bond by F. B. Kollberg. Mill will be installed when enough ore opened to secure working places for large production.

R. R. R. (Patagonia)—Now using water concentration; reported that expense of flotation, including royalties, not warranted by additional recovery. Producing at full capacity but handicapped by scarcity of Mexicans. Estimated that more than 10,000 Mexicans have gone north in last month or so.

Yavapai County

JEROME VERDE (Jerome)—Shipped two carloads ore to Humboldt smeltery. Raise in Maintop claim north of U. V. Extension line is 40 ft. Above 1200-ft. level and in ore.

BIG LEDGE (Mayer)—Construction work resumed on smeltery, second unit being erected with capacity of 500 tons. Reverberatory furnace and two converters being installed. Three shifts employed in Butternut and Henrietta mines. Construction of flotation plant and half-mile tramway to connect the mines with railway under consideration.

ARKANSAS

Marion County

NORTH STAR (Yellville)—Struck good ore in tunnel. Aerial tram contemplated from new orebody to mill.

ANNA MAY (Buffalo)—Drifted 60 ft. through zinc carbonate orebody on mountain side. Contemplate erecting mill this winter.

OHIO (Yellville)—Good blende ore opened. Hauling to mill at Reynolds mine, half mile distant, situated in Hall Mountain camp.

FOX DEN (Buffalo)—Situated in Cow Creek camp. Installing two 60-hp. crude-oil engines and enlarging capacity. Ore from Dry Bone mine will be milled here also.

CALIFORNIA

Calaveras County

SAFE DEPOSIT (Mokelumne Hill)—After being closed down three months, owing to scarcity of water, hydraulic operations resumed.

Eldorado County

BEEBE (Georgetown)—Reported that Bulkeley Wells interests surrendered lease. Shaft deepened to 264 ft. and crosscuts driven, but reported that results were unsatisfactory. J. H. Robinson and Martin Costello, owners of the property, will carry on development.

Kern County

CENTRAL CALIFORNIA GAS CO. (Bakersfield)—Railroad commission dismissed application for authority to construct transmission system for natural gas from fields to Corcoran, Hanford, Tulare and Porterville, on ground that company failed to show that natural gas is available in the quantity required.

Lassen County

PLINCO (Doyle)—Oscar Ridenour, mucker, killed Sept. 16 at 200-ft. level station of vertical shaft. Supposed to have been struck by truck after placing bucket on skids and signaling to hoist.

Nevada County

MOLYBDENUM reported discovered on railroad land between English Mountain mine and Lake Faucherie, above Graniteville.

ALLISON RANCH (Grass Valley)—Good ore reported disclosed in 700-ft. level. Reported property optioned by W. W. Bryne and associates, of Salt Lake. The

20-stamp mill is crushing about 90 tons a day. Ore is taken from four of the stopes, chiefly in 400-ft. level.

EMPIRE (Grass Valley)—New Ingersoll-Rand compressor, 2500-cu.ft. capacity, being installed, to be operated by 500-hp. motor connected to the main power line. New plant adjoins present compressor plant. Mine and mill in steady operation. George W. Starr, managing director.

ALLISON RANCH AND GOLDEN CENTER (Grass Valley)—Unverified report that C. A. Brockington tendered his resignation as manager. Recent development work at both properties and installation of mill and cyanide plant at Allison Ranch have been under Brockington's management.

Placer County

EXCELSIOR GOLD MINES (Forest Hill)—Fire at Cache Rock burned underpinning of powder magazine last August believed of incendiary origin. Fire in the nearby forest burned for several days near Fords Bar, Cache Rock and Todds Valley.

Plumas County

MANGANESE ORE of fair quality reported near summit of Mt. Hough, north of Quincy, being mined by W. S. Robinson and hauled to Quincy Junction for shipment over the Western Pacific. Manganese is also being mined in Dixon Canyon and Indian Creek.

MONITOR (Quincy) — Operations suspended for winter owing to necessary renewal of pumping apparatus. Developed to vertical depth of 130 ft., with several hundred feet of drifts. Reported body of gravel tapped but bottom of tunnel not reached. Believed deposit is part of famous Bellevue lead.

San Joaquin County

SAN JOAQUIN LIGHT & POWER (Stockton)—Authorized by Railroad Commission to use proceeds of $410,000 bonds for expenditures since Dec., 1916, and current debts. Furnishes power and light for southern end of Mother Lode mines and for towns and cities.

Shasta County

MAMMOTH (Kennett)—Estimated production for September is 1,280,000 lb. copper.

Siskiyou County

SODA DEPOSITS, near Dorris, belonging to H. A. Weed, C. U. Huff and W. E. Tibbe, of Weed, have been purchased by the Spreckles interests on a tonnage basis. Tonnage estimated at not over 2000 tons.

KNOW NOTHING (Yreka)—The 8-stamp mill overhauled and in commission. Compressor installed and machine drills will be used. Mill will be driven by water power. Worked under lease by W. R. Beall, after being idle about 20 years.

Sonoma County

GRAHAM (Ukiah) — Manganese claims on Red Mountain taken over by J. Chase of San Francisco. Contemplate installation of concentrating plant, capacity, 75 tons, and tramway.

Trinity County

PACIFIC GOLD DREDGING CO. (Oroville)—Dredge removal from Morrison gulch down Coffee Creek about five miles, completed. Reconstruction completed in a month. Buildings removed to new site. Pit for flotation, 190 ft. wide and 10 ft. deep.

Tuolumne County

IN CAYUSE GULCH, mining in Humbug district will be resumed by R. S. Ammen, of San Francisco, after suspension during warm months owing to lack of water.

SONORA WONDER (Sonora)—Reported sold to E. G. Blake, of Nevada. Clearing out 50-ft. shaft in progress. Owned by Knowles, Hough and Mrs. Bachman.

EAGLE-SHAWMUT (Shawmut)—Five stamps started, being the first reduction of ore for several months, owing to development work being done. Large amount of ore blocked out and probably mill will run at full capacity.

COLORADO

Boulder County

COMSTOCK (Caribou)—Being developed and operated under lease to Hankins & Co. On 200-ft. level, 3-ft. vein of silver-lead ore opened; producing 10 tons per day. Compressor and 30-hp. electric hoist installed.

BOULDER TUNGSTEN PRODUCTION CO. (Boulder)—Contract let to advance main tunnel 700 ft. Leases will be granted on some of veins already cut by tunnel, and some development will be done on company account. Refining plant operating.

CONSOLIDATED LEASING CO. (Eldora)—Developing properties of Swarthmore Consolidated Mining Co. under lease. Opened by 2000-ft. crosscut tunnel; 25-ton flotation mill, to be built soon and machinery ordered. C. E. Kahler, president and general manager.

Clear Creek County

PRIMOS (Empire)—Contracted with Silas Knowles for 2000-ft. crosscut tunnel to open property 600 ft. below present workings.

SILVER AGE (Idaho Springs)—C. Johnson and associates developing Ship Ahoy property under lease. Crosscut driven to vein and 6-in. streak high-grade silver-lead ore opened.

LAKE (Idaho Springs)—Bond and lease secured by W. T. Hireen. Opened by four levels driven from Virginia Canyon, and Big Five tunnel which cuts vein at 2300-ft. depth. Development will be performed on company account and operated on sub-leasing system. Pump installed on tunnel level to unwater east shaft. Intends to develop Mosher oreshoot above tunnel level and raise to surface. Robert Hasty, of Idaho Springs, superintendent.

Gilpin County

RIDGE and SARATOGA WEST (Central City)—Reported these properties at Russel Gulch will be reopened.

BRYAN TUNNEL (Black Hawk) — Shoot, good-grade lead-silver ore opened in winze; shipping to smeltery.

POWERS (Central City) — Lessees resumed shipping after unwatering shaft. Good-grade ore in lower levels.

BROOKLYN (Central City)—Will be reopened. Shaft is 500 ft. deep; crosscutting on 300-ft. level will be done. Contract to supply air to Homer mine made.

HOMER (Central City)—Shaft 200 ft. deep will be sunk 200 ft. more. Small force employed in development. Milling ore opened; 8-in. shoot smelting-grade ore assaying 1.5 oz. gold and 4% copper.

Ouray County

VERNON (Ironton)—Mill now making 12 to 14 tons concentrates daily. New orebody on 300-ft. level drifted on for 45 ft. Flotation unit in satisfactory operation and will add more units to increase capacity.

Summit County

EVANS DREDGE launched Sept. 17, near Breckenridge. Hull 130 ft. long and 40 ft. 8 in. bucket line will dig to 60 ft.; capacity of buckets, 8 cu.ft.

BUNKER HILL (Breckenridge) — Lessees breaking shipping-grade ore.

RARE METALS (Breckenridge)—Large shoot molybdenum ore assaying 1% opened in old tunnel workings.

CONGRESS (Breckenridge) — Milling plant being remodeled, and new machinery will be installed. Considerable ore developed. C. W. Warner, manager.

San Juan County

BELCHER (Silverton)—Reopened and developed by R. Ferguson and A. Marshall. Small vein of payable silver and copper ore opened and trial shipment made to Durango smeltery.

TELESCOPE (Red Mountain) — Upper workings being developed under lease by R. Sawyer and associates. Carload of high-grade lead ore from development work shipped to Durango.

CONGRESS (Silverton)—Being developed and operated under lease by Offerman, Hansen & Johnson. High-grade copper ore being shipped to Durango smeltery. Milling ore consigned to Silver Lake custom mill.

Teller County

PORTLAND (Cripple Creek) — Victor mill treating 600 tons and Independence 1400 tons daily; five units operating in latter.

SIGNAL HILL TUNNEL (Cripple Creek) —Experimental mill satisfactory. Signal Hill section southwest of Cripple Creek has been little developed.

KOMET MINING CO. (Cripple Creek)—Operating Victor mine under lease. Shaft retimbered to 900-ft. level; 1000-ft. level being unwatered, where development work will be done. Regular shipments made.

IDAHO

Blaine County

FEDERAL (Wallace) — Independence Mining Co.'s property in Wood River district optioned at $300,000 until Nov. 15; not purchased as previously reported. Owners are Mrs. H. J. Allen, of Hailey, Dr. Harper, of Chicago, C. F. C. Ruton, of New York, and others.

Bonner County

ARMSTEAD MINES, INC. (Sagle)—No. 3 tunnel advanced 366 ft. during September, which is a record for the district. Total length, 1748 ft. Cut two small galena stringers and expect to strike vein 1500 ft. further on early next year. Drift along vein on No. 1 tunnel level encountered copper ore. Will not construct concentrator until vein is cut; running tests on ore at present. Company pays bonus of $5 per ft. for distance of over 300 ft. per month in driving tunnel; $6 per ft. for over 400 ft. H. H. Armstead, president.

Shoshone County

ANTIMONY SHIPMENT was made by Coeur d'Alene Antimony Mining Co. from Pine Creek district to smeltery. Price of metal cause of developing several antimony properties in district.

REX (Wallace)—Value of lead and zinc concentrates shipped in September was $24,000, $8000 more than August. Value of shipments since Nov. 1 given at $190,000. Now shipping carload zinc concentrates per day and four or five of lead per month. Recently acquired zinc property near Miami, Okla. Capital stock increased from 2,000,000 to 5,000,000 shares.

IDAHO CARBONATE HILL (Mullan)—Organized by W. D. Greenough, formerly manager of Atlas mine near Whitehorse, Yukon. Has taken option on Carbonate Hill and Idaho Giant groups and also owns Boulder Creek group of claims, all adjoining. Plans for extensive development; work will begin within two weeks. Lead and zinc orebody developed on Carbonate Hill in tunnel, and 100-ft. shaft. Situated on south side of river in section heretofore not tested by deep workings.

MAINE

Washington County

U. S. MOLYBDENUM CO. (Cooper)—Property will be acquired by H. S. Predmore and A. S. Gunn, of New York, according to present arrangements. Reported that a 500-ton mill is planned to replace present 20-ton mill.

MICHIGAN

Copper

ADVENTURE (Greenland) — September output over 6000 tons.

WINONA (Winona)—Has arranged with R. R. Seeber, superintendent, to operate property on royalty basis, guaranteeing profits to company.

CENTENNIAL (Calumet) — September rock output was 10,000 tons, another falling off. Difficult to secure men and long tram hauls make costs high. Government price-fixing may necessitate closing.

WOLVERINE (Kearsarge) — Copper Range railway plans to take over rock haulage for Wolverine and Mohawk in two months. Production at Wolverine now down to 34 cars daily.

OSCEOLA CONSOLIDATED (Osceola) —No. 4 North Kearsarge getting into best grade of rock yet found. Tonnage at old Osceola branch maintained, but total for October will be about 100,000.

MASS CONSOLIDATED . (Mass) — Should produce 19,000 tons of rock in October. Evergreen lode is furnishing some stamp rock, but Butler continues largest producer. Newer openings encouraging.

CALUMET & HECLA (Calumet)—Production in September by C. & H. and subsidiaries was: C. & H., 5,706,400 lb.; Allouez, 706,217; Ahmeek, 2,163,635; Centennial, 196,930; Isle Royale, 1,092,197; La Salle, 180,335; Osceola, 1,081,698; Superior, 136,023; White Pine, 293,003.

MINNESOTA

Mesabi Range

WEBB (Hibbing)—Owned by Shenango Furnace Co. has put shovel at work cutting approach for ore track into pit being stripped by Winston Dear.

BENNETT (Keewatin)—Operated by Pickands, Mather & Co., both by underground and open pit. Employing about 50 gangs of miners. Shaft work covers large area. R. L. Downing, superintendent.

NORTH EDDY (Hibbing) — Owned by Dean Iron Co. Contract with Peter Olson for ditch north of mine to divert water off caving ground and west along Great Northern railroad completed.

SHENANGO FURNACE CO. (Chisholm) —Shipments will run over million tons if Government does not remove boats. Plan an incline in Shenango openpit and change of method of mining. Improbable, delivery of machinery will permit work this year so will probably continue for another year along same lines.

Vermilion Range

LUCKY BAY AND ANDERSON mines leased to Ohio interests and will produce next season. Developed by E. C. Kennedy, of Duluth. McComber mine, at Robinson Lake, developed to 300-ft. level by Mutual Mining Co., of Duluth, under royalty lease. About 6000 tons in stockpile and equal amount available above 200-ft. level in No. 2 shaft. Iron ore in No. 1 shaft with about 2% sulphur as pyrites. Duluth and

Iron Range R.R. built to property and will ship this year, if boat tonnage available.

MISSOURI

Joplin District

COSDEN & AIKEN (Tulsa, Okla.)—Will move McDonald mill, at Prosperity, to lease at Tar River, Okla.

F. H. HARRINGTON (Joplin) — Sold first lease on 40-acre tract adjoining Picher-Whitebird at Picher, Okla., to George Beck, Miami, and associates. Consideration not made public.

HICKEL (Baxter Springs, Kan.)—Sold to J. M. Postelle, of Oklahoma City and associates, for $40,000. Situated three miles south of Baxter. Bought last June for $5000 by Mr. Hickel. Partly developed.

ST JOE (Joplin)—New mill south of Picher, Okla., in operation. Julius Miller, Jr., of Joplin, promoted company and was manager of plant sold his one-fourth interest for $30,000 to J. W. Grounds and associates, of Kansas City

MONTANA

Beaverhead County

ARGENTA AND BANNOCK districts showing activity and number of old silver mines may be reopened. Argenta, large producer in past, has high-grade slag on dump now being broken up and hauled by motor truck to railroad.

Lewis and Clark County

ROCK ROSE (Helena)—Taking out ore on 100-, 200- and 300-ft. levels.

CRUSE CONSOLIDATED (Helena)—Ore in north and south drifts at 150 ft.

PORPHYRY DIKE (Helena)—New 300-ton ball mill about ready. Electric power.

ECLIPSE-ARGO COPPER (Helena)—Four cars to smeltery monthly. One car concentrates; three of ore.

Missoula County

ROYAL MINING CO. will operate Charcoal mine near Missoula, having acquired title from Mrs. D. Harrington, of Butte, original owner. Recently encountered high-grade ore stringer. Formerly silver producer.

Silver Bow County

BIG DOME OIL AND GAS CO. (Butte)—Capital stock of $200,000; filed articles of incorporation on Oct. 4 with county recorder. Directors are John A. Plint, Charles E. Foye, Harry F. Bartels, Warren E. Coman and Louis B. Flagler.

NORTH BUTTE (Butte)—Is made defendant in another suit growing out of the fire in Granite Mountain shaft. Plaintiff is sister of Frank Scandula, who perished in the fire, it is alleged, due to the lack of water to extinguish the fire, and lack of another exit to safety but one blocked by fire. Damage asked for is $30,000.

Yellowstone County

OIL STRIKE made near Laurel in well 1000 ft. deep on Schauer ranch by B. F. Hoyt and associates. Considerable real estate activity has resulted.

NEVADA

Mineral County

WEDGE COPPER MINING CO. (Luning)—Property consists of nine claims in Santa Fe district, six miles from here, on Southern Pacific Ry. Development consists in number of tunnels showing copper ore carrying gold. Three leasers working in addition to company operations. Mark Walser, president. General office, Herz Building, Reno, Nev.

Nye County

TONOPAH ORE PRODUCTION for the week ended Oct 6 was 8944 tons, valued at $156,520, comparing with 9519 tons, the previous week Producers were Tonopah Belmont, 2320 tons; Tonopah Mining, 2200 tons; Tonopah Extension, 2380 tons, Jim Butler, 700 tons, West End, 967 tons; Montana, 239 tons, Rescue, 133 tons.

MANHATTAN CONSOLIDATED MINES DEVELOPMENT (Manhattan)—Drifting east from fourth level, working two shifts. Face of drift 50 ft from shaft From third level, south crosscut extended 150 ft. Purpose is to strike two orebodies developed near surface; workings are gassy and raise will be made to second level for ventilation

WHITE CAPS (Manhattan)—Maintaining average production of 100 tons per day Development work on fifth level exposed east orebody for additional 32 ft., total being 65 ft Drift still on foot wall so width between walls undetermined A crosscut from footwall already shows 15 ft. of width

NEW HAMPSHIRE

RUGGLE MICA MINE (Canaan)—Situated at Grafton, four miles distant, will be operated again after 25 years' shutdown. Has been in litigation.

NEW MEXICO

Grant County

BONNEY EXTENSION (Lordsburg)—Has been consolidated as Tyndale Copper Mining Co., W. T. McCaskey, president; T. Lester, vice president; J. P. Porteus, secretary and treasurer. Development work will begin this month under direction of J. B. Porteus.

BETHLEHEM COPPER CO. (Steins)—Employing 20 men sinking prospect holes. Veins traceable for 5000 ft. opened by number of holes show copper-silver ore. Trying to interest Los Angeles men. J. A. Sund, president.

UTAH

Juab County

PRODUCTION BY TINTIC MINES for first nine months of 1917 amounted to about 7300 cars which, estimated at 365,000 tons, in round numbers, represents a value of about $10,000,000. September showed 634 cars, as compared to August with 929 and 772 in July, the falling off being due to shortness of the month, smeltery embargo on some of the mines, shortage of railroad cars and difficulty in securing coal.

LEHI TINTIC MINING (Tintic)—Advanced 70 ft. in stope in right tunnel. Encountered vein matter for over 50 ft., showing mineralization; reported to be lead to main orebody. George Nicholes, president; H. J. Fitzgerald, secretary. Main office, 425 Atlas Block, Salt Lake City.

Salt Lake County

AMERICAN CONSOLIDATED (Salt Lake)—Compressor and drills to be installed soon to develop ore recently opened, carrying copper, silver and lead.

UTAH IRON AND STEEL (Midvale)—Will bring production up to about 50,000 tons of finished steel per year shortly, and have new open-hearth furnace ready for operation in about two weeks. Will make heavier bars and mine rails up to 30 lb. a yd. Stated to Public Utilities Commission fuel requirements are 3000 tons gas coal per month.

Summit County

PARK CITY PRODUCTION for September is given as 10,125 tons, valued at $400,000 to $500,000 from 12 shippers. August shipments amounted to 10,346 tons and July to 7500 tons. First six months of 1917 the tonnage was about 45,000, and for first nine months about 75,000, valued at about $3,500,000. Principal producers for September as follows: Judge Mining and Smelting, 2659 tons; Silver King Coalition, 2538 tons; Ontario, 1597 tons; Daly West, 1028 tons; California-Comstock, 366 tons.

JUDGE MINING AND SMELTING (Park City)—New electrolytic plant operating satisfactorily.

Tooele County

UTAH LIME AND STONE CO., near Timpie, plans to develop limestone quarries on Western Pacific R.R. Stated that railroad is to build extension to property, and number of lime kilns to be built. C. W. Nibley, of Salt Lake City, president; W. L. Ellerbeck, general manager.

WASHINGTON

Stevens County

AMERICAN MINERALS PRODUCTION CO. (Valley)—Has 20 teams, each hauling 10 tons magnesite ore from quarries. Standard-gage 16-mile railroad being built by General Construction Co., of Spokane, from here to quarries and connecting with Great Northern railroad.

VALLEY MAGNESITE CO. (Valley)—Operates plant with 25-ton capacity per day, producing calcined and dead-burned magnesite. Will enlarge to 125 tons capacity within 90 days. Standard-gage railway, 11 miles long, being constructed within ¼ mile of quarries, will be in operation within three months. F. M Handy, president and manager

WYOMING

ROXANA OIL CO., subsidiary of Royal Dutch Shell property, six miles from Grass Creek, contracted for 5000-ft well at $11 per ft, Roxana to pay for all material except fuel Hole will be cased with 20-in. pipe probably for 2000 ft Believed there are four strata bearing salt water before reaching 5000-ft depth. No oil found within five miles of this drill hole.

CANADA

British Columbia

CANADA COPPER (Greenwood)—Production for September amounted to 537,229 lb copper

FLORENCE SILVER MINING (Ainsworth)—Shipped 500 tons concentrates and crude ore. Expect increase in October. F. R. Wolfe, president.

ENTERPRISE MINE in Slocan district sold by Finch & Campbell of Spokane for $375,000 to British Columbia Mines Co. of London, taken over on lease and option for $125,000 by Seattle-British Columbia Lead Silver Co., organized by H. F. Millard of Valdez, Alaska. Former owners worked property by handsorting, with profit.

Manitoba

MOLYBDENITE DEPOSITS reported discovered by W. Gordon, of Hawk Lake, within a few miles of Greater Winnipeg Water District railway line. Two main deposits have been staked out in Falcon Lake district by Gordon and G. B. Hall, 745 Somerset Block, Winnipeg. The first consists of three claims northwest of Finnel Lake, three hours' journey from Indian Bay at end of G. W. W. pipe line. The second consists of nine claims, four miles distant. Veins said to be 2 to 40 ft. wide of good ore.

New Foundland

HYDRO-ELECTRIC SMELTING CO. LTD. (Little Bay)—Making good recovery of cement copper from cuprous waters. Expect to produce 150 tons copper per year.

Ontario

ELLIOTT KIRKLAND (Kirkland Lake)—Made payment of $30,000 on property.

HOLLINGER (Porcupine)—Milling just enough ore to pay expenses. Company still short of men.

PITTSBURG LORRAIN (South Lorrain)—Leased Wettlaufer mill and producing silver concentrates.

BUFF MUNRO (Munro Township)—Two shafts down 50 ft. each. Roadway being cut to bring in small mining plant.

BEAVER CONSOLIDATED (Cobalt)—High grade vein encountered at 1600-ft. level stoped on for about 100 ft. Winze started on vein.

DAVIDSON (Porcupine)—Has obtained good results in diamond drilling. Crosscut will be run at 300-ft. level to prospect ground cut with drill.

TOUGH OAKES (Kirkland Lake) — In August treated 3400 tons. Short of ore due to faulting of main vein below 500-ft. level and expect decreased production.

LE HEUP (Gowganda)—Taken over by Toronto men Adjoins Miller Lake O'Brien where silver discovery made some months ago permits production at 6c. per oz. mining cost.

KERR LAKE (Cobalt)—Recommended by directors that at stockholders' meeting on Nov. 12, company be dissolved and new Canadian corporation, known as Kerr Lake Mines, Ltd., be organized. Production of silver during September was 210,388 oz., compared with 200,855 oz. in August. Average monthly production for 12 months ended Sept 30 was 216,102 oz

DOME LAKE MINING AND MILLING (Porcupine)—Two new orebodies opened up and diamond drilling proved continuance to 600-ft. level. Not developing below 500-ft. level. Mill running on reduced tonnage; filtering equipment proved inefficient and discarded in July Now using amalgamation only and on account large tailing loss milling only sufficient tonnage to cover operating and development charges. Will install Oliver filter. R. T. Reguell, manager.

MEXICO

EMBARGO ON GOLD exportation into the United States will now be modified in accordance with an arrangement arrived at between the United States and Mexican Governments It is agreed that the United States will allow a certain amount of gold to be sent to Mexico and that Carranza will cancel the existing order prohibiting the removal of gold from the country.

SALVADOR

BUTTERS SALVADOR (San Sebastian) Tonnage crushed in August amounted to 3675 tons, averaging $11 66 per ton. Expenses amounted to $28,000; bullion for shipment, $36,000; profit, $8000.

BOLIVIA

FRANK & CO (Oruro)—Shipped seven tons nickel and cobalt ore taken from surface to Liverpool, England, for test. Awaiting results before further development. Vein is about 24 in. wide on surface.

SOUTH AFRICA

ANGLO-AMERICAN CORPORATION (Johannesburg)—Registered with capital of $5,000,000, and increase of $10,000,000 provided for. Object is to negotiate for new Eastern Rand leases now being offered. Directors are Ernest Oppenheimer, Chairman, W L. Honnold, H Crawford, H C. Hull, C H Sabin and Royce Thompson.

The Market Report

SILVER AND STERLING EXCHANGE

Oct.	Sterling Exchange	Silver		Oct.	Sterling Exchange	Silver	
		New York, Cents	London, Pence			New York, Cents	London, Pence
11	4.7525	88¼	44¾	15	4.7515	86¼	43¾
12		...	44¼	16	4.7515	85⅜	43⅜
13	4.7525	86¾	44	17	4.7515	84⅞	43⅛

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

DAILY PRICES OF METALS IN NEW YORK

Oct.	Copper	Tin	Lead		Zinc
	Electrolytic	Spot.	N. Y.	St. L.	St. L.
11	*23½	61	6⅞ @7⅜	6.90 @7.30	7.80 @8.00
12	....	...	....	.....	....
13	*23½	61	6¾ @7	6 70 @6.90	7⅞ @8
15	*23½	61¼	6¾ @7	6.70 @6.80	7⅞ @8
16	*23½	61¼	6.70 @7.00	6.70 @6 80	7.80 @8.00
17	*23½	61¼	6 70 @6.80	6 70 @6.80	7.80 @8 00

* Price fixed by agreement between American copper producers and the U. S. Government, according to official statement for publication on Friday, September 21, 1917.

The above quotations (except as to copper, the price for which has been fixed by agreement between American copper producers and the U. S. Government, wherein there is no free market) are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

The quotations for electrolytic copper are for cakes, ingots and wirebars.

We quote electrolytic cathodes at 0.05 to 0.10c. below the price of wirebars, cakes and ingots.

Quotations for spelter are for ordinary Prime Western brands. We quote New York price at 17c. per 100 lb. above St. Louis.

Some current freight rates on metals per 100 lb. are: St. Louis-New York 17c.; St. Louis-Chicago, 6.3c.· St. Louis-Pittsburgh, 13.1 cents.

LONDON

Oct.	Copper			Tin		Lead	Zinc
	Standard		Electrolytic				
	Spot	3 Mos.		Spot	3 Mos.	Spot	Spot
11	110	110	125	245¾	243	30½	54
12	110	110	125	246½	243	30½	54
13	.	..					
15	110	110	125	247	244	30½	54
16	110	110	125	247½	246	30½	54
17	110	110	125	247½	245	30½	54

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2,240 lb. For convenience in comparison of London prices, in pounds sterling per 2,240 lb., with American prices in cents per pound the following approximate ratios are given, reckoning exchange at $4.75½. £30½ = 6 474c.; £54 = 11.462c.; £120 = 25.473c.; £137 = 29.082c.; £240 = 50 946c. Variations, £1 = 0.212277c.

Metal Markets

NEW YORK—Oct. 17

Once more we have to record a week of dullness. Lead was the only interesting feature, and the interest in it was associated with the sharp decline in its price on small business.

Copper, Tin, Lead and Zinc

Copper—Government specifications came forward from day to day, and the Copper Producers Committee, getting a line on the Government requirements, previously having had the foreign requisitions, was able to get its bearings and to release further copper to domestic manufacturers. Arrangements to even things up among manufacturers were made, and it is now the opinion that the essential requirements for October can be equitably filled.

The Metals Division of the National Association of Waste Materials Dealers held a meeting in New York on Oct. 17, and agreed to work in harmony with the War Industries Board on the basis of 23½c. for copper. It is considered probable that a sliding scale for scrap copper will be fixed, having in view its inferior value.

Eugene Meyer, Jr., having been released by the Treasury Department, has returned to the War Industries Board to take charge of the business in metals under Mr. Baruch.

Copper Sheets are quoted at 35c. per lb. for hot rolled, and 1c. higher for cold rolled. Wire is quoted nominally at 31c. per lb., f.o.b. mill.

Tin—Business in this metal was very small and there was scarcely any change in quotations during the week. At the close, Straits tin was quoted at 61¼c. and Banka at 59¼c.

Tin shipments from the Federated Malay States for the six months ended June 30 were 19,752 gross tons, a decrease of 1973 tons from last year.

Lead—At the close of last week, lead was easily to be had at 7½c. The following day further concessions were offered. The American Smelting and Refining Co., recognizing the weakness in the metal and the failure of buying to develop, took the bull by the horns, and on Thursday afternoon reduced its price to 7c., but it had no sooner done so than it was undercut, transactions at 6⅞c. being reported The reduction in price by the American Smelting and Refining Co. did not become generally known until the following Monday, but right through the week there was weakness and at the close lead was easily obtainable at 6⅝c., either at New York or St. Louis. The business of the week amounted to only a moderate tonnage, and the fact that buying failed to develop on the sharp decline produces the feeling in the trade that the decline may go further. It was reported today that the Federal Lead Co. had reduced the production at its mines in Missouri to one-half.

Zinc—Business in this metal was light in volume, the most noteworthy feature being the sale of some round lots for export. At present prices, which are below the cost of production by many producers, there is no reason why foreign users of spelter should continue to hold aloof from this market. Many producers asked 8¼c., while others offered at 8@8⅛c., in order to test the market, but they failed to make sales, it being evident that cheaper sellers were taking what business was being offered; in fact, some sales of 100-ton lots were made at 8c., but the bulk of the business of the week was done at about 7.90c.

Zinc Sheets—Price of zinc sheets has not been changed. Market is still at $19 per 100 lb. f.o.b. Peru, Ill., less 8% discount.

Other Metals

Aluminum—Further decline occurred in this metal, No. 1 ingots at New York being quoted at 38@39c. per lb. for small lots, market being comparatively inactive.

Antimony—The market continues dull, with producers and dealers able to sell nothing but small lots—10-ton lots, etc. On such business, 15@15½c. could be realized. This price is very low from the viewpoint of the Chinese producers, who are not interested in selling at less than 16c. We quote spot at 15@15½c., and futures at 15c., c.i.f., in bond.

Bismuth—Unchanged at $3.50 per pound.

Cadmium—This metal is quoted at $1.40 @1.50 per pound.

Nickel—Steady at 50c. per lb., premium of 5c. per lb. for electrolytic.

Quicksilver—This market was dull and scarcely more than nominal. We quote $99@100. San Francisco reports, by telegraph, $99, dull.

Gold, Silver and Platinum

Silver—This metal has continued to decline, exhibiting weakness and closing at 84⅞c. in New York and 43⅛d. in London.

Mexican dollars at New York: Oct. 10, 67½c.; 11, 67c.; 12, ... 13, 65c.; 15, 64⅝c.; 16, 64⅜c.

The holdings of the Indian government in the note reserve on Aug. 31 were 3840 lakhs of rupees in silver coin and bullion. Stocks in Bombay on the same date were 2100 bars.

Stocks of silver in Shanghai on Aug. 31 were $15,600,000 in dollars and 31,000,000 oz. sycee; a decrease of $100,000 in dollars but an increase of 8,800,000 oz. sycee over Aug. 15.

Platinum—Good business is reported at $103@105.

Palladium — We quote $120@125, with strong demand.

Zinc and Lead Ore Markets

Joplin, Mo., Oct. 13—Blende, per ton, high, $76; basis 60% Zn, premium, $75; medium to low, $70 to $60; calamine, per ton, 40% Zn, $38@35; average selling price, all grades of zinc, $62.73 per ton.

Lead, high, $89.23; basis 80% Pb, $90@80; average selling price, all grades of lead, $82.54 per ton.

Shipments the week—Blende 8033 tons, calamine 365 tons, lead 1237 tons. Value, all ores the week, $630,510.

Platteville, Wis., Oct. 13—Blende, basis 60% Zn, $67 base for premium grade down to $62 base for medium grade. Lead ore, basis 80% Pb, $80 per ton. Shipments reported for the week are 3104 tons of zinc ore, 72 tons of lead ore, and 547 tons of sulphur ore. For the year to date the figures are: 114,075 tons of zinc ore, 6116 tons of lead ore, and 22,250 tons of sulphur ore. Shipped during the week to separating plants, 3562 tons of zinc ore.

Other Ores

Molybdenum Ore — In active demand. Sales reported at $2.20 per lb. on the basis of 90% molybdenum sulphide, and $1.80 on the basis of 75%.

Pyrites—Spanish lump quoted at 15c. per unit on basis of 10s. ocean freight, buyer to pay war risk, excess freight and any duty. Ocean freights are 35s. for northern ports, 40s. for south Atlantic and 42s. 6d. for Gulf ports.

Tungsten Ore — We quote high-grade wolframite unchanged at $23@25. This is for the highest grade, assaying 70% wolfram trioxide, and free from undesirable impurities. Considerable supplies of such ore are now offered in the market. An ore of 60% grade, which used to be standard, is now called low-grade, and was quoted this week at about $20 per unit. Owing to the change in the metallurgy of tungsten, there are heavier penalties for impurities than formerly. In the older hydro-metallurgical processes, tin and copper were readily removed, while these impurities are now penalized by alloy manufacturers using electric furnaces. Tin or copper exceeding 0.03 and 0.04% are objectionable for electric-furnace work. Scheelite ores carrying 63 to 65% WO_3 and from 2 to 3% tin and from 1 to 1.2% copper, sold recently for $20, while ores carrying the same amount of tungstic acid, free from objectionable amounts of tin and copper, brought $24.

Iron Trade Review

PITTSBURGH—Oct. 16

The second batch of prices arranged by agreement between the Government and the iron-and-steel industry was announced at Washington late last week, the prices referring to steel only and being as follows: Billets, 4 x 4-in. and larger, $47.50; smaller billets, $51; sheet and tinplate bars, $51; slabs, $50; all per gross ton, f.o.b. Pittsburgh or Youngstown; wire rods, $57 per gross ton, f.o.b. Pittsburgh; grooved steel skelp, 2.90c.; universal mill skelp, 3.15c.; sheared skelp, 3.25c.; shell-steel rounds, over 3 in. to and including 5 in. 3.25c.; above 5 in. to 8 in., 3.50c.; above 8 in. to 10 in., 3.75c.; over 10 in., 4c. per lb., f.o.b., Pittsburgh. The first batch of prices was announced Sept. 24: Lake Superior iron ore, unchanged from 1917 schedule, making Mesabi nonbessemer, $5.05 at Lake Erie dock; foundry and basic pig iron, valley, $33; steel bars, 2.90c.; shapes, 3c.; plates, 3.25c. f.o.b. Pittsburgh.

At this writing it is expected at any moment Washington will announce a third batch of prices, to include pig iron of other grades at valley furnaces, also pig iron in other districts, three or four descriptions of iron and steel scrap, and the finished steel products, sheets, pipe and wire, with possibly a few others.

The extent to which prices submitted by the industry are being modified by the War Industries Board or the President, who has the last word in these matters, is not known, but it is frankly admitted throughout the trade (1) that the original or basis prices are very fair and calculated to yield quite satisfactory earnings, and (2) that the prices for the various commodities are in strict accord with each other, distributing earnings equitably in the different departments in accordance with cost of production and capital investment.

The new conditions are being imposed on the trade with a minimum of disturbance. Buyers with scarcely an exception were already well covered and deliveries are proceeding on contract. There had been scarcely any business done in the open market for many weeks before price fixing was undertaken. The attitude of all producers, so far as can be ascertained, is that they will strive earnestly to carry out both the spirit and the letter of the agreement. Some confusion has been caused by a few buyers assuming that the agreement upon one price for all, the Government, its Allies and the general public meant that producers would be ready to sell promptly to the public at these prices whatever material might be called for. That is not correct as the producers could not do so when they already have so much tonnage on their hooks and when the Government has assured them that it will shortly place orders for 6,000,000 or 7,000,000 tons of steel in addition to about 3,000,000 tons it has already bought. What the producers agreed upon, with respect to the public, was that they would not sell at higher than the fixed prices. Their position now is that they will take care of their customers.

Pig Iron—Transactions in small lots are being made almost daily, at the fixed prices, but as a rule only between furnaces and their regular customers, and there is practically no forward business. There is little unsold iron for the balance of this year. High-priced contracts are expected to be carried out. We quote foundry, malleable and basic at $33, valley, and bessemer at $36.30, valley, a tentative price that is expected to be confirmed at Washington.

Steel—At its top the billet market was $95 to $100. About three weeks ago a sale of 1000 tons of 4 x 4-in. billets sold at $60 and just before prices were fixed at Washington there were sales at a trifle less than $60, Pittsburgh, including one sale at $60.50, Philadelphia. We quote billets, 4 x 4-in., and larger at $47.50, small billets, $51; slabs, $50 and sheet bars, $51, all f.o.b., Pittsburgh or Youngstown, and wire rods at $57, Pittsburgh.

Ferroalloys

Ferromanganese—Buyers are out of the market entirely, except in very occasional instances when a consumer is caught short. It is expected that the Government will set prices much lower than those lately ruling, which for six months or more have been predicated upon a possible famine, the famine not developing up to date, as stocks are fully up to normal. The market has weakened somewhat and there are sellers for early shipment at not over $340.

Coke

Connellsville—Production and shipments are about the same as formerly. No particular change is observable since the order a week ago for a 100% car supply for the region. Sales of spot coke at the fixed price of $6 are increasing but are still very light, the coke being shipped chiefly upon contracts at higher figures, or upon contracts calling for the market price, such contracts being now adjusted to a $6 level. There is considerable inquiry in the market but some operators think this is chiefly from furnaces that have contracts at above $6 per ton.

STOCK QUOTATIONS

N. Y. EXCH.†	Oct. 16
Alaska Gold M.	3½
Alaska Juneau	3
Am.Sm.& Ref.,com.	86½
Am. Sm. & Ref., pf	103
Am. Sm. Sec., pf., A	93
Am. Sm. Sec., pf. B	‡93
Am. Zinc	14¼
Am. Zinc, pf	48
Anaconda	65½
Batopilas Min.	1¼
Bethlehem Steel	74
Bethlehem Steel, pf.	93
Butte & Superior	18
Cerro de Pasco	31½
Chile Cop	16
Chino	44
Colo Fuel & Iron	36½
Crucible Steel	65
Dome Mines	8½
Federal M. & S	14½
Federal M. & S., pf	38½
Great Nor., ore ctf.	27½
Greene Cananea	36
Gulf States Steel	90
Homestake	102
Inspiration Con	44½
International Nickel	29½
Kennecott	34
Lackawanna Steel	77¼
Miami Copper	30¼
Nat'l Lead, com.	45
National Lead, pf	100
Nev. Consol	18
Ontario Min.	4½
Quicksilver	1
Quicksilver, pf.	1½
Ray Con	22½
Republic I & S., com.	75¾
Republic I & S., pf	99
Sloss-Sheffield	38
Tennessee C. & C.	12½
U. S. Steel, com	103¾
U. S. Steel, pf	114
Utah Copper	84
Va. Iron C. & C.	55

N. Y. CURB†	Oct. 16
Big Ledge	1½
Butte & N. Y.	.75
Butte C. & Z	8½
Butte Detroit	1/16
Caledonia	.58
Calumet & Jerome	1½
Can. Cop. Corpn	1¾
Carlisle	3½
Cashboy	.05½
Con. Ariz. Sm.	1½
Con. Coppermines	7½
Con. Nev.-Utah	.08
Emma Con	¾
First Nat. Cop.	2 1/16
Goldfield Con.	.32
Goldfield Merger	.03½
Greenmonster	7/16
Hecla Min	5 3/16
Howe Sound	4¼
Jerome Verde	1 1/16
Kerr Lake	5½
Louisiana	½
Magma	44½
Majestic	31
McKinley-Dar-Sa.	.60
Milford	1½
Mohican	.25
Mother Lode	.30
N. Y. & Hond	13
Nipissing Mines	7½
Ohio Cop.	¾
Ray Hercules	3½
Richmond	‡ .57
Rochester Mines	.43
St. Joseph Lead	17½
Standard S. L.	50
Stewart	28½
Success	11
Tonopah	6½
Tonopah Ex	1 11/16
Tribullion	25
Troy Arizona	.15
United Cop	.50
United Verde Ext	32
United Zinc	2½
Utica Mines	.14
Yukon Gold	2

SAN FRAN.*	Oct. 16
Alta	.02
Andes	.10
Best & Belcher	.03
Bullion	.02
Caledonia	.10
Challenge Con	.05
Confidence	.05
Con. Virginia	.10
Gould & Curry	‡ .01
Hale & Norcross	.03
Jacket-Cr. Pt	.05
Mexican	.15
Occidental	.60
Ophir	.14
Overman	.04
Savage	.03
Seg. Belcher	‡ .02
Sierra Nevada	.16
Union Con	.77
Utah Con	.01
Belmont	3.75
Jim Butler	.78
MacNamara	.17
Midway	.08
Mont.-Tonopah	.15
North Star	.07
Rescue Eula	.12
West End Con.	.62
Atlanta	.07
Booth	.03
Comb. Frac	‡ .02
D'field Daisy	.02
Florence	.10
Jumbo Extension	.15
Kewanas	.07
Nevada Hills	.13
Nevada Packard	.10
Round Mountain	.23
Silver Pick	.10
White Caps	.05
Big Jim	‡ .62½
United Eastern	3.60

BOSTON EXCH.*	Oct. 16
Adventure	1½
Ahmeek	91
Algomah	.25
Allouez	56
Ariz. Com., ctfs	8½
Arnold	.25
Bonanza	.21
Butte-Balaklava	.40
Calumet & Ariz	66
Calumet & Hecla	495
Centennial	13
Copper Range	50½
Daly West	1½
Davis-Daly	4½
East Butte	9½
Franklin	4
Granby	73
Hancock	10
Hedley	‡17
Helvetia	.25
Indiana	1½
Isle Royale	27½
Keweenaw	2
Lake	6¾
La Salle	3
Mason Valley	4¾
Mass	6¾
Mayflower	1½
Michigan	1¾
Mohawk	70
New Arcadian	2
New Idria	10½
North Butte	13½
North Lake	.55
Ojibway	1¼
Old Dominion	40½
Osceola	70
Quincy	76
St. Mary's M. L.	59
Santa Fe	1
Seneca	7
Shannon	5½
Shattuck-Ariz.	19
So. Lake	2½
So. Utah	.15
Superior	6½
Superior & Bost.	2½
Trinity	4½
Tuolumne	1¾
U. S. Smelting	51
U. S. Smelt'g, pf	47½
Utah Apex	2½
Utah Con	12½
Utah Metal	3
Victoria	2½
Winona	2
Wolverine	38
Wyandot	.50

BOSTON CURB*	Oct. 16
Alaska Mines Corp	.37
Bingham Mines	11
Boston Ely	.65
Boston & Mont	.50
Butte & Lon'n Dev	.12
Calaveras	2½
Calumet-Corbin	.01
Chief Con.	2½
Cortez	.10
Crown Reserve	.22
Crystal Cop	.61
Eagle & Blue Bell	2½
Houghton Copper	.75
Intermountain	1½
Iron Cap, Com.	14
Iron Cap Cop., pf.	13½
Mexican Metals	.30
Mines of America	1½
Mojave Tungsten	.35
Nat. Zinc & Lead	.28
Nevada-Douglas	1 1/16
New Baltic	1¾
New Cornelia	15
Oneco	.40
Pacific Mines	.35
Rex Cons	.12

SALT LAKE*	Oct. 15
Bannock	.26
Big Four	.01
Cardiff	4.00
Colorado Mining	.13
Daly	1.95
Daly-Judge	8.25
Empire Copper	1.27½
Gold Chain	.17
Grand Central	.57
Iron Blossom	.56
Lower Mammoth	.03
May Day	.06
Moscow	.11
Prince Con	.97
Silver-King Coal'n	2.97
Silver King Con.	3.50
Sioux Con	.04
So. Hecla	.93
Tintic Standard	1.47½
Uncle Sam	.04
Wilbert	.25
Yankee	.08

TORONTO*	Oct. 15
Adanac	.15
Bailey	.04½
Beaver Con	.35
Chambers Ferland	.12
Coniagas	3.80
Davidson	.34
Hargraves	.09
La Rose	.40½
Peterson Lake	.09
Temiskaming	.29
Wettlaufer-Lor.	.07
Dome Exten	.10
Dome Lake	.15
Foley O'Brien	‡ .60
Hollinger	4.50
McIntyre	1.38
Newray	.55
Porcu. Crown	.39
Schumacher	‡ .42
Teck-Hughes	.42
Vipond	.25
West Dome	.16

STOCK QUOTATIONS—Continued

COLO. SPRINGS	Oct. 16
Cresson Con	4.87½
Doctor Jack Pot	.03
Elkton Con.	.03
El Paso	.15
Gold Sovereign	.02½
Golden Cycle	1.74
Granite	‡ .40
Isabella	.07
Mary McKinney	.06½
Portland	1.30
United Gold M.	.16
Vindicator	.46

LONDON	Oct. 2		
Alaska Mexican	‡£0	5s	0d
Alaska Tre'dwell	‡ 1	0	0
Burma Corp.	4	1	3
Cam & Motor	0	9	6
Camp Bird	0	9	6
El Oro	0	11	6
Esperanza	0	9	9
Mexican Mines	5	8	9
Nechi, pfd.	0	13	0
Oroville	0	19	6
Santa Gert'dis.	0	15	6
Tomboy	0	18	6

* Bid prices. † Closing prices. ‡ Last Quotations.

MONTHLY AVERAGE PRICES OF METALS

Silver	New York			London		
	1915	1916	1917	1915	1916	1917
Jan.	48.855	56.775	75.630	22.731	26.960	36.682
Feb.	48.477	56.755	77.585	22.753	26.975	37.742
Mar.	50.241	57.935	73.861	23.708	27.597	36.410
April	50.250	64.415	73.875	23.709	30.662	36.963
May	49.915	74.269	74.745	23.570	35.477	37.940
June	49.034	65.024	76.971	23.267	31.060	39.065
July	47.519	62.940	79.010	22.597	30.000	40.110
Aug.	47.163	66.083	85.407	22.780	31.498	43.418
Sept.	48.680	68.515	100.740	23.591	32.584	50.920
Oct.	49.385	67.855	......	23.925	32.361	......
Nov.	51.714	71.604	......	25.094	34.192	......
Dec.	54.971	75.765	......	26.373	36.410	......
Year	49.684	65.661	..	23.675	31.315	......

New York quotations cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Copper	New York		London			
	Electrolytic		Standard		Electrolytic	
	1916	1917	1916	1917	1916	1917
Jan.	24.008	28.673	88.083	131.921	116.167	142.895
Feb.	26.440	31.750	102.667	137.895	133.167	148.100
Mar.	26.310	31.481	107.714	136.750	136.000	151.000
April	27.895	27.935	124.319	133.842	137.389	147.158
May	28.625	28.788	135.457	130.000	152.522	142.000
June	26.601	29.962	112.432	130.000	137.455	142.000
July	23.865	26.620	95.119	128.409	125.500	140.409
Aug.	26.120	25.380	110.283	122.391	126.304	137.000
Sept.	26.855	25.073	113.905	117.500	134.071	135.250
Oct.	27.193	......	122.750	..	142.523	......
Nov.	30.625	......	134.659	.	155.432	......
Dec.	31.890	......	145.316	.	162.842	......
Year	27.202	......	116.059	......	138.281	......

Tin	New York		London	
	1916	1917	1916	1917
January	41.825	44.175	175.548	185.813
February	42.717	51.420	181.107	198.974
March	50.741	54.388	193.609	207.443
April	51.230	55.910	199.736	220.171
May	49.125	63.173	196.511	245.114
June	42.231	62.053	179.466	242.083
July	38.510	62.570	168.357	242.181
August	38.565	62.681	169.870	243.978
September	38.830	61.542	171.345	244.038
October	41.241		179.307	
November	44.109		186.932	
December	42.635		183.368	.....
Av. year	43.480	.....	182.096	......

Lead	New York		St. Louis		London	
	1916	1917	1916	1917	1916	1917
January	5.921	7.626	5.826	7.530	31.167	30.500
February	6.246	8.636	6.164	8.595	31.988	30.500
March	7.136	9.199	7.375	9.120	34.440	30.500
April	7.630	9.288	7.655	9.158	34.368	30.500
May	7.463	10.207	7.332	10.202	32.967	30.500
June	6.936	11.171	6.749	11.123	31.011	30.500
July	6.352	10.710	6.185	10.644	28.137	30.500
August	6.244	10.594	6.088	10.518	29.734	30.500
September	6.810	8.650	6.699	8.611	30.786	30.500
October	7.000	......	6.898	.....	30.716	......
November	7.042	......	6.945	.....	30.500	......
December	7.513	......	7.405	....	30.500	......
Year	6.853		6.777		31.359	.....

Spelter	New York		St. Louis		London	
	1916	1917	1916	1917	1916	1917
Jan.	16.915	9.619	16.745	9.419	89.810	48.329
Feb.	18.420	10.045	18.260	9.875	97.762	47.000
Mar.	16.846	10.300	16.676	10.130	95.048	47.000
April	16.695	9.459	16.525	9.289	99.056	54.632
May	14.276	9.362	14.106	9.192	94.217	54.000
June	11.752	9.371	11.582	9.201	68.591	54.000
July	8.925	8.643	8.755	8.473	50.750	54.000
Aug.	8.730	8.360	8.560	8.190	51.587	54.000
Sept.	8.990	8.136	8.820	7.965	52.095	54.000
Oct.	9.829	.....	9.659		54.159	..
Nov.	11.592	......	11.422		56.023	...
Dec.	10.665	.....	10.495	.	55.842	....
Year	12.804		12.634		72.071	.....

New York and St. Louis quotations, cents per pound, London, pounds sterling per long ton.

Pig Iron, Pitts.	Bessemer‡		Basic‡		No. 2 Foundry	
	1916	1917	1916	1917	1916	1917
January	$21.60	$35.95	$18.78	$30.95	$19.70	$30.95
February	21.16	36.37	18.93	30.95	19.61	30.95
March	21.81	37.37	19.20	33.49	19.45	35.91
April	21.65	42.23	18.95	38.90	19.45	40.06
May	21.78	46.94	19.11	42.84	19.58	43.60
June	21.95	64.22	18.95	50.05	19.34	50.14
July	21.95	67.45	18.95	53.80	19.20	53.95
August	21.95	54.17	18.95	50.37	19.22	53.95
September	22.88	46.40	19.58	42.24	19.63	48.68
October	24.61		21.26	.	21.61	.
November	30.07		28.18	....	26.55	....
December	35.16		30.95	.....	30.79	.....
Year	$23.88		$20.98	.....	$21.15	.....

‡ As reported by W. P. Snyder & Co.

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Manganese Deposits in Costa Rica

By ALLEN MURRAY YONGE*

Principal operations in Playareal district, along the west coast of Nicoya peninsula. Deposits are in sedimentaries, highly metamorphosed by volcanic intrusions, ore occurring near the contact. Coast offers safe anchorage for large vessels. Climatic conditions make strict sanitary rules necessary.

FOR a few years it has been vaguely known that there existed large deposits of manganese on the peninsula of Nicoya, in Guanacaste Province of Costa Rica, but the inaccessibility of the country and its fame as a fever-ridden, malarial section have deterred systematic explorations until within the last year. The prospecting carried on up to that time had been confined to surface ore. Manganese outcrops of different grades, from highly siliceous to the pure grades for the arts, were discovered and steps were taken by the Costa Rica Manganese and Mining Co. to acquire title to the large area or zones where development showed the slighest prospect of encountering ore. What may be called the centers of these occurrences are along the west coast of the peninsula from latitude 10° 15′ to 10° 33′ North and the headquarters and townsite were established at a point called Playareal.

The Playareal district is the closest to the sea and thus far the most important district. The outcrops are of a basic volcanic rock and of highly metamor-

A CAMP OF THE COSTA RICA MANGANESE AND MINING CO., ON THE NICOYA PENINSULA phosed sedimentaries, originally impure marls interbedded with impure shales and sandstones. The volcanic rock is porphyritic in structure, blackish green in color and of the more basic series. On the east side of the peninsula, where it drains into the Gulf of Nicoya, impure limestone outcrops are much in evidence but, in the same manner as the sedimentaries on the west coast, they form a fringe to the volcanic which rises westward toward the range that divides the peninsula.

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*Manager, Costa Rica Manganese and Mining Co., Playareal, Costa Rica, C. A.; captain, Engineer Officers' Reserve Corps, U. S. A.

ORE FOUND NEAR CONTACT

The Peninsula of Nicoya is part of the Coast Range which extends from Nicaragua and, in the section now being extensively developed, was formed by the uplift of a huge batholith of the basic volcanic. The sedimentaries are completely altered on the west coast, not only by regional metamorphism but by actual contact, and it is in these metamorphosed sedimentaries that the manganese has been deposited and the ores are always found near the contact with the volcanic. The sedimentary fringe along the coast is not continuous and is cut off, not only by the many ravines and watercourses from the dividing range of the peninsula but also by bulges or intrusions of the porphyry. As a result the altered sedimentaries are found as remnants of various thicknesses and lengths in the form of hills which make up the spurs and slope of the range. There is no doubt that the sedimentaries were continuous and even covered a large portion of what is now the coast line, as small manganese remnants are found on the multitude of small islands and large rocks lying several hundred yards from shore. As the result of constant weathering and erosion, caused by the heavy rainfall of this country, the ravines and creek beds contain much high-grade manganese float.

The peninsula is accessible from both of its coasts and, although the Pacific side presents a most dangerous, rugged and uninviting entrance or anchorage, there are several small coves or inlets which permit the entering of large vessels to safe anchorage to within a few hundred yards from shore.

Owing to the long rainy season and the unhealthy conditions of the district, development during the first eight months was slow, as it was difficult to secure the necessary labor and supplies to do this work. As development progressed and the large deposits were uncovered, all energy was expended on a large headquarters camp. Strict rules were established to keep it sanitary, and knowledge of the way this was accomplished might be of value to those interested in the future growth and mineral development of those sections which are unhealthy and overridden with malaria and in which the mosquito has had full sway. After some 20 years' mining in the tropics I have discovered that there is no better rule to follow to preserve your health than to keep your feet dry and bowels open, use little or no alcohol, and keep early hours.

RULES FOR A SANITARY CAMP

In many new mining ventures all efforts are spent in development of the property and none to protect the health of the laborer. As a consequence the time is bound to arrive when the labor stops automatically until proper measures are taken to preserve the health of the men. This is truer in the tropics than in other parts of the world and I would suggest the following rules in starting operations: (1) Select the site for the camp or town for the laborers' homes on the crests of hills or highest ground, or where the best natural drainage is, with not more than one family to a house; (2) build sealed privies at 100 ft. or more back of houses, at least one for each two houses, and use lime freely; (3) clean all creeks of all obstructions and keep brush along their banks closely cut, as well as for a radius of not less than 300 yd. from the boundaries of the village. Although it has been proved that the mosquito cannot fly over 200 yd. it must be remembered that it is as easy for the mosquito to propagate and thrive in any stagnant water held in the hollows or knotholes of a tree, or even a leaf, as it is in swamps and stagnant pools or in still water in rivers and creeks; (4) the digging of shallow holes along the course of creeks to obtain drinking water should be strictly prohibited; (5) drinking water should be used only from the well that gives the best supply and all other sources prohibited; (6) clean the camp of accumulating rubbish and felled trees. Provide a pit for burial for rubbish and garbage and install a service of collection; (7) the laborers should be instructed and compelled to place rubbish (empty cans, bottles, fruit skins, etc.) and garbage in containers to be provided, from which collection by cart will be made several times a week; (8) if possible all buildings should be screened; (9) all drains from kitchens should be piped away; (10) no outside night work should be attempted until the camp is sanitary; (11) recruit laborers, preferably those with families, of good physical condition who desire to settle permanently, and allow only those at work to remain in camp. With a shifting force it will be difficult to eradicate malaria, for every new arrival is probably a latent case who requires treatment to make him non-infective and an efficient laborer; (12) every new laborer should be examined for malaria and if infected should be rejected or treated until cured. This measure will be effective if only the laborers actually employed, and their families, be permitted on the mine property; (13) at the beginning of the rainy season oil all pools of water and those sections of the creeks with slow-moving currents and so reduce mosquito propagation to a minimum; (14) a doctor or an intelligent employee should be employed to maintain the service of sanitation—one who can also be entrusted to give prophylactic doses of quinine to the laborers, should this measure be deemed necessary.

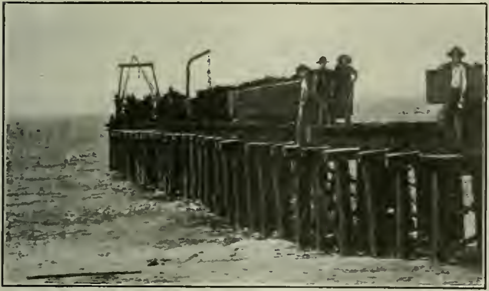
QUININE MIXTURE SYSTEMATICALLY ADMINISTERED

The following mixture is one I have employed which has given excellent results: To 8 oz. of quinine sulphate add aromatic sulphuric acid until the quinine is completely dissolved, appearing as a greenish yellow liquid. Add to this 2640 c.c. of boiled water. This gives a solution of five grains of quinine to a teaspoon. It is compulsory that every resident on the mine estate take a teaspoonful of this solution every meal until he has been free from malarial attacks for three weeks. Thereafter it is compulsory that every individual on the estate take three teaspoonfuls, before dinner, on Wednesdays and Saturdays.

I believe that if the foregoing measures are carried out, the laborers will remain as healthy as they are accustomed to be, or, as is being proved, even better; and the tendency will be for the men to become permanent residents and thus more efficient and productive laborers. Notwithstanding the strict adherence to the above rules the labor problem has been most serious and it is difficult to attract intelligent miners from the gold mines situated in the high lands in the interior of the country. Therefore practically all labor for the mine must be recruited from the peninsula. After careful medical examination it was found that all of the inhabitants have malaria.

STEAM TRAMS UNDER CONSTRUCTION .

In spite of many difficulties, including the hot tropical climate, during the last three months the entire district has been fairly prospected, a system of trams established, and the whole operation is being developed and worked along crude but effective lines. Two temporary piers on the open sea have been constructed, from which large lighters are loaded with bulk ore and towed to steamers lying in the open roadstead, as high as 200 tons per day having been loaded in this manner.



LOADING PIER OF COSTA RICA MANGANESE MINE

At present a harbor is being prepared and a railway is being built to a permanent pier site, where large ocean-going steamers can dock and receive their cargo direct. The steam-tram system is to tap the entire district and will be the means of handling a large tonnage at a minimum cost. Without going into details, it is estimated from actual results now being obtained that to produce a ton of 50% ore will not cost more than $2, U. S. currency. To date the development of the properties is uncovering a large surface area and has already reached many thousands of square feet, varying from 1 to 30 ft. in thickness. The manganese occurs as: (1) Oxides with little impurities, which give a high-grade ore 53 to 58% manganese; (2) oxides with siliceous impurities, which give a high-grade furnace ore, 50% manganese, 6% silica; (3) ores in which the manganese is so mixed with siliceous impurities that they fall below furnace regulations, but, mixed with higher grade ores, are suitable and in demand for furnace use. The company has three large ore steamers under construction at Seattle which will be ready for service within the next few months. They will deliver their cargoes either at Philadelphia or Baltimore and from there the ore will be taken directly by rail to Dunbar, Penn., where it is used in the furnaces of the American Manganese Manufacturing Co., with which the Costa Rica company is affiliated.

Tungsten Mining in Eastern Nevada

ELY CORRESPONDENCE

In White Pine County, Nev., many veins are known to carry tungsten ore, both in the form of scheelite and hübnerite. In spite of the fact that many regard this part of Nevada as being an important tungsten area, the lowered price of the product throughout the last year has been responsible for a limited production.

The United States Tungsten Corporation at Tungsten, often stated to be a subsidiary of the Tonopah Mining Co. but not so acknowledged by the reputed parent, formerly operated a concentrating mill south of Osceola. During the period of high prices the company made a good profit, treating the ore from the Hub vein and handling other ores and concentrates. The entire plant is now advertised for sale.

The Minerva Scheelite Co. continues to work three men, under the terms of its bond and lease. They are reported to have mined about 1000 tons of 2% ore, but the only milling facilities are limited to a capacity of two tons per 24 hours. The Salt Lake Tungstonia Co., with a 20-ton mill and reputed large tonnage of high-grade ores, advertise in the local newspaper a long list of stockholders that have not paid the last assessment levied. The Tungstonia Mines, Inc., of which A. R. Shepherd is president and manager, has a good property and some tonnage of hübnerite but has no milling capacity. The Independent Scheelite Co. erected a $35,000 mill last year and made one run. The product was reported to be too low grade and nothing has been done since. It is supposed that a total of $53,000 was spent.

Atkins, Kroll & Co., of San Francisco, who erected a 50-ton mill at Toy, in Humboldt County, also operated to a small extent in White Pine County, but apparently with discouraging results. Since many of the tungsten orebodies in White Pine County are small and irregular, it is doubtful whether more than a few of the properties can be operated at a profit, except during periods of abnormal prices. The exceptions are those where the deposits bear a resemblance to true fissure veins and where the properties have also been equipped with proper milling facilities.

Antimony Industry in China

A recent official report on the antimony industry in China, which is the main source of supply, may be read with interest. China last year exported in all 22,088 tons of regulus and crude—the latter containing about 70 to 74% metal—and 11,572 tons of ore. Antimony ores are distributed over a wide area of China, comprising the provinces of Hunan, Kwangsi, Yunnan, and Kwangtung. In this region, says the London *Mining Journal*, Changsha is the chief center of the business.

The greatly increased demand for antimony in the making of ammunition has been immensely stimulated by the war; and the Chinese, knowing well the great resources of their country in this respect and the good quality of the metal which they manufacture, opened an office in New York, and were very successful for a time in disposing of their products at excellent profits. But the demand also stimulated the industry in other parts of the world; and it is certain that, although there were no complaints about the quality of their products, the Chinese sustained heavy losses in 1916 in this business, because of the severe depression in the market prices. In January, the Hankow Customs value of antimony regulus was Hk. Tl. 880 (1173⅓ oz. of silver) a ton and of crude antimony Hk. Tl. 500 (666⅔ oz. of silver). In December the corresponding rates were Hk. Tl. 218 (290⅔ oz. of silver) and Hk. Tl. 113 (150⅔ oz. of silver), the depreciation being practically continuous throughout the year. It should be kept in mind, however, that exchange was steadily rising. That disaster swiftly followed is not surprising.

Some of the important causes were due to the consolidation by the large consumers as to their buying requirements, especially in New York; to the development in Spain of large supplies of ore for Great Britain; to ores from Bolivia coming into the market for some months; and to shipments from China to New York of large quantities on consignment when prices were high, resulting in a glut in New York. The effects in China were that mines and smelting works which were not exceptionally favored with respect to transportation and ore supplies could not bear the financial strain, and had to stop work; also several large companies, trusting to the continuance of high prices and to no new sources of supply being opened up, over-speculated, and failed.

Sulphur, Pyrite and Sulphuric Acid in 1916

As 99% of the sulphur production in the United States in 1916 came from two companies, no statistics regarding sulphur production will be made public in the forthcoming volume on "Mineral Resources of the United States in 1916." Importation amounted to 22,235 long tons valued at $404,784, practically the same as for the last five years. The exports amounted to 128,755 long tons valued at $2,505,857 or an increase of nearly 350 per cent. over exports in 1915.

The domestic production of pyrite in 1916 was 423,556 long tons valued at $1,965,702; a tonnage increase of about 30,000 and a value increase of about $290,000 more than in 1915. The apparent consumption of pyrite, or the domestic production plus the imports, amounted to about 1,670,000 long tons. Returns from acid manufacturers show that 577,045 long tons of domestic copper-bearing sulphide ores, 196,404 long tons of foreign copper-bearing sulphide ores, 531,625 long tons of domestic zinc sulphide ores, and 92,002 long tons of foreign zinc sulphide ores were treated in 1916 for their sulphur as well as for their metallic content.

The pyrite production was reported from 57 mines situated in 13 states. From the Appalachian region, including New York, Virginia, South Carolina and Georgia, came 218,000 long tons valued at $1,245,000; from the region east of the Mississippi and including Pennsylvania, Ohio, Indiana, Illinois and Tennessee came 36,000 long tons valued at $93,000; from the region west of the Mississippi in the States of Missouri, Wisconsin and South Dakota, came 23,000 long tons valued at $60,000; and 145,000 long tons valued at $565,000 came from California. The record of sales indicates that 336,000 long tons of lump ore valued at $1,588,000, and 87,000 long tons of concentrates valued at $377,000 were produced. The importation of pyrite ores in 1916 was 1,244,662 long tons valued at $6,728,318, a notable increase and the greatest in the history of the industry.

Due to the demand created by war conditions, more sulphuric acid was consumed in this country in 1916 than ever before. The production, expressed in terms of 50° Bé acid, was 5,642,112 short tons valued at $62,707,369, to which figures must be added those of acid of strengths higher than 66° Bé, and not convertible into 50° Bé equivalent, amounting to 443,332 short tons valued at $10,806,757. The total value of sulphuric acid produced in the United States in 1916, including the byproduct acid produced at copper and zinc smelteries, was $73,514,126. The byproduct acid produced at smelteries was 1,069,589 short tons expressed in terms of 60° Bé acid and valued at $12,158,266, and also 92,802 short tons of acid of strength higher than 66° Bé and valued at $1,941,661. Sulphuric acid was produced at 211 plants. Of these, 27 plants situated in 14 different States produced acids stronger than 66° Bé About 700 tons of acid valued at about $21,000 was imported, practically all from Canada. No sulphuric acid was exported from the United States during 1916. The source of the sulphur in the sulphuric acid manufactured in the United States in 1916 is indicated in the accompanying table.

ORE USED IN THE MANUFACTURE OF SULPHURIC ACID IN THE UNITED STATES IN 1916

	Domestic Long Tons	Foreign Long Tons	Total Long Tons
Sulphur	261,574	10,903	272,477
Pyrite and pyrrhotite	324,602	1,154,550	1,479,152
Gold- and silver-bearing pyrite	1,673		1,673
Copper-bearing sulphides	568,116	196,404	764,520
Zinc-bearing sulphides	531,625	92,002	623,627

The figures given for "pyrite and pyrrhotite" include all the sulphide ores used which are not treated further for their copper, lead, zinc, gold or silver content. Much of the material doubtless contains small amounts of these other metals, but as they are not recovered the presence of the metals in the ore is considered as of no economic importance.

Extralateral Mining Rights

BY A. L. H. STREET*

Since Congress has prescribed the conditions upon which extralateral mining rights may be acquired, the holder of a mining claim must bring himself within the scope of those conditions or content himself with only such minerals as lie beneath the surface of his claim. Under section 2319 of the United States Revised Statutes and other following provisions the end lines of a mining claim are required to be projected parallel with each other and crosswise to the general course of the veins within the surface limits of the location, and whenever the top or apex of the vein found within the surface lines extended vertically downward, the vein may be followed outside of the vertical lines. But if the apex of a vein crosses one end line and one side line of a claim, as located, there is no right to follow the vein on its dip beyond the side line. These points were lately applied by the Washington supreme court in the case of Quilp Gold Mining Co. vs. Republic Mines Corporation, 165 Pacific Reporter, 57.

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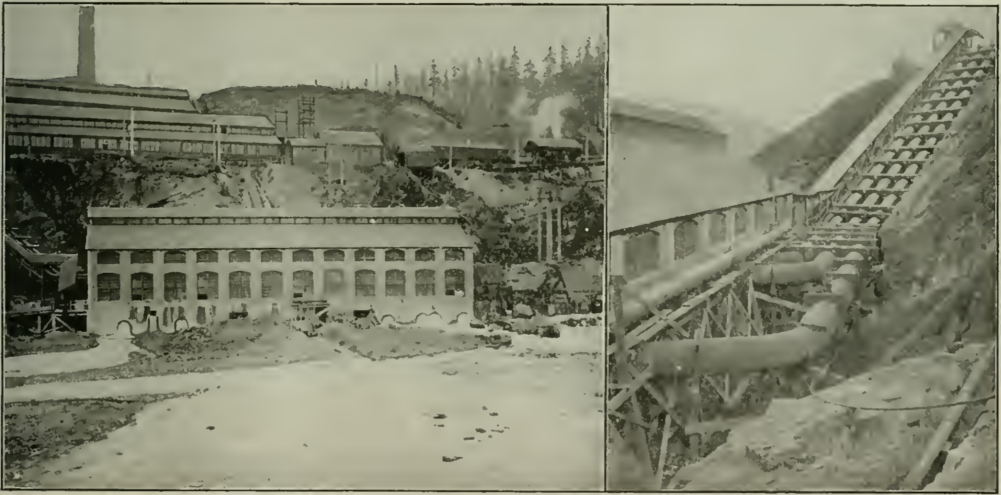
The Granby Power Plant at Anyox, B. C.*

By WAKELY A. WILLIAMS†

Hydro-electric power for the Granby mines and plant is obtained at the mouth of Falls Creek. A dam, 110 ft. high, was built one mile upstream and water is conducted to the power house through a 6-ft. wood-stave pipe giving an effective head of 375 ft. The power house is equipped with Pelton waterwheels direct-connected to compressors, converter blowers and electric generators. An auxiliary 6000-hp. steam plant provides power during the winter season when there is a diminished water supply.

THE mines, smeltery and hydro-electric power plant of the Granby Consolidated Mining, Smelting and Power Co., at Anyox, B. C., are situated on the west shore of Observatory Inlet, an arm of the sea in northwest British Columbia. Ores from the Granby company's Hidden Creek mines at Anyox are mined and smelted together with Granby and custom ores shipped in by boat from the outside. Fuel, fluxes and all supplies are brought in by steamship and unloaded at the company's wharves from which they are distributed to the mines and various plants by the company's railroad. Power for the various operations of the Granby company is secured from a hydro-electric power plant, which utilizes the water from Falls Creek, and from a 6000-hp. steam plant which operates during the winter months when there is a decreased water supply.



HYDRO-ELECTRIC POWER PLANT OF THE GRANBY COMPANY AT ANYOX, B. C.
To the left is shown the plant with a portion of the smelting works in the background. On the right are shown the air mains leading from the hydro-electric plant to the smeltery

Falls Creek, a stream of considerable size emptying into Granby Bay at the north end of the smeltery site, receives its flow from melting glaciers. The surrounding hills are steep and provide but little chance for storage. The company constructed a crib and rock-fill dam 110 ft. high at a suitable point a mile distant where the canyon is narrow and the stream could be deflected over a natural rock spillway 125 ft. wide. From this dam the water is taken by a 6-ft. wood-stave pipe down the creek and across the north end of the smeltery site to the power house. This plant is situated just below the smeltery and well toward the mouth of the creek. From the smelting plant to the power house, the penstocks are of steel with branches leading to the various Pelton wheels. The arrangement and location of the pipe line gives a water pressure of 110 lb. at the smeltery site. The head of water on the Pelton nozzles at the power house is 375 ft., the effective head giving a pressure of about 165 pounds.

The power house is a brick-and-steel structure and all foundations are on solid rock. A 15-ton crane running the entire length of the building handles the heavy machinery. The water discharge from the Peltons is a little above the high-tide watermark on Falls Creek. The building is 50 ft. wide by 180 ft. long and has concrete floors. In this building are installed the following: One Nordberg variable-capacity waterwheel-driven two-stage air compressor, with cylinders 22 and 36 x 42 in., running at 84 r.p.m., with a capacity of 4000 cu.ft. of free air per minute delivered at 100-lb. pressure; one Nordberg waterwheel-driven special converter blowing engine with duplex cylinders, 60 and 60 x 48 in., running at 75 r.p.m. and giving a capacity of 20,500 cu.ft. of free air per minute delivered at 16-lb. pressure; three Connersville high-pressure blast-furnace blowers, having a displacement of 400 cu.ft. of free air per revolution and each with a capacity of 45,000 cu.ft. of free air per minute at 48-oz. pressure. The Pelton wheel buckets are directly bolted to specially designed flywheels. The blowers are connected by chain drive to 500-hp. motors, and can be driven either by water or electric power. A pipe system leads to the furnaces and converters from the blowers, and high-pressure air is delivered to the mine by 9-in. and 6-in. pipe lines. There are two direct-connected motor-driven pumps taking water from the raceways and delivering it to condensers at the steam plant.

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*The last of a series of three articles by the same author covering the mining and smelting operations of the Granby Consolidated Mining, Smelting and Power Co., Anyox, B. C. Previous articles appeared in the "Engineering and Mining Journal" on Oct. 13 and Oct. 20, 1917.

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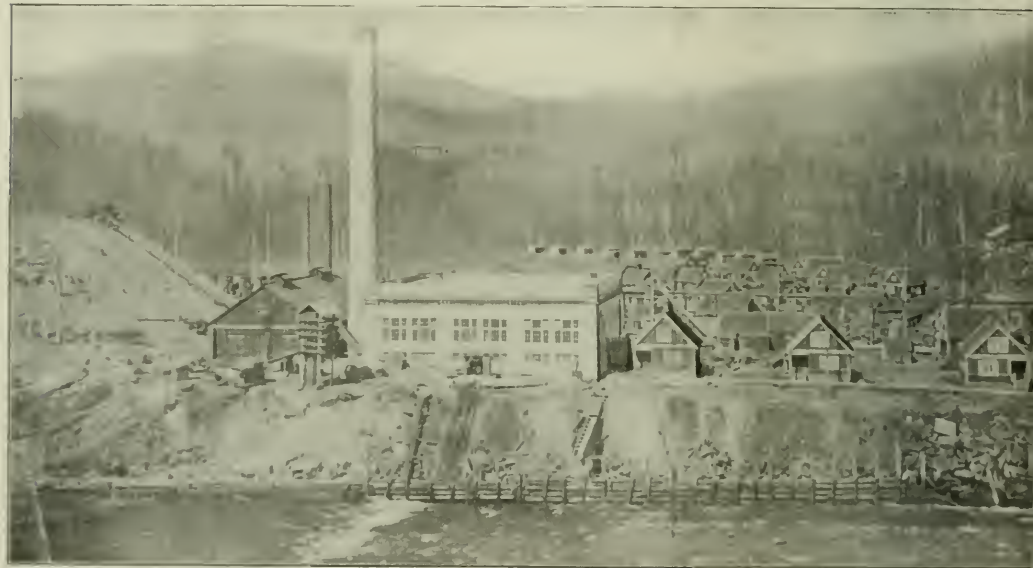
The present hydro-electric plant consists of two 938 kv.-a. alternators, with two 700-hp. overhung Pelton-Doble waterwheels to each alternator. Alternating current at 2200 volts is generated by Westinghouse 60-cycle three-phase alternators. They are separately excited by two 50-kw. Westinghouse motor-generator sets, one of which has an overhung waterwheel on an extension motor shaft for initial starting. The excitation voltage is 125 volts. The 6-ft. pipe line from the dam branches to 25-in. pipes outside the power house for delivery to each wheel. The effective head used is 372 ft. The 25-in. lines divide again at a Y near the Peltons into two 18-in. pipes, one of which leads to each wheel. The waterwheel driving the exciter is fed by an 8-in. pipe.



THE TOWN OF ANYOX, B. C., AND THE GRANBY COMPANY'S 6000-HP. STEAM PLANT—IN T

There are two 300-kw. motor-generator sets, supplying direct current at 550 volts, for railroad and smeltery use. The generators are type M Westinghouse and each is driven by a 440-hp., 2000-volt, three-phase, 60-cycle, Westinghouse type CCL induction motor.

SWITCHBOARD CONTROL IN 15 PANELS

The switchboard is divided into 15 panels. A synchronoscope is mounted on a bracket together with two voltmeters, one for each machine, and below these there is a Tirrell voltage regulator. The first panel controls the street lighting, which is a Westinghouse series tungsten system with a constant-current transformer on a gallery over the board. The second and third panels control the two generators. On them are mounted three ammeters, one for each phase, an indicating wattmeter and one three-pole, type B oil switch; also there are a double-pole field switch of 400 amp., a main field rheostat, an eight-point voltage receptacle synchronism plug and a reversing switch for operating the pilot governor control on the generator. Panel No. 4 has 125-volt, direct-current excitation. On this panel are mounted voltmeters and ammeters for each machine, a field rheostat, two double-pole 400-amp. field switches and one 200-amp. double-pole double-throw switch for power-house lighting, taken from the transformer or from the exciter bus as desired. Panel No. 5 is a totalizing panel on which is mounted a three ammeter, type TG static ground detector, a TI power factor meter, a 2400-kw. polyphase graphic wattmeter and a type C watt-hour meter. Panel No. 6 controls the two 75-hp. motors driving direct-current generators for excitation. Panel No. 7 controls the mine feeder. The mine is supplied by one three-phase line direct to the line substation and a branch three-phase line from the town circuit for use in case of emergency. There are three ammeters, on this panel, a circuit breaker and a watt-hour meter. Panel No. 8 controls the smeltery power feeder. All the alternating-current motors in use around the smeltery and shops are connected to this circuit. Panel No. 9 controls the smeltery lighting, town lighting and power circuits. On this panel there are two ammeters, one to each circuit, operating through meter plugs to enable the reading of each phase. There are two circuit breakers, one to each circuit, and two watt-hour meters. Panel No. 10 is for the 440-hp. motors in connection with the motor-generator sets. Panels Nos. 11 and 12 control the direct-current side of the motor-generator sets. On each panel are mounted one carbon breaker, one voltmeter, one ammeter, a field rheostat and a three-pole knife switch. Panel No. 13 controls the railroad circuit and is provided with a circuit breaker, an SPK switch, an ammeter and a Columbia wattmeter. Panel No. 14 controls the direct current supplied to the smeltery for cranes, 12-ton locomotives and some direct-current motors. All the cables between the boards and the machines are rubber covered and braided. Stranded 2200-volt, three-conductor and single-conductor cables are laid in Orangeburg fiber conduits.

Five-Panel Switchboard at Substation

All the power supplied to the mines goes to the mine substation where there is a five-panel switchboard connecting incoming and outgoing power lines. The outgoing lines are on No. 2 panel, which has one 3-phase, 2200-volt power line for motors. No. 3 panel has two single-phase lines for small motors and heating and lighting around the plant. The fourth panel controls the motor for the motor-generator set which supplies 500-volt direct-current for ore haulage. The fifth panel controls the direct-current generator.

OREGROUND IS FALLS CREEK, WHICH FURNISHES POWER FOR THE HYDRO-ELECTRIC PLANT

The board at the substation is a Westinghouse type similar to the one at power house No. 1 and with the panels similarly equipped.

Electric Locomotives for Ore Haulage

The direct-current trolley receives power from the 100-kw. motor-generator set installed in the substation or else power is taken from the railroad-trolley feeders which receive power from power house No. 1. At present one six-ton locomotive operates on the 530-ft. level of the mine on a 2-ft. gage track, hauling ore to the main pockets and hauling out waste. At the 385-ft. or main shipping level, three 6-ton locomotives are in service, hauling ore from the pockets to the bins, a distance of three-quarters of a mile. At the bins there are two crushers, each belt-driven by a 150-hp., 2200-volt, three-phase, Westinghouse type HF motor. In one case the motor has an extended shaft on which are mounted two pulleys in line with pulleys on either side of the crusher while in the other case the motor is in the center, between two pulleys, a combination that produces a more equalized pull on the motor.

On the 150-ft. level of the mine a six-ton locomotive is used for hauling waste from development work. Each of these locomotives is of Baldwin-Westinghouse manufacture and is smaller though similar to the 12-ton smeltery locomotives. The railroad runs into the mine tunnel at the 150-ft. level where eight and ten 25-ton cars are made up into trains for one of the 42-ton electric locomotives to haul to the smeltery storage bins. The 42-ton locomotives are also employed to convey ore, coke, etc., from the dock to the smeltery bins. These locomotives are provided with four 84-hp., 500-volt, No. 909 mine motors, double-end series-parallel control with independent automatic air for breaking. When operating in series two motors, one for each truck, are in series, and parallel operation gives full line voltage to each motor.

The furnace-charge trains are hauled by three 12-ton mine locomotives of Baldwin-Westinghouse manufacture and each locomotive has two No. 907, 500-volt, direct-current, series interpole motors. There is a pinion drive, Westinghouse No. 141 controller with wiring protected by a railroad-type circuit breaker. All brakes are hand operated. The trolley is type D, of Nuttall & Co. manufacture.

At the dam there is a 50-hp., 2200-volt, type CCL motor which is used in pumping water for sluicing.

The cranes used in the smeltery are of Niles-Bement-Pond manufacture. Each crane has two 40-ton hoists, without auxiliaries. This arrangement enables a pouring of metal at either end of a narrow span which could not be done with a long carriage, main hoist and two auxiliaries. Each hoist is driven by an 80-hp. 500-volt series motor equipped with a Cutler-Hammer controller. The trolley and bridge are both driven by a 25-hp. Westinghouse No. 7, type K, direct-current motor, equipped with an R28, General Electric controller. The protection of each circuit is insured by an Electric Controller and Manufacturing Co.'s type S crane switchboard. Each motor circuit has an overload relay, operating the main circuit breaker. During daily inspection, the safety plug can be taken out, or locked in its off position, which makes it impossible to operate motors or obtain current beyond the main switch.

The converters are tilted by Westinghouse type 47D, 500-volt, direct-current, crane motors; each motor being equipped with a Westinghouse R27 controller and the motor circuit protected by a Westinghouse railroad-type breaker.

There are about six miles of track including yards, all equipped with trolley 18 ft. over the center of the track. A 0000 copper feeder is carried on cedar poles spaced 55 ft. apart and 7 ft. 6 in. from center of the 3-ft. gage track. The trolley-support construction is mast and arm on the tangent track and double pole and span wire on the curves. About a third of the way between the mine and the smeltery there is a turnout and a spur track to the dock and a branch to the smeltery yards half a mile further on. Along both tracks a No. 0000 feeder is installed and both feeders and one No. 0000 trolley lead to the mine.

The copper-casting machine has two 15-hp., 500-volt, direct-current, Westinghouse type K motors, one of which is used for hoisting the pot and the other for moving the molds. Both are equipped with an R122 General Electric controller.

The mud mill is operated by a 75-hp., 2000-volt, type CCL, induction motor and is controlled by the standard auto-starter panel.

The sampling mill is driven by a Westinghouse type C, 2000-volt motor of 150 hp., controlled by standard auto-starter panel; also two 5-hp. motors for conveyor belts. The matte digger is operated by a 440-volt, type CCL, induction motor, controlled by an overload circuit-breaker and double-throw auto-starter switch.

In the assay-office bucking room, there is one 5-hp. 200-volt, type CCL, induction motor, controlled by a double throw three-pole switch and fuse; and one ½-hp. 200-volt, three-phase, 60-cycle, General Electric type DST induction motor for running a fan; also a small motor-generator set comprising a ½ hp. 200-volt, type CCL induction motor, direct connected to direct-current 110-volt generator used for driving electrical apparatus.

In the smeltery store, there is one Otis-Fensom elevator driven by a 7½-hp., 200-volt, type CCL, induction motor, with rope control from the cab.

Machine-Shop Equipment

The electrical and mechanical departments are in charge of all mechanical and electrical equipment at the mines, smeltery, railroad, docks, ships and town. On account of the varied work required, these departments have to be well equipped. The departments comprise the machine, boiler, blacksmith, electric and tinsmith shops and a foundry where all castings up to eight tons can be made. There is a plant for generating oxygen in conjunction with a complete oxyacetylene welding plant. The main mechanical shops, such as the blacksmith and machine shops, are housed in one building. This building is of wood 58 ft. wide 254 ft. long with a craneway the length of the building upon which is operated a Niles 20-ton electric crane. The construction floor is 30 ft. wide and all machinery so placed that any piece can be reached by the crane. The line shafting is in the lean-to part of the building over the work benches and machines. The building is well lighted and has a hot-air heating system for winter.

In the machine shop there are two 15-hp. 200-volt, type CCL, induction motors with auto-starter control for line shaft; one 1-hp., 200-volt, Western Electric type KT 122 motor for grinder; one 20-hp., 500-volt, direct-current variable-speed, Northern Electric motor operating a lathe, the speed variation of which is made by a field rheostat, 300 to 900 r.p.m.; one 75-hp., type CCL induction motor driving a turret lathe; one 1-hp. type CCL induction motor for tool grinder; one ½-kw. 250-volt generator for driving a ⅛-hp. motor on grinder table; one 50-hp. 2000-volt motor for driving compressor and standard auto-starter panel. In addition there are: Two 15-hp. motors for boiler room, one 5-hp. motor for foundry and one 15-hp. motor for pipe shop.

Electric Shop Equipment

The electric shop is in a separate building 42 ft. wide 76 ft. long with a craneway over the entire length of the construction floor and rooms for winding armatures and other work. All the shops are served by railroad tracks in the center of the construction floors.

The motor equipment in the electric shop comprises: One 5-hp. for the line shaft; one 6½-kw., 125-volt generator for battery charging; one 1-hp. motor for drill press; one 2-hp. motor on banding machine; and one 1-hp. 125-volt, direct-current motor on coil winding machine.

The company mess has a refrigerating plant and numerous electrical appliances and the butcher shop has a refrigerator plant and sausage machine.

There are various small motors of 5, 10 and 15 hp. used in the machine shop, company mess house, carpenter shop, etc. The mines and all the houses are lighted by electricity. In the mines 220-volt current is used for lighting and 110-volt current for house lighting. All small motors are of the three-phase 60-cycle type for 220-volt current.

Unloading Equipment at Dock

The unloading equipment at the dock is all electrically driven. On dock No. 1, there are four boom derricks; one with a 25-hp. induction motor for unloading quartz; and three derricks which have direct-current series motors for big ranges of speed and fast operation. These derricks are equipped with 50- or 80-hp. motors for hoisting and a 15-hp. motor on each boom. The 50-ton hoist has a 50-hp. direct-current Westinghouse type K 10 series motor, operating through mechanical brake to drums of hoist. These motors are equipped with Westinghouse R27 controllers for the 50-hp. motors and Cutler-Hammer No. 5100 controllers for the 80-hp. motors and General Electric R122 controllers for the 15-hp. motors. On this dock there is also a 10-hp. motor which drives the matte elevator.

On dock No. 2 there are two unloaders. Each unloader has two motors, one for hoisting which is a 35-hp., variable-speed Westinghouse induction motor equipped with a Westinghouse rheostatic controller, and one 20-hp. type CCL, constant-speed induction motor which is controlled by an auto-starter and drives the conveyor belt.

The two power houses are situated facing each other on opposite banks of Falls Creek which is about 300 ft. wide at this point. Close to each power house a wooden four-pole structure is erected and the cables span the creek about 30 ft. above high water.

In No. 1 power house three 500-hp., 2000-volt, three-phase, 60-cycle Westinghouse type HF motors drive the blowers. One panel is allotted to each motor, and on it is mounted one three-pole type D circuit breaker, six type DDPST oil switches for cutting out resistance, and one ammeter and plug. Enough resistance is installed in the secondary circuit of each motor to obtain speed variation for continuous duty from half to full speed. One watt-hour meter will be installed for three motors.

For additional 16-lb. air, there is being installed one 25,000-cu.ft. De Laval turbo-blower, driven by an 1800-hp., three-phase, 60-cycle, 2000-volt, Westinghouse type CCL motor. The control is mounted on one panel and on the panel is one 3 DST overload circuit breaker, and three interlocking starting switches connecting the motor through the 2000 kv.-a. auto-transformer, one ammeter and one watt-hour meter. To obtain additional supply of power for the railroad, a new 500-kw. synchronous motor-generator set is being installed to run in parallel with the one at present in operation. The motor of this set will also be used for power-factor correction, and arrangements are made for future water-wheel connections on the extension of the motor shaft.

The cables from No. 2 power house are brought to a panel in No. 1 power house, on which is mounted a type B circuit breaker, voltmeter, synchronizing plug and watt-hour meter.

The two Ingersoll-Rand compressors will be driven by one 200- and one 400-hp. type CCL motors.

The power line to the mine will be overloaded when these extensions are complete and to remedy this the line potential will be raised to 6600 volts using a step-up bank of three 150-kv.-a., 2200 to 6600 volts at power house No. 1, and three 150-kv.-a., 6600 to 2200 volts at the mine substation. The distribution control of the whole equipment is kept at No. 1 power house.

Auxiliary Steam Plant for Winter Months

On account of the glacier feed to Falls Creek, there is a period of three months in the winter of extreme cold, when the flow of water is not enough to give all the power needed to fully operate mines and smelter to capacity. To be insured against this shortage of power there has been installed an auxiliary steam plant of 6000 hp. For this purpose a reinforced-concrete building has been erected across the creek opposite and facing No. 1 power house, with dividing walls separating the boiler and operating rooms. In the boiler room there are five 550-hp., Babcock & Wilcox oil-fired boilers with superheaters. All the necessary machinery is installed to make them easily and cheaply operated.

In the operating room there is installed: One 3750-kv.-a. three-phase, 60-cycle, 2200-volt, Westinghouse turbo-generator; one 2000-kv.-a. three-phase, 60-cycle, 220-volt Westinghouse turbo-generator; one 100-D.W. exciter; and one DeLaval turbo-compressor with 800-hp. motor so arranged that it can be either driven by steam turbine or motor. The capacity is 3500 cu.ft. of free air per min. at 100-lb. pressure. There is a space allowance for one extra turbo-generator. All the necessary condensers, vacuum pumps, switchboards, etc., are installed to make an up-to-date and efficient plant.

The warehouse building is of wood 36 ft. wide, 160 ft. long and has three floors. A complete stock of supplies and repair parts are kept on hand, more so than would be the case if the works were not so removed from the source of supply.

World's Petroleum Production

Although the world's production of petroleum in 1915 was the greatest in the history of the industry, being an increase of 7% over that of the preceding year, that record was surpassed in 1916, as is shown by the revised statistics prepared by J. D. Northrop, of the United States Geological Survey.

The total quantity of crude petroleum entering the world's markets in 1916, amounting to 460,639,407 bbl., exceeds by 33,746,734 the quantity reported for 1915, or an increase of practically 8%. More than 91% of the increase came from the United States, Russia and Mexico, which are the greatest producers. The United States production increased about 7%, that of Russia 6%, and Mexico produced nearly 21% more than in 1915. In view of the potential production of Mexico the increase is not an indication of greater activity in development, but simply means that the marketing and transportation facilities were improved. The figure for Germany is, of necessity, pure guesswork, being set down the same as for 1915, 1914 and 1913. The distribution of the known and estimated petroleum production for 1916 is shown in the accompanying table.

WORLD'S PRODUCTION OF PETROLEUM IN 1916

Country	Barrels of 42 Gal.	Metric Tons	Percentage Total
United States	*300,767,158	40,102,288	65.29
Russia	†72,801,110	9,933,387	15.81
Mexico	39,817,402	5,308,987	8.64
Dutch East Indies	‡13,174,399	1,820,247	2.86
Roumania	†10,298,208	1,432,296	2.24
India	§8,228,571	1,097,143	1.79
Galicia	6,461,706	898,670	1.40
Japan and Formoca	2,997,178	399,624	0.65
Peru	2,550,645	340,086	0.55
Trinidad	§1,000,000	139,082	0.22
Germany	995,764	§140,000	0.22
Argentina	870,000	116,000	0.19
Egypt	411,000	54,800	0.09
Canada	198,123	26,416	0.04
Italy	43,143	§6,000	0.01
Other countries	§25,000	3,333	
	460,639,407	61,818,359	100.00

* Marketed production. † Estimated in part. ‡ Includes British Borneo § Eatimated.

Volatilization of Tin from Scrap

Washington Correspondence

A small, electric furnace has been installed and operation begun on the volatilization of tin from scrap at the Northwest experiment station of the United States Bureau of Mines at Seattle, Wash. An extensive series of experiments will be carried out there with the idea of saving the tin now wasted in discarded containers and other forms of scrap.

Industrial Democracy Established by Colorado Fuel and Iron Co.

DENVER CORRESPONDENCE

Industrial democracy, as practiced by the Colorado Fuel and Iron Co. under its "Industrial Representation Plan and Agreement," has made substantial progress during the last two years. The object of the plan is to promote harmony and good will between the company and its employees, and the furtherance of the well-being of the employees and their families, and the communities in which they reside. The success of the plan should be an object lesson worthy of careful study by the officials in control of other large industrial and mining enterprises. Under the plan each mining district, as well as the Minnequa Steel Works, is provided with committees on industrial coöperation and conciliation, safety and accidents, sanitation, health and housing, and recreation and education. These committees are composed of an equal number of representatives of the employees and of the company.

PLAN ADOPTED BY OVERWHELMING VOTE

The industrial-representation plan was adopted at the company's mines in October, 1915, by a vote of 2404 to 442, and was adopted at the steel works, May 4, 1916, by a vote of 2321 to 863. Twenty-seven joint conferences and 162 joint committee meetings have been held, over 90 complaints adjusted through the industrial representatives, and a much larger number of less important misunderstandings adjusted between the employees or their representatives and the local management at the various properties. On Dec. 3, 1915, the president appointed an advisory board on social and industrial betterment. On Jan. 12, 1916, he appointed a salary committee which has considered the remuneration of all salaried employees. General increases have been made. On Mar. 22, 1917, a service-retirement plan was adopted, and under this plan 24 employees, who are veterans in the service of the company, have been retired on monthly allowances, and two hundred 25-year service buttons have been awarded.

The wages paid to the miners in the employ of the Colorado Fuel and Iron Co. are now on a higher basis than the rates paid for similar labor in most other coal-mining districts. In January, 1916, the total payroll of the company was $797,147, and in May, 1917, the payroll amounted to $1,381,572. The average individual monthly wage in January, 1916, was $79.24, and in May, 1917, it was $114.59. Prices at the company stores have been kept at the lowest possible level. The company has built 104 new houses for miners, and 250 more are in the course of construction. The houses are screened and the lots fenced. Over $35,000 has been expended in the construction of miners' homes. The company has employed a horticulturist, and the cultivation of lawns and gardens is encouraged by annual prizes. An efficient medical department is maintained. At the Minnequa hospital a nurses' home is being erected. Dispensaries have been built at Primero, Colo., and at Sunrise, Wyo., and are planned at several other camps. Ambulance service is provided and specialists are employed to care for the eyes and teeth of the children of employees.

An important feature of the general plan is education. Five new school buildings have been erected, and 10 junior high schools have been established under the supervision of the local high school authorities. Traveling libraries are circulated in the schools. Extension work has been undertaken in manual training, domestic science, and first aid. Classes in English for foreigners are conducted under the supervision of the Young Men's Christian Association. Special courses of study are provided, through the engineering department, for those wishing to prepare for state examination for certificates. First-aid teams have been organized and prizes are awarded each month for the best safety records. Storage-battery electric lamps have been provided for all underground employees in the Trinidad district, and at Walsen-Robinson, Cameron, Pictou, Crested Butte and Floresta.

Under the auspices of the Y. M. C. A., 16 branch associations are conducted in the various camps, with a secretary in charge of each and a general secretary devoting his entire time to supervision. Five women community workers are employed. Seven new buildings have been erected at a total cost of over $113,000, and three additional buildings have been authorized. Four old buildings have been remodeled at a cost of $13,500. The company plans to erect at the Minnequa Steel Works a Y. M. C. A. building to cost $225,000. Catholic and Protestant churches have been erected and others are in the course of construction, through the coöperation of residents, the company and John D. Rockefeller, Jr.

At present there are seven camps of Boy Scouts and 10 camps of Camp Fire Girls at C. F. and I. properties. Various athletic sports and holiday social affairs are encouraged. Baseball parks have been fitted up near the Minnequa plant and elsewhere. Bands have been organized, bandstands erected, and clubhouses and lodge buildings provided. High sanitary standards are being maintained by the installation of wash rooms and bathhouses at all properties of the company, in accordance with plans approved by the advisory board. Drinking fountains are being installed in all camps. The success of the entire plan has been fully established, and the company has reason to be proud of its record.

[The State Industrial Commission in a report submitted on Oct. 20 on the situation created by the miners' demands and affirmative strike vote upholds the "Rockefeller plan." John McLennan, district member of the International Board stated that union officials were opposed to any drastic action but there was dissatisfaction among miners and they might vote to strike against advice of their officers.—Editor.]

Pig-Iron Production

The monthly reports of the blast furnaces show that on Oct. 1 there were 347 coke and anthracite stacks in blast, having a total daily production of 107,250 tons, a decrease of 2950 tons from Sept. 1. Making allowance for the charcoal furnaces, the total make of pig iron in September was 3,164,900 tons; for the nine months ended Sept. 30, it was 29,096,000 gross tons. Of this, 20,221,799 tons, or 69.5% of the total, was made by the furnaces owned or operated by the steel companies. Production in September was to some extent limited by scarcity of coke and in some districts by shortage of labor also.

Chemicals Used in Flotation*

Modified effects obtained in the flotation process by the addition of various chemicals is described by Messrs. Ralston and Yundt who predict that along these lines some of the great advances in the process will be made.

THE flotation of minerals from ore pulps, as practiced at present, involves the use of a small amount of a flotation oil, which so modifies the water in the pulp that a froth is formed and certain valuable minerals are gathered in the froth. The froth must have sufficient persistence to allow time for separation from the body of the residual ore pulp. This paper does not deal with the subject of flotation oils but rather with the other chemicals which are occasionally added to ore pulps for one reason or another.

The development of ore flotation in a few years to a stage where over 100,000 tons of ore are treated every day in the United States, and half as much again in the rest of the world, threatened for a time to upset disastrously market conditions for various products, such as pine oil, coal creosotes, coal tar, etc. Incidentally, flotation has also opened a market for other chemicals which formerly could not be used in the Western intermountain districts. Chemical engineering has never flourished in these districts on account of the smallness of the market but it is hoped that ore flotation will now open up new fields for the chemical engineer. The signs of the times point toward the speedy development of sulphuric-acid plants at various smelteries that are now wasting their sulphur in smoke, and on these plants many other industries will depend. Certain other chemicals will not require sulphuric acid in their manufacture but will soon find a market in these regions, due to the demands of flotation mills and of hydro-metallurgical plants. The more important of these chemicals will now be enumerated and the reasons set forth for their use or the theories as to why they have certain definite effects.

CONFLICTING THEORY AS TO FUNCTION OF ACID

Acids—Almost the only acid used for flotation work is sulphuric acid, which costs less than most of the other available commercial acids. No one knows why the addition of sulphuric acid to certain pulps improves the flotation work. It is known that it often produces a cleaner flotation froth containing less gangue, and also that with it higher extractions are often made. Further it can reduce the amount of oil necessary to produce the same frothing effect. However, the addition of acid to an ore pulp sometimes proves fatal to good flotation, especially with some copper ores in which a part of the copper has been oxidized by weathering. Such an example is the Insipration ore in Arizona. In this case the trouble may be due to the formation of enough copper sulphate to spoil flotation, copper sulphate having been found deleterious in the flotation of a number of copper ores. The oxidized copper minerals dissolve easily in dilute sulphuric-acid solutions, whereas the natural copper sulphides are not attacked.

When the addition of sulphuric acid causes an improvement in the flotation of a definite ore, its exact function is rather a difficult thing to explain, and theories are conflicting. The phenomenon has been known since the early development of the art. The Potter-Delprat processes depend on the acid to develop bubbles of gas through interaction on the carbonate minerals in the ore, such as calcite, in order to form a froth, and bubbles of air were not beaten into the pulp. Consequently it was natural that some of the early theories claimed that the addition of acid to a pulp being treated by air flotation caused an increased number of gas bubbles to form in the pulp and hence facilitated frothing out all the desirable mineral particles. The fallacy of this argument has long been felt.

ELECTROSTATIC THEORIES NOT SUSTAINED

Fanciful electrostatic theories have been advanced to explain flotation and the statement has been made by one theorist that the addition of an electrolyte to the water of the pulp allowed the electrostatic charges on the gangue particles to be conducted away while the charges on the particles of the desired minerals were insulated by a surrounding film of flotation oil. This electrostatic theory was soon exploded as it rested on a misapprehension as to just what caused charges to appear on suspended particles. The surfaces of small particles suspended in a liquid usually tend to absorb more ions of one electric sign than of the other sign and hence carry apparent electrostatic charges. The thing to be noted, however, is that these charges on the particles are not conducted away by the presence of electrolytes but their existence is dependent upon the presence of ions in the solution. The surface of oil droplets and that of air bubbles likewise absorb ions from solutions, and a certain parallelism between the charges on these various particles of matter and the conditions of good flotation has been observed. Just what is the inner connection has never been explained. It is an interesting fact that one mill in Colorado was reported to have received exceedingly pure water from melting snow and that flotation of its ore in this water was unsatisfactory until the water was contaminated with an electrolyte, sulphuric acid being acceptable among other things.

Bancroft[1] calls attention to the fact that the acid in ore flotation may not react because of the replaceable hydrogen atom, but by cutting down the concentration and consequently the adsorption of the hydroxyl ions. The connection which he wishes to draw with flotation is that "in acid and neutral solutions air seems to be adsorbed by organic liquids much more readily than by water," and he thus derives a reason for the attachment of the air bubbles to the oiled sulphides. The preferential adhesion of the oil to the valuable sulphide minerals in the presence of gangue minerals is well known.

The "surface tension" theorizers have claimed that the addition of the proper electrolytes, such as sulphuric acid, so alters the surface tension of the water that frothing can take place. This may be true without conflicting with the colloidal theory but attention should be directed to the small amounts of acid which sometimes produce a marked effect on flotation and the small resulting changes in surface tension of the water. Small amounts of electrolytes are sometimes known to produce profound changes in colloids and we feel more inclined toward the colloidal theory.

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*A paper read by Oliver C. Ralston and L. D. Yundt, of the Salt Lake City experiment station of the United States Bureau of Mines, with permission of the director, before the American Chemical Society, September, 1917, at Boston.

[1] Wilder D. Bancroft, "Ore Flotation," "Met. and Chem. Eng.," 14:631 (1916).

Nevertheless it is not right to claim that the replaceable hydrogen atom has nothing to do with the improvement in flotation results when acid is added. Allen and Ralston[2] have called attention to the fact that if an ore sample is ground dry it is usually necessary to use acid in its flotation, while it is often possible to grind this same ore in a wet condition in a ball or pebble mill and obtain the same flotation results without the use of acid. The natural inference is that the dry grinding has caused oxidized films to form on some of the particles of natural sulphides and that the sulphuric acid was needed to dissolve these films, leaving a clean unaltered surface for the action of the flotation oil and the air bubbles. This, of course, is only a special case and does not claim exception to the colloidal theory in the least.

As to the amounts of acid used and the ores on which it is generally applied, it may be said that the amount used is usually the minimum which has been found to produce a given effect. It varies from 2 or 3 lb. of sulphuric acid per ton of ore (contained in three to five tons of water) to as high as 100 or 200 lb. of acid. When a large excess of acid is necessary we feel that it must be dissolving off oxidized films, while small amounts of acid are probably effective in causing selective adsorption effects. Acid seems to be necessary in the flotation of many sphalerites and iron pyrites. Occasionally a pyritiferous copper ore needs acid. The Anaconda, Mont., slimes constitute an example of such an ore. The present tendency among flotation men is to find substitutes for acid.

THE "FLOTATION MYSTERY" AT MASCOT, TENN.

Copper Sulphate—So much has been said about the "flotation mystery" involved in the improved results obtained at the Mascot, Tenn., plant of the American Zinc Co. that a word should be said here. There is no doubt that the use of less than 1 lb. of copper sulphate per ton of ore, suspended in over four tons of water, has caused much increased recoveries of the sphalerite in this ore and allowed cleaner work. The same effect has been noticed in many other mills treating zinc-sulphide ores, although an improvement in the flotation is not necessarily the invariable result of adding copper sulphate to zinc-sulphide ores.

At Mascot the large-scale plant was unable to produce commercial results on the ore which had yielded good results in laboratory tests. A bucket of pulp taken from the mill and tested in the laboratory gave good results where the mill failed. At last it was realized that the bronze castings used in the laboratory machine might account for the difference and the hanging of a plate of copper in the mill pulp while it was passing through the large flotation machines corrected the difficulty, and led to the discovery of the effect of salts of copper on flotation of sphalerite. The method by which this discovery was made deserves commendation.

So much then for the fact. Copper sulphate added to the pulp improves the flotation of sphalerite but it has been called a flotation mystery because no one could explain it. Copper sulphate is deleterious in the flotation of silver ores[3] and of copper ores, its effects being overcome by precipitation with such a reagent as hydrogen sulphide, sodium sulphide or sodium carbonate.

Neither silver minerals nor copper minerals precipitate copper ions from solutions, but it is well known that natural zinc sulphide reacts with copper-sulphate solutions, precipitating copper sulphide. In fact, this reaction is used in the Huff electrostatic-separation process for separating zinc sulphide from minerals of the same specific gravity which are poor electric conductors, such as barite. By soaking the mixture of minerals in a dilute copper-sulphate solution a thin imperceptible film of copper sulphide is formed over the zinc-sulphide particles and after drying they then act as good conductors and can be caused to jump from the electrostatic machines, leaving the barite behind.

The suggestion is inevitable that in the case of improved flotation of sphalerite the copper going into solution is precipitated as copper sulphide on the surfaces of the zinc-sulphide particles, making them capable of better flotation. Why the modified particles float better is the true mystery. Whether the increased electric conductivity of the surfaces of the particles has anything to do with it or whether copper sulphide has some inherent property of being more easily "oiled," is hard to say. Some rather simple experiments in the physical laboratory might well be suggested.

SOME OTHER EFFECTS OF COPPER SULPHATE

Some other effects which have not been previously recorded have been reported to me by F. G. Moses, one of the engineers of the General Engineering Co. He had observed the appearance of the tailing from the flotation machines treating a sphalerite ore, when it was passed over a slime table as a pilot to indicate the work of the flotation machine by the size of the concentrate streak produced. Before the addition of copper sulphate the slime in the tailing seemed impalpable but afterward it had the appearance of curdled milk (flocculated). However, in a second mill the slime in the tailing still seemed to be deflocculated. In both instances the finely ground zinc sulphide in the concentrate seemed to be flocculated and in the second case the grade of the concentrate was raised considerably by passing it through a drag classifier from which some of the deflocculated gangue slime could overflow. This observation by a young engineer who kept his eyes open may be of a great deal of importance. We have often noticed the flocculated condition of the concentrate in flotation froths but had been inclined to attribute it to the oil which supposedly collected the material into little flocs. Evidently the copper sulphate could assist in this flocculation, for it is well known that heavy metal ions are strongly adsorbed. In colloid chemistry it is usual to find small amounts of such chemicals producing striking effects and it is probable that the extremely small amounts of copper sulphate involved in the case at hand are sufficient only for some colloidal reaction, be that what it may.

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[2] "Min. and Sci. Press," Jan. 1 and Jan 8, 1916.

[3] "Min. and Sci. Press," Dec. 18, 1915. "Effects of Soluble Compounds of Ore on Flotation."

The condition of the concentrate and gangue particles, with regard to their degree of flocculation, has not been sufficiently investigated and hence arises the necessity of determining just what becomes of the copper introduced into such ore pulps. Is it precipitated as copper sulphide or is it adsorbed?

USE OF ALKALINE ADDITION AGENTS

Lime and Alkalies—Of late there has been a tendency to use various alkalies as addition agents in flotation, with the result that in many places they are competitors of acid. Of course, the best thing to do if possible is to find an oil mixture that will not call for any addition agent, but as long as the use of these further addition agents increases the extraction of the desired mineral or improves the grade of the concentrates more than enough to pay for the amount of addition agents used, they will not be displaced. The use of alkaline addition agents has advantages in lessening the corrosion of the machinery and often diminishes the amount of oil necessary. With alkaline pulp the oils can be added to the pulp ahead of the final grinding machinery so that the tube or ball mills can be caused to disseminate the flotation oil before the pulp reaches the flotation machinery.

Few people have reported any observations on the phenomena produced by the use of these addition agents beyond the improvement of the metallurgical results. There is no doubt that soluble heavy-metal salts are precipitated by the use of these various alkaline substances and it is also well known that these heavy-metal compounds are often deleterious to flotation, so that their removal by precipitation is imperative. Whether more than the amount of alkaline agent necessary to react with the deleterious salts should be added is not known. It is known that in a number of instances it has been possible to float a 'tarnished' ore by the addition of various alkaline sodium salts where the same flotation oils did little good without them. If sodium sulphide were the alkali used this would not be surprising, as it could be easily seen that the sodium sulphide would react with copper carbonates and other oxidized minerals, forming sulphides and thus causing their flotation, but when sodium hydroxide brings about the same results, it makes it seem possible that the thin films of oxidized material are dissolved off the faces of the natural sulphide particles. This would be possible with zinc, copper or lead ores since the hydrates of these metals are somewhat soluble in sodium alkaline solutions. Instances of improvement of the grade of work with ores containing each of these metals are known. We have not heard of many instances of the improvement in the flotation of pyrite by the use of such addition agents. British pat. 5856 of 1914, granted to Minerals Separation and De Bavay's Processes Australia Proprietary, Ltd., states definitely that in the flotation of such tarnished ores the water in the circuit should be distinctly alkaline toward phenolphthalein. Sodium carbonate is the alkali preferred.

The use of caustic soda at a number of mills has resulted in some degree of satisfaction, especially with the porphyry copper ores. At the September, 1916, meeting of the American Institute of Mining Engineers, during the discussion of one of the papers it was brought out that the Old Dominion mill at Globe, Ariz., was using caustic soda to the amount of 1 lb. per ton of ore. According to the metallurgist, Mr. Cramer[4], this resulted in a much less viscous froth which tended to lie more flatly in the flotation machine, was more easily broken down and flowed more readily in the froth launders so that not so much water was required. This, in return, allowed better work in the overworked Dorr thickeners where the flotation concentrate was thickened before filtering. Furthermore, the extraction was somewhat increased, the grade of the concentrate was raised and hence less "insoluble" was left in the concentrate. At still another mill a reduction in the flotation oil necessary also resulted.

ALKALI CAUSED MORE MOBILE FROTH

It is noticed that such alkalies cause a weaker, more mobile froth. The effect of the addition of alkali to a ball of stiff clay lying on a board is well known. A drop of alkali will cause the clay to flatten out, whereas the same amount of water does not. The alkali deflocculates the clay so that it "liquefies." The cause of the decreased viscosity of the froth in a flotation machine is hence easily understood. The higher extraction of the desirable mineral is also easily explained, because the alkali tends to deflocculate the gangue slimes and therefore any desirable mineral particles entrained in the gangue flocs will be liberated and become available for flotation. As a result of this, not so much excess of flotation oil and agitation will be necessary in the attempt to break up mechanically the flocs and bring the oil in contact with the sulphide minerals. Not so much air being necessary to bring the mineral particles to the surface, there will not be such a large proportion of mechanically entrained gangue in the froth concentrate. In other words, all the effects above noticed can be explained on this assumption.

Of the various alkalies used, caustic soda, sodium silicate, sodium carbonate, sodium sulphide and lime are the principal commercial ones. Sodium silicate is a more powerful deflocculent than sodium hydrate, possibly due to a "protective" action of the colloidal silicic acid formed in dilute solutions. It was used for a while with success in the flotation plant of the Utah Leasing Co., but was later displaced by sodium carbonate. Our own experience with many different types of minerals, at the Salt Lake station of the Bureau of Mines, has been that sodium carbonate is the most desirable alkali as it does not tend to deflocculate so permanently the gangue slime, allowing easier thickening and filtration of the flotation concentrate and tailing.

A rather surprising claim is made in U. S. pat. 1,03,341 of Oct. 31, 1916, granted to Allen C. Howard, of Minerals Separation company. He claims that if alkaline substances are made into a strong solution and the proper amount is dripped into the first cell of a series of flotation machines, a better result is obtained than where the circuit water which contains the ore is already alkaline to the same extent. Attempts to check this claim by experimentation in our laboratory have failed to justify it. The patent claims that in the mill of the Caucasus Copper Co., in the Caucasus, southern Russia, this effect is marked. We fail to understand just how this can be so, and strongly suspect that the patent is actually attempting to claim the use of these alkalies in the manner in which they are most naturally used, in the form of a strong solution, the proper amount of which is dripped into the pulp at the most convenient point in the flow sheet. To avoid infringing the patent the alkali would have to be mixed previously with all the mill water before the ore was ground in it, which might easily prove more expensive and be less easily performed. Until we can be shown to the contrary we shall be inclined to suspect some patent petifoggery.

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[4] Bull. 119, A. I. M. E., November, 1916, p. 1891.

Lime Not a Deflocculator

Lime is not such a desirable addition agent as the alkaline-sodium compounds, and while it may cause desirable effects when added in small amounts, an excess is often harmful. Lime and most other calcium compounds are usually flocculators of gangue slime, rather than deflocculators as the alkaline sodium compounds are. This may explain the difference between the two, although it has been continually hinted that we know entirely too little about the condition of flocculation of the ore pulp during flotation. It is probable that in the cases noticed where lime improves the flotation it functions in precipitating other less desirable soluble impurities, such as the iron sulphates. At the Miami mill it was found that if lime were added to the pulp before entering the ball mills a somewhat increased extraction resulted, whereas the addition of lime directly at the head of the flotation cells resulted disastrously. Supposedly the lime had to be allowed time enough to react with all the soluble or semisoluble impurities of the pulp before going to flotation so that there would be no raw caustic lime to cause trouble.

Sodium sulphide and calcium sulphide, or polysulphides, are used in the flotation of oxidized ores of lead and of copper. Hydrogen sulphide is also in use for the same purpose in the flotation of copper-sulphide ores. The oxidized minerals are "sulphidized" by these chemicals and can be floated in the same manner that the natural sulphides can be floated. However, there is no objection to using sodium sulphide or the other sulphides to precipitate soluble heavy-metal salts from solution. Hence these soluble sulphides can serve a double function. Three mills are now in operation using sodium sulphide in the sulphidizing of lead carbonate ores and several copper mills use it for oxidized copper compounds. The method is fairly satisfactory because only small amounts of the sodium sulphide are used, the lead carbonate particles being merely coated superficially with a film of lead sulphide which can be oiled and floated. As little as 3 lb. of sodium sulphide per ton of ore containing 15% Pb is successful in causing the flotation of over 90% of the lead minerals. In case the ore contains manganese dioxide or basic iron sulphates or lead peroxide, these minerals tend to use up the sodium sulphide before the lead carbonate is satisfactorily sulphidized. Since such minerals are fairly common in the oxidized ores of lead the method can be applied only to those ores that are free from such constituents. Hydrogen sulphide is in use in the mill of the Magma Copper Co., at Superior, Ariz., sulphidizing copper carbonates.

Of all the alkaline compounds mentioned above, lime is the cheapest but not the most desirable. Sodium carbonate is not only highly desirable but also can be obtained more cheaply than most of the other sodium compounds. In fact most of the flotation work which calls for the use of sodium carbonate is situated in the intermountain region not far distant from the alkaline lakes and natural trona deposits of the arid and semiarid regions. An outlet for some of this natural soda has long been desired. At present most of the soda in use by flotation mills is shipped in from the East and is much purer and more expensive than the work demands.

Sodium sulphide also costs too much when delivered into the intermountain country from the Middle West or the East. It can be made from niter cake or from sodium sulphate by reduction. Sodium sulphate is available in a fair degree of purity from deposits on the bottom of Great Salt Lake or from Searles Lake, in California.

Effect of Organic Acids Uncertain

Organic acids, such as tartaric acid, citric acid, etc., and their salts, have been mentioned in British pat. 17,327 of 1914, granted to George A. Chapman, one of the Minerals Separation engineers. Argols, the crude tartrate of potassium, was added to the pulp in both the Anaconda, Mont., and the Burro Mountain, N. M., mills, which are treating copper ores. The argols were introduced into the pulp as it entered the tube mills, in amounts ranging from 0.1 to 0.25 lb. per ton of ore. Both of the ores mentioned are noted for the high percentage of colloids present, due to clay-like minerals in the original ore. The flotation results were said to be greatly improved. The effect of the tartaric acid seems to be a slow flocculation or coagulation of the gangue slime. These organic acids and their salts are known to have low dissociation constants and the theory advanced in Chapman's patent is that these reagents do not flocculate the gangue slime so quickly but that the sulphide minerals escape entrainment in the flocs so that they are collected by the oil and air into the froth before flocculation of the gangue. To quote the words of the patent, "the effect of electrolytes upon colloids (as is known) depends *inter alia* upon the valency and upon the ionizing power and dissociation constant of the electrolyte. Tartaric acid is divalent and as compared with ordinary mineral acids it has a low dissociation constant. Citric acid has similar properties but is trivalent. Many other electrolytes, such as organic acids and their salts, also have similar properties as electrolytes and the choice of a suitable electrolyte for the purposes of this invention can be readily determined by a preliminary test."

This is a most interesting theory, but I have noticed that citric acid, which is mentioned above, usually does not flocculate gangue slimes, but rather exerts the reverse effect. It is probable that the effects of organic acids in flotation will be found to be as erratic as their absorption effects, commonly known to colloid chemists.

Silicofluorides for Acid-Consuming Ores

Silicofluorides—British pat. 4938 of 1914, granted to Sulman and Minerals Separation, calls for the use of silicofluorides as a substitute for acid in the flotation of ores. It is claimed that these compounds give the desired results. The complex fluorine salts have rather unusual ionization and other chemical constants and hence it might easily happen that their effects on flotation would be unusual and hard to predict. The diversity of the various compounds mentioned as having been patented by the Minerals Separation company shows how far their engineers and chemists have gone in developing the process of flotation.

A test of Broken Hill, Australia, tailing was made in London tap water without the addition of potassium fluoride and another test was made with this addition agent present to the extent of 3.4 lb. per ton of ore. The oil used in each test amounted to 2 lb. of eucalyptus oil per ton of ore. The data on the two tests were as follows:

	Ordinary Flotation	With Silicofluorides
Heading	Zinc 19 0%	Zinc 19 0%
	Lead 7 0%	Lead 7 0%
Concentrate	Zinc 29 0%	Zinc 36 1%
	Lead 9 3%	Lead 14 7%
Tailing	Zinc 14 4%	Zinc 4 8%
	Lead 2 5%	Lead 1 6%
Recovery	Zinc 56 0%	Zinc 86 2%
	Lead 70 2%	Lead 88.5%

The patent also makes a good suggestion that the silicofluorides can be prepared by adding hydrofluoric acid to the ore pulp. This produces soluble silicofluorides of the bases in the pulp. The main value of a substitute for sulphuric acid would be for ores containing a great deal of calcium carbonate or other acid-consuming materials in the gangue.

Calcium Sulphate.—This compound has been added to ores containing colloidal gangue although its success has been somewhat erratic. It was once used in one of the Broken Hill mills and its effect was that of an electrolyte. It is sparingly soluble so that there can never be a high concentration of its ions in solution and it is hence more or less equivalent to the tartrates in providing ions rather slowly, so that supposedly the flocculation of the gangue slime will not entrain particles of the desired mineral.

MANGANATES AND CHROMATES ARE USED FOR DIFFERENTIAL FLOTATION

Sodium Manganate and Sodium Chromate.—Two oxidizers are recommended for differential flotation of two flotative minerals. They seem to deaden one or the other of the flotative minerals so that it will not float. The exact mechanism of this deadening action is not known, for while chromates will deaden galena particles in the presence of sphalerite, manganese compounds have the reverse effect. They are efficient in this type of work but there is a widespread impression among metallurgical men that they are too expensive. To be sure, the market prices on the chemicals usually sold are rather high, but high purity of these compounds is not essential. There is no apparent reason why they should not be made by fusing local manganese or chromium ores with sodium carbonate. Manganese ores are usually easily available in most zinc and lead districts, although the chromium ores are harder to obtain. Mill managers who have considered only potassium permanganate of the usual high commercial purity might well give their attention to the more cheaply prepared sodium manganate.

Sulphur Dioxide, Sodium Sulphite, Sodium Thiosulphate.—These reagents are inhibitors of flotation, if used in sufficient amounts. If sulphur dioxide is applied to an ore pulp the first effect is one similar to that obtained when sulphuric acid is added to the pulp, an improvement in the flotation. However, if the sulphurous acid is allowed to act on the ore long enough to form sulphites the result will be non-selective flotation, and the gangue will be floated with the desired mineral particles. The great use of such compounds has been found in differential flotation, the basic idea being to add just enough of one of these inhibitors to deaden the surfaces of one kind of flotative minerals while another group is only slightly affected and can still be floated. Mixtures of sphalerite, galena, pyrite and chalcopyrite or any two of them usually need separation, and in case they need to be finely ground to be liberated from each other, mechanically differential flotation methods are in demand.

Chloride of Lime.—This reagent is said to be good for differential flotation of sphalerite in the presence of pyrite.

Sodium Cyanide—In most cyanide mills, where the tailings have been tested by flotation, it has been found that the cyanide left in the tailings is deleterious to flotation. E. J. Atckison has informed us that in some tests made by him with the ore of the Amparo Mining Co., of Mexico, this effect was noticed unless the amount of cyanide present was less than 0.007% on the weight of the ore, or 0.0018% in the mill water, under which conditions improved flotation results were obtained over what could be done in water containing no cyanide. At the mill of the Ohio Copper Co., Lark, Utah, mine water, containing a rather high percentage of the sulphates of iron and similar impurities, is used in the flotation and the addition of a small amount of cyanide has been found to greatly improve the flotation. It is probable that in both these instances complex double cyanides are formed with the solutes in the mill water, and it may even be that some of the most undesirable are precipitated by the cyanide. So far as we know, little has been done with cyanogen compounds.

The use of certain chemicals in the flotation concentration of ores has been described and theories of the action of these chemicals have been explained. The use of chemical addition agents in ore pulps during flotation is only in its infancy and as the process is better understood operators will make greater use of chemical addition agents which will allow them to obtain the highest economic results. The possibilities of such applications are almost unlimited and it is probably along lines of this kind that some of the great advances in ore flotation will be made.

Australian Minerals and Metals

The policy of the Australian government will be that all minerals produced in Australia are to be treated in Australia now and after the war, according to C. E. D. Rodgers, chairman of the Sydney Committee of the Australian Metal Exchange, quoted in the London *Financial Times.* This significant statement, made shortly after an interview with the prime minister, is of great interest to the people concerned in the industry. The metal exchange had felt that it could be an institution having the power to do a large amount of good to the metal and mineral industries if it had a larger scope. Therefore information was sought regarding the government policy. Mr. Rodgers believes that it means that an attempt will be made to treat all minerals produced, which would involve some form of government assistance.

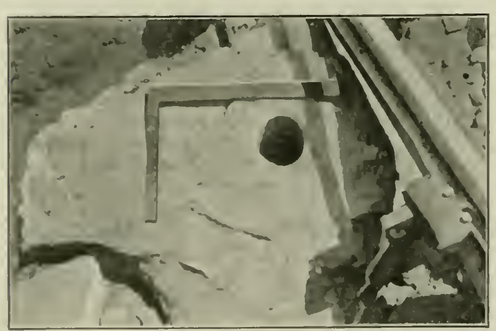
"If they were going to treat their own minerals," Mr. Rodgers added, "it meant that the metal industry would have to occupy a similar position to that now occupied by the wool industry. Thus, instead of selling their metals in various parts of the world, it would mean the creation of an exchange in Australia similar to that in London, and instead of their metals being sold in London they would be sold in Sydney or Melbourne.

Strange Freak of Dynamite

By J. B. Stoneking

Recently, while a new shaft was being sunk on the property of the Land Lead Mining Co., at Joplin, Mo., an unusual incident occurred which demonstrates the enormous power of dynamite, the peculiarities of rock cleavage and breakage lines, and the effect of air resistance on a rapidly whirling body.

A 5⅝-in. churn-drill hole had been previously sunk to locate the orebodies, and a shaft 5 x 7 ft. begun, using the drill hole as a center line. When the bottom of the shaft was 75 ft. below ground surface in solid, hard limestone, the incident mentioned occurred. The cut holes, sometimes called "sump" holes, eight in number and 5 ft. deep, were arranged to blast out the center cut to relieve the burden on the rib or "squaring-up" holes to be drilled later. These eight cut holes were each loaded with four cartridges of 1¼ x 8-in. 40% Red Cross Gelatin and a No. 6 electric-blasting cap, making a total of 32 cartridges. The eight holes were fired simultaneously with an electric-blasting machine, and the force of the blast threw a large boulder from the bottom to a height 100 ft. above the top of the shaft. The boulder fell 50 ft. away from the center of the shaft on top of the mine-car track leading to the dump, breaking and bending the track out of shape. This boulder when measured was 1½ ft. thick, 3 ft. wide, and 4½ ft. long, but was somewhat irregular in shape and was estimated to contain about 16 cu.ft. assuming 165 lb. per cu.ft., which would make the total weight of the boulder approximately 2600 lb. As the total height of the lift was 175 ft., the work done represents the expenditure of 455,000 ft.-lb. of energy, or 17,344 ft.-lb. per cartridge of dynamite.



BOULDER BLASTED FROM A SHAFT AT JOPLIN, MO.

This is not by any means the total energy in the dynamite, for such important items as the energy required to disrupt the cohesion of the rock particles, the enormous wind resistance against the hurling of this immense boulder through the air, and that represented in the broken and disrupted rock still left in the bottom of the shaft are entirely unknown, but they all go to show the vast amount of energy contained in dynamite for the performance of useful work.

Ordinarily, when subjected to a violent rending and disruptive force, a rock will break at the weakest point, and in some classes of work, holes are drilled along the line where it is desired to have the rock break, so to weaken it along the projected line. A peculiar feature of this blast is that although there was a large hole, 5⅝ in. in diameter in the center, the rock did not disrupt or break along an imaginary line, drawn through this center hole, which might be theoretically taken as the weakest part. This boulder landed with the drill hole intact through the 18 in. of thickness, and not even a crack was found radiating outward from the center.

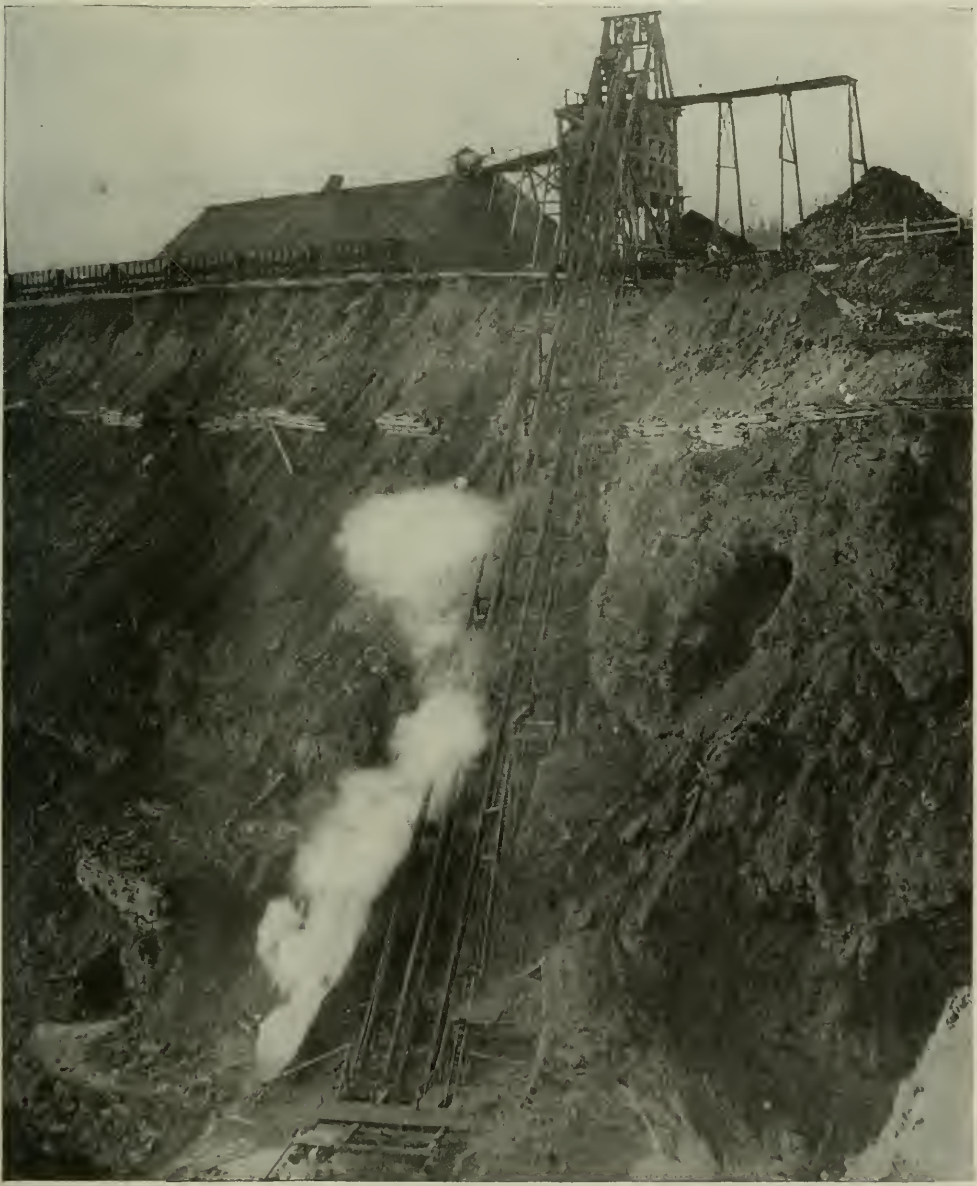
Another peculiar feature of this freak performance was that the boulder rose to the top of the flight without any twisting or whirling, but at the start of its descent it began whirling rapidly, and this whirling action caused it to curve outward and to land 50 ft. away from the shaft. Since the boulder did not strike the sides of the shaft in the upward course, as evidenced by its not whirling, the line was practically perpendicular, or, at the maximum, at a slight angle from the vertical. Taking the maximum angle which would allow the boulder to clear the collar of the shaft without touching, the point at which it would have struck the ground should be 20 ft. from the shaft. The influence of the air on a rapidly whirling body is here strikingly shown, for the difference between 20 and 50 ft. gives 30 ft. as the horizontal effect of the curvature in the descending flight. Many strange features, of which this incident is an example, occur when enormous forces are released and when they work opposed to natural forces and subject to the laws of physics.

Miners Trained in Rescue Work are Listed

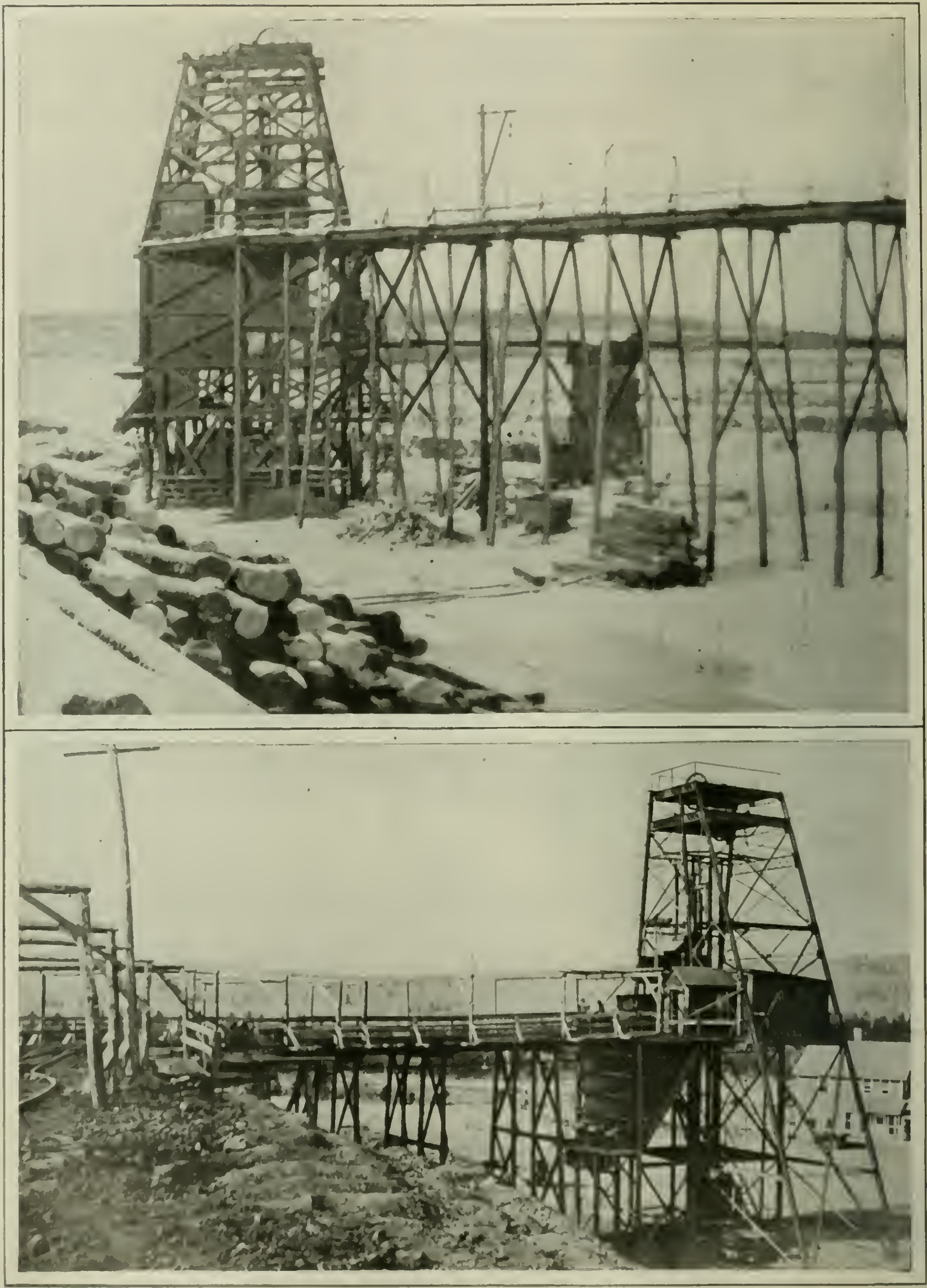
The United States Bureau of Mines, in a recent report, prints as a roll of honor the names and addresses of the miners throughout the country who have taken the bureau's course in mine-rescue work from July 1, 1914 to June 30, 1916. Copies of this report are being sent to every mine operator and state mine-inspector in the country, so that should there be a disaster in his district or at his mine, he will be able at once to discover the nearest trained men for rescue work. Mine owners in the past have coöperated in this manner as much as they could, but have sometimes been delayed in learning what miners have been trained in such work. The report gives the names and addresses of more than 3000 men.

Ten Tons of White Lead are being used in repainting the capitol. Since the edifice is of stone and not imperatively in need of a new coat of paint, some criticism is being voiced by those who are anxious to see lead supplies conserved.

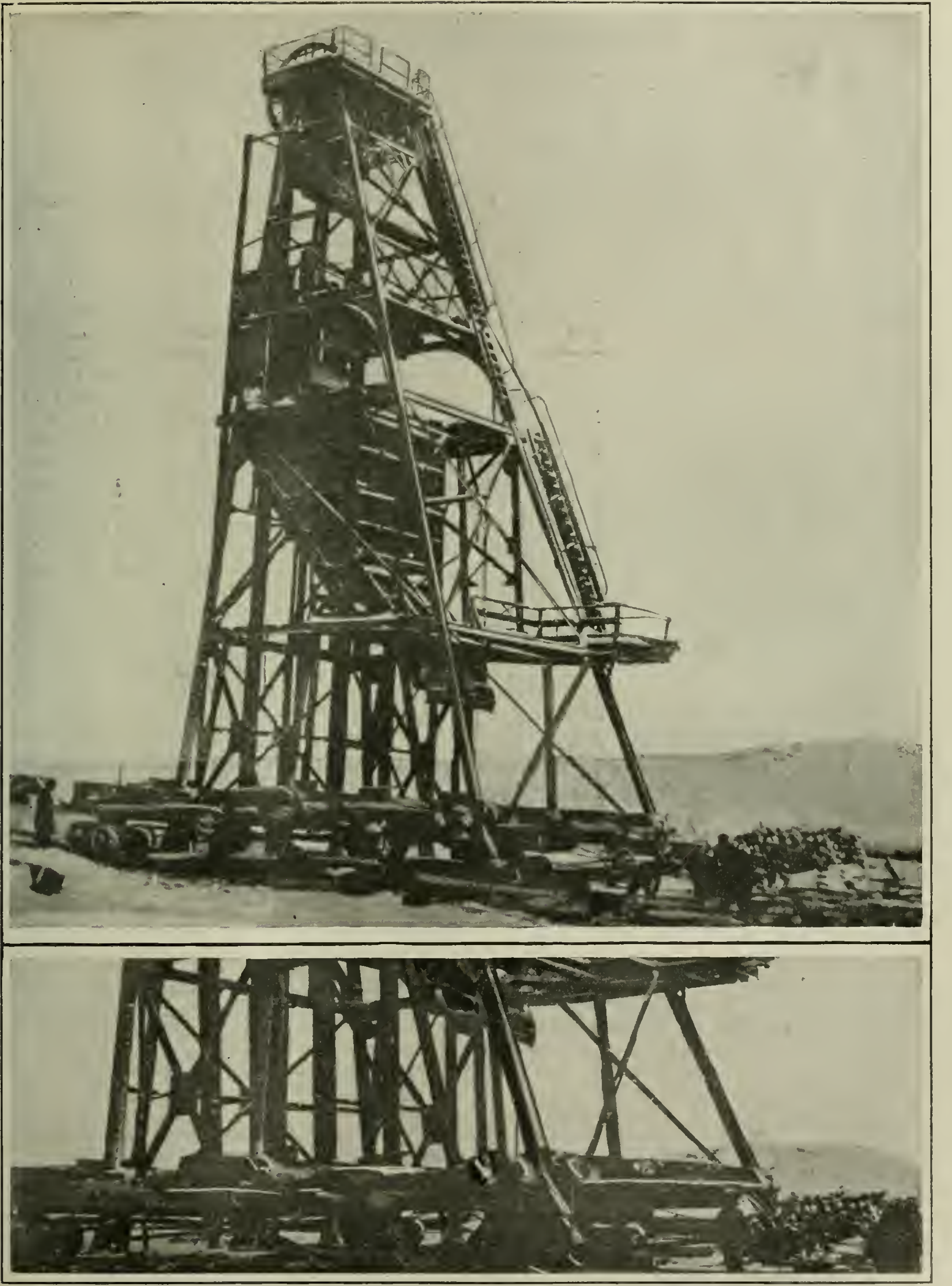
Views from Mesabi Range, Minnesota



TYPE OF INCLINE HOISTWAY IN THE OPENPIT MINES OF THE MESABI RANGE



OLD AND NEW TYPES OF HEADFRAME AND BIN ON MESABI RANGE



MOVING THE STEEL HEADFRAME OF THE HAROLD MINE, HIBBING, MINN.

This headframe is shown jacked up for moving. One team of horses and eight men moved this headframe 800 ft. in three days

Large Pyrrhotite Deposits in Maine

WASHINGTON CORRESPONDENCE

Katahdin iron mine, on the Bangor & Aroostook Ry., 85 miles from tidewater, yielded gossan or oxidized ores, which are now practically exhausted. A large body of pyrrhotite remains, apparently 2300 ft. long, 300 to 700 ft. wide and of undetermined depth. Probably contains at least 5,000,000 tons of pyrrhotite with 42 to 50% iron and 26 to 35% sulphur. Allowing a profit of 50c. per ton, it is estimated that sulphur ore can be laid down at New York and vicinity at a cost equivalent to 13.3c. per unit of sulphur.

IN VIEW of the increasing demands for materials available for use in the manufacture of sulphuric acid, the presence in central Maine of an undeveloped pyrrhotite deposit of great magnitude, is noteworthy. This deposit, which can be cheaply mined and is favorably situated with respect to transportation facilities, has been examined recently by Edson S. Bastin for the United States Geological Survey, and the official results of his examination are here presented with the approval of the Director of the Geological Survey. The deposit, commonly known as the Katahdin iron mine, is in Piscataquis County, Maine, near Iron Works station (post-office, Katahdin Iron Works), at the end of a branch line of the Bangor & Aroostook Ry. It occupies the north slope of a ridge trending nearly east and west and rising about 300 to 400 ft. above its surroundings. From 1846 until 1890 the property was worked as an iron mine by utilizing the oxidized portion or "gossan" at the surface of the deposit and also iron oxides deposited from spring waters issuing along the hillside. Chester G. Gilbert, who examined the property a number of years ago for the Bethlehem Steel Co., estimated that perhaps 150,000 tons in all had been mined and that the remaining oxide ore would not total 25,000 tons. The ores were smelted at Iron Works in furnaces that are now in ruins.

MINING OF OXIDE ORES UNCOVERED SULPHIDES

As a source of oxidized iron ores the mine is practically exhausted, but the stripping incident to the mining operations revealed the presence of iron sulphides a few feet below the surface, the oxidized iron ores being in fact the "iron cap" or "gossan" of a great body of iron sulphide of the variety known as pyrrhotite. This body of pyrrhotite forms a prospective source of sulphur for the manufacture of sulphuric acid, and if so utilized it is quite probable that, after burning, the sinter could be made use of in iron manufacture. In view of this probability it may be noted that several trustworthy analyses of the oxidized iron ores show from 40 to 57% of iron, 1 to 4% of sulphur, and 0.006 to 0.01% of phosphorus. With careful burning the content of the sinter may approximate these figures. For many years the Katahdin iron was noted as a source of some of the best tool steel in America. The stripping extended in a few places to solid bedrock, so that small exposures of pyrrhotite ore in place are now visible over an extended area. More commonly the stripping did not extend below the zone of partial disintegration but uncovered irregular, boulder-like remnants of slightly altered pyrrhotite which were discarded and now lie mingled with the other waste of mining. Though not actually *in situ*, these "boulders" are plainly close to their original position and may be relied upon as indicating approximately the nature of the underlying bedrock.

DEPOSIT CONSIDERED AS IGNEOUS INTRUSION

Although conditions are not favorable for detailed geologic studies, it is fairly clear that the deposit is essentially an igneous rock extraordinarily rich in pyrrhotite and that it was intruded into its present position in a molten or plastic condition. Evidence for this belief rests upon its analogy to other deposits which were formed in this manner and upon microscopic examination of a coarsely granular rock bordering the deposit which shows, in order of abundance, hornblende, plagioclase feldspar, pyrrhotite, and biotite. The pyrrhotite appears to be an original component of the rock but was the last mineral to crystallize, and embeds grains of the other minerals. This rock is apparently a low-grade border phase of the pyrrhotite body.

Trenching of the surface to expose the bedrock continuously along several strips across the deposits should precede any attempt to estimate accurately the tonnage available, but from present indications the deposit has a length of at least 2300 ft. and a width varying from 300 to 700 ft. If an average width of 400 ft. is taken, the area of the deposit would be somewhat over 900,000 sq.ft., equivalent to 100,000 long tons of ore for every foot in depth. The specific gravities of three samples taken by Mr. Bastin were 3.69, 4.14, and 4.24; average taken was 4.00. No drilling has been done to test the extent in depth of the pyrrhotite ore. The present meager exposures give slight indication of the dip of the orebody, but it is probable that it dips steeply and that the ore persists to depths of several hundred feet, or even much deeper. The hillside situation of the deposit would probably permit its development by quarrying methods to an average depth of about 150 ft. If developed only to an average depth of 50 ft., 5,000,000 tons would be available. An independent estimate, made by the engineers of the Bangor & Aroostook Ry., places the tonnage readily available at 6,000,000. It is, of course, possible that within the area covered by the old workings there may be bodies of rock barren or poor in pyrrhotite, but the richness in that mineral of nearly all of the outcrops and "boulders" points to uniformity rather than to any considerable variability.

SULPHUR CONTENT PROBABLY INCREASES WITH DEPTH

Several analyses of the pyrrhotite material show from 42 to 50% of iron, 26 to 35% of sulphur, and 0.006 to 0.009% of phosphorus. Arsenious oxide as determined by a single analysis made by the General Chemical Co. was only 0.0008%. An analysis by C. G. Gilbert showed 0.1% of nickel. An assay by Ricketts & Co. for gold and silver gave negative results. A composite sample collected by Mr. Bastin from 43 different places over the deposit is now being assayed for all of the above components and also for copper. The results will be received in a few weeks, and may be obtained by addressing the Director of the Geological Survey at Washington. There is little likelihood of any great change in the character of the ore in depth except a playing out of oxidation and increased firmness. The firm and unoxidized ore will probably average several per cent. higher in sulphur than that now on the surface, which is represented by the assays quoted above and by Mr. Bastin's composite sample.

The property is owned by the Piscataquis Iron Co., Frederick Hill, president, Bangor House, Bangor, Maine. J. S. Morris, 206 Spring St., Portland, Maine, at present has an option on the property and is attempting to promote its development.

Deposit Can Be Mined Cheaply by Quarrying

The waste of former mining operations includes many boulder-like masses of pyrrhotite that could be utilized, but also much earth that would have to be discarded. The marshy land flanking the deposit on the north furnishes ample ground for the disposal of waste. The hillside situation of the deposit makes it practicable to work it by quarrying methods at a mining cost probably not exceeding 50c. per ton in normal times, though at present possibly slightly higher. Men familiar with quarrying operations and the handling of machine drills could probably be secured from the granite industry of Maine. With almost no grading, a spur could be constructed from Iron Works to the eastern end of the deposit, a distance of 4500 ft. According to F. C. Wright, vice president of the Bangor & Aroostook Ry., the cost of construction would approximate $3 a foot, or $13,500 in all. The usual practice of this railroad is to furnish the metal for such construction. It would probably be necessary to confine quarrying operations to the months May to November, inclusive, accumulating sufficient stocks during that period to insure winter shipments.

As the crude pyrrhotitic material carries only from 15 to 20% of siliceous material, there is some question as to the necessity of concentration. Experiments by certain acid makers in burning pyrrhotite indicate that crushing to 20 mesh, or finer, is necessary in order that the material may readily support its own combustion. Whether it would be profitable to attempt partial concentration, in connection with the crushing operations, to effect some increase in the sulphur content is a question involving careful balancing of cost data and possibly some experimentation.

Electric Power Available

Some hydro-electric power, totaling perhaps 500 hp., could be developed at Iron Works. The Milo Electric Light and Power Co., in a letter of Sept. 28, 1917, states that it is in a position to furnish power for a mining company at Katahdin Iron Works almost immediately. It has a developed power at Milo with a surplus of from 300 to 400 hp., and an undeveloped water power at the outlet of Sebec Lake, Maine, estimated at 10,000 hp., and would be glad to commence developing at once if a sufficient block of power could be contracted for to warrant the necessary expenditure. A block of power up to 400 hp. could be taken care of immediately, but in order to deliver power at Katahdin Iron Works it would be necessary to build a transmission line of approximately 15 miles. It would require probably from six weeks to two months to construct a transmission line.

The lowest freight rates from the mine to acid plants on the Atlantic seaboard would be secured by a combination of rail and water shipment. First shipment would be by rail over the Bangor & Aroostook Ry. to Stockton Harbor, a protected harbor, open during the entire year and provided with ample docking facilities. On June 11, 1917, the railway company quoted a tentative tariff of 90c. per gross ton for pyrrhotite from Iron Works to Stockton Harbor, a distance of 85 miles. At Stockton the pyrrhotite would be transferred from cars to vessels at a cost not to exceed 20c. per gross ton, which is the rate now charged for transferring coal from barges to cars. In handling large amounts with a clamshell bucket, the cost could probably be reduced to about half this figure.

For water transport, returning coal vessels—most of which return light—are available. In 1916, according to data furnished by the Bangor & Aroostook Ry., 83 cargoes of coal were handled at Searsport (in Stockton Harbor) by vessels ranging from 1000 to 5000 tons' capacity. Nearly all of these vessels returned light. During the same year 159 cargoes of coal entered Bangor, 25 miles from Stockton Harbor, in vessels ranging from 1500 to 3000 tons' capacity. These vessels also returned light and would be available for call at Stockton Harbor on their return voyage. Under normal conditions the water freight from Stockton Harbor to New York and vicinity would be from 65 to 75c. per gross ton, according to Bangor & Aroostook Ry. officials. Under present conditions it would probably reach twice these figures.

Estimate of Probable Costs

Summarizing the several cost items that have already been indicated, and allowing a profit to the mining company of 50c. per ton, it would appear that under present conditions crude Maine pyrrhotite could be laid down at New York or vicinity for about $4 per long ton.

COST DATA FOR MAINE PYRRHOTITE PER LONG TON

	Normal Conditions	Present Conditions
Mining	$0 50	$0 75
Royalty	20	.20
Rail freight	80	.90
Transfer charges	15	.15
Water freight	75	1 50
Operator's profit	50	.50
Total	$2 90	$4.00

All-rail shipment would increase the $4 cost to about $6.30. Four dollars per ton for material averaging 30% sulphur is equivalent to 13.3c. per unit of sulphur. To obtain a given amount of sulphur dioxide from pyrrhotite more furnaces would, of course, be required than the number necessary to derive a like amount from pyrite; but, with pyrite fines bringing 25 to 30c. per unit in the New York market, the development of the Maine pyrrhotite appears worthy of most careful consideration.

Survey Steamer "Surveyor," of the Coast and Geodetic Survey, which was completed in June, 1917, at the yard of the Manitowoc Shipbuilding Co., Manitowoc, Wis., was built especially for surveying work in and around Alaska and is probably one of the largest vessels of its type afloat. It is oil-burning, and is so equipped that it can remain at sea for several months at a time.

Manganese Fluxing Ore at Pioche, Nev.

WASHINGTON CORRESPONDENCE

It is not generally known that one mine at Pioche, Nev., is shipping 350 tons of manganiferous iron ore a day, and that its gross production up to September of this year has been about 600,000 tons. The high prices paid for manganese, due to the influence of the war in curtailing imports, however, has not served to direct this supply into the ferroalloy industry. Small amounts of lead, zinc and silver in the ore, together with its desirability as a flux, give it a greater value to the lead smelters than to the steel works. In case of actual necessity, however, Pioche could supply a large tonnage of ore suitable for the manufacture of spiegeleisen.

The only mine in the district shipping manganiferous ore is owned by the Prince Consolidated Mining and Smelting Co., which also owns a railroad leading 8.75 miles to the tracks of the Salt Lake Route at Pioche. According to Joseph B. Umpleby, of the United States Geological Survey, who recently visited the district, "Several mines situated within 4 miles north and west of the Prince show manganiferous material on the dumps, but the quantity available seems to be small and the grade is low. Nothing else like the great bed deposits on the Prince and Louise properties is known in the area."

"The rock formations of the Pioche area," says Mr. Umpleby, "include a basal quartzite overlain by a series of alternating calcareous shale and limestone, all of Cambrian age. The ore replaces certain limestone beds and, to a minor extent, certain beds of calcareous shale.

LARGE AMOUNT OF FLUXING ORE AVAILABLE

"In the productive area the formations dip 15° SSE. A number of normal faults cut this area and offset the ore-bearing beds 100 ft. above their normal position. In several parts of the mine, because of the large amount of ore more readily available, exploration has not extended beyond faults which are clearly younger than the mineralization. For this reason the estimates of tonnage must be considered as a minimum.

"The ore shipped from the Prince mine runs approximately as follows: Mn, 12%; Fe, 33%; SiO_2, 12%; CaO, 3.5%; Pb, 3%; Zn, 4%, and Ag, 2.5 oz. This ore comes from two beds, 80 and 20 ft. thick, respectively, which are separated by 30 ft. of calcareous shale. A bed above the 80-ft. bed is 25 ft. thick, but has not been extensively mined because it is of lower grade. Eighty-five feet below the 20-ft. bed is a bed 5 ft. thick, and an equal distance below this is another 12 ft. thick. Still another, about 12 ft. thick, has been found in drilling below the lowest, or 503-ft. level.

"All of the ore is completely oxidized and seems to have been formed by the breaking down, with little transfer of metals, of manganiferous siderite through which sphalerite, galena and probably pyrite were disseminated.

"The 20-ft. bed has been explored over an area 1150 ft. long, 175 ft. wide at the south end and 400 ft. wide at the north end. On the east, west and north the limits of ore have probably been reached, but on the south, exploration of this bed has not crossed a fault known to offset the overlying 80-ft. bed. No other bed has been explored over such a large area. Southward the 80-ft. bed has been opened to some extent on the Louise ground. A considerable tonnage has been developed but no shipments made.

"Because of combined metals and fluxing value the Prince ore now nets the operators about $4.50 per ton on a daily production of about 350 tons. This is much more than its value as manganese ore on the present market. Should conditions warrant the use of the ore for spiegeleisen, however, Pioche can supply a large tonnage from the Prince and Louise properties—certainly 500,000 tons and probably much more."

The examination of the manganese deposits of the United States has been undertaken by the Geological Survey as an investigation of particular urgency at the present time. Of the world's three great sources of manganese, Russia, British India and Brazil, only the South American deposits are available to us now. Although these are claimed to be capable of supplying our needs, for the near future, the scarcity of ships makes the development of a domestic supply highly desirable, if not absolutely necessary. It is planned by the Survey to make the data public as rapidly as possible until the essential features of all the known manganese deposits in the country are placed on record.

Sulphuric Acid in Japan

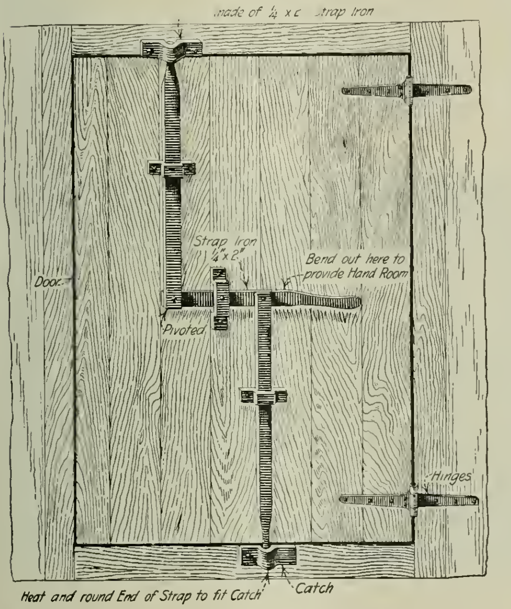
The price of sulphuric acid in Japan has been steadily advancing owing to increased exports to Russia and China, and also to the Allies for war purposes. As a result, some of the artificial-fertilizer companies have reduced the output of fertilizers and devoted their energies to the manufacture of sulphuric acid, while a number of companies have been established exclusively for the manufacture of the chemical. Its output has accordingly increased in a large measure, and some anxiety is entertained in regard to overproduction after the war. According to latest investigations, says the *Japan Weekly Chronicle*, the present total output of Japan amounts to 582,500 tons a year, excluding the output of a few factories that is not made public. Of this quantity, 421,150 tons is consumed by the manufacturers themselves for the manufacture of sulphate of ammonia, hydrochloric acid, etc., leaving the remaining 161,150 tons available for general requirements. The domestic demands now amount to about 100,000 tons a year, so that the quantity for export is about 60,000 tons. It is taken for granted that at the conclusion of the war the exports will fall off, while it is also probable that the stoppage of war industries will cause a considerable decline in domestic requirements. It is estimated that the output of sulphuric acid, if turned out at the present rate, will be in excess of the demand by about 100,000 tons on the resumption of normal conditions after the war.

Arsenical Pyrites Deposits in Galicia, Spain, have been prospected from time to time, according to *Madrid Cientifico*, but the difficulty of transport and the lack of industrial spirit among Gallego miners have made it impossible to compete with foreign producers of material for the manufacture of insecticides. In the Province of Coruña and vicinity, groups of stringers of arsenical pyrites are often found. In the municipality of Curtis, near Teijeiro, more than 40 tons of the ore was mined, but the freight charges absorbed the profit and the enterprise was abandoned. At an establishment in Valdoviño more than 50 tons of arsenical powder was produced in a patented furnace and is being held in the hope of finding a market.

Details of Practical Mining

Fastener for Large Doors

The accompanying sketch shows a strong, reliable fastener for heavy wooden doors that may be operated with one hand without reaching above the head or bending down to operate the necessary levers or catches. This may be made and installed by any blacksmith or handy shop man in a short time and will give excellent service.


made of ¼ x 2 strap iron
Strap Iron ¼" x 2"
Bend out here to provide Hand Room
Door
Pivoted
Hinges
Heat and round End of Strap to fit Catch
Catch

FASTENER FOR UNDERGROUND DOOR

Reducing Danger from Sharp Curves in Mountain Roads

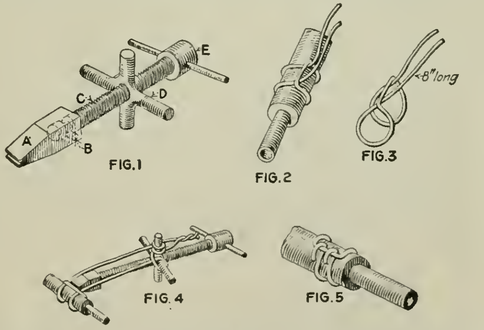
Sharp curves of mountain roads are danger factors in many mining districts requiring serious thought, the more serious the longer the road, the greater the number of abrupt turns and the steeper the hill slopes. According to *Engineering and Contracting*, Sept. 5, 1917, the last-named element, a steep sidehill, is the cause of many collisions of automobiles because timid drivers hug the "inside" of the roadway, regardless of their right to be there.

The Ridge Road in California has developed an ingenious and effective method of reducing the number of collisions. The sidehill at each sharp curve was excavated so as to "daylight the curve." This consists in widening the sidehill cut, but not carrying the cut clear down to the grade of the road. The cut is carried down to within 3 ft. of grade, and a bench or berm of earth is left, over which the automobile driver can look. Then if the driver is hugging the hillside, he can, nevertheless, see an approaching car in time to swing out of its way. Experience has taught engineers of the California Highway Commission that if they widen steep sidehill cuts on sharp curves in the ordinary way, that is, by widening the roadway, cars still continue to hug the sidehill and drivers are unable to see approaching vehicles any better. The new method of "daylighting" is a decided improvement.

Hose Clamping with Wire

A hose-clamping device which will insure a tight, serviceable joint is described by J. V. Hunter in the *American Machinist*. There are now several clamping devices on the market for drawing up a piece of wire into a tight joint in a manner similar to that illustrated in Fig. 5, but the little tool that is shown in Fig. 1 can be made in a few minutes in the shop toolroom and will serve admirably for producing a strong air-tight wire clamp that will stay in place.

Referring to the sketch of this clamping device, it will be seen to consist of but few parts. The head *A* has a groove at the end, which is really only a slight depression for catching and holding the wire. The other end of the head has been drilled out to receive the stem *C*, which is free to revolve, being held in by the pin *B*, which acts as a key in the small groove that has been turned in the stem. This stem *C* is about 6 in. long and has the solid end *E* fitted with a pin handle, so that it may be turned to tighten up the wires.



FIGS. 1 TO 5. WIRE-CLAMPING TOOL AND SOME SAMPLES OF ITS WORK

On the threaded portion of the stem runs the special nut *D*, which has four small arms forged out from it at right angles, these arms serving both as handles and for the purpose of fastening the wire during the operation of binding the hose.

In joining two broken sections of hose, use a straight nipple of pipe that will force into a snug fit. A length of 6 in. is sufficient for most cases, and it is preferable to have it free from threads, since the hose manufacturers claim that the cutting of the inside lining of the hose by the threads of a nipple damages its fabric and shortens its life. If you feel that a straight piece of pipe will not hold firmly, then on the corner of a grinding wheel grind a couple of shallow grooves at each end so that the wire will have a small depression to force the hose into, and there will be no sharp edge there to damage the hose. Also grind a short taper on each end of the nipple, to remove the burr and the sharp edge.

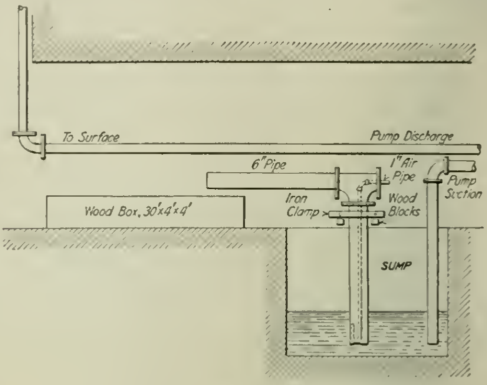
For a binding wire, a piece of No. 14 soft steel from 20 to 24 in. in length will be suitable. Bend the two ends back, in the middle, making a square-bottomed U, with the center section about ⅜ in. wide. This wire can then be looped into the form shown in Fig. 3. While in this shape it can be slipped over the end of the hose, or before looping it can be threaded around the hose in any manner to suit the convenience, provided the final condition is as shown in Fig. 2.

The next step is to fit the nose groove in the end of the tool into the straight section that was prepared in the center of the wire. The two loose ends are tightly wrapped about the arms of *D*, as shown in Fig. 4, and given a final twist on the far side to prevent unwrapping. Everything is then ready for the final operation of tightening up the wire clamp. To accomplish this hold *D*, Fig. 1, with one hand, and with the other turn the handle head at *E*, which automatically pushes forward one end of the wire while drawing back on the other.

In this manner the wire can be drawn to any desired degree of tightness. One operator claimed that he could draw it so tight that he could cut the hose in two. But anyone with judgment will instinctively know when the wire is pressing firmly into the hose and discontinue the drawing up. At this point the tool is swung over in an arc of 180 deg., which turns the wires back sharply upon themselves about the bottom of the original U, and so provides an automatic lock. Then snip off the long ends of the wires with your pliers, removing the tool at the same time and bending the ends down sharply against the surface of the hose, as shown in Fig. 5. This will make the coupling smooth for handling and prevent the wire ends from catching and cutting everything that may come in contact with them.

Sump-Cleaning Device

The application of the principles of the air lift for draining sumps in the iron-ore mines of Michigan as described by Thomas J. Pascoe in *Power*, Sept. 13, 1917, is shown in the accompanying illustration. The equipment is made up with a 6-in. tee and a piece of 6-in. pipe that is lowered into the sump; another 6-in. pipe extends to a wood-box settling tank. The pipe extending to the sump has a 1-in. air pipe (it may be on either the inside or the outside) that extends close to the bottom end, with an upward bend. On the top it is connected with an air hose carrying about 70-lb. air. When the sump needs cleaning, the covering over the sump is removed; two pieces of 4 x 4-in. wood are placed across and the 6-in. suction pipe lowered near the bottom of the sump. A clamp is fastened tight on the pipe close to the tee and resting on the 4 x 4-in. pieces, holds the pipe in position. With the discharge extended to the settling tank and the air hose attached, it is ready for operation.

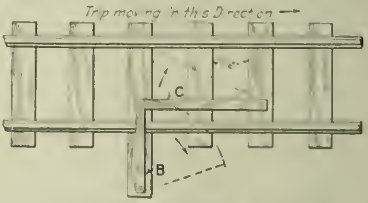


CLEANING SUMP WITH AIR LIFT

When the air pressure is turned on, it causes the water and fines to rush up the pipe and over into the tank, where the heavy particles will settle to the bottom and the water will overflow at the top. After a few minutes the clamp is moved along on the timbers to another position to bring the suction in contact with more sludge to be drawn out. A device of this kind will clean a large sump in a short time.

Jones Safety Car Stop

A satisfactory safety car stop for spotting a train of loaded cars, described by W. R. Jones in *Coal Age*, is shown in the illustration. Blocks *B* and *C* are independent. Block *C* is made a little longer than block *B*, and one bolt is used to fasten each. Thus, when the loaded car is against the block *B* with the down grade toward the portal, block *C* is bumped over toward the other rail, permitting block *B* to push past block *C*, as shown by dotted arcs, after which all there is to do is to release the brakes, and the trip is ready to move.



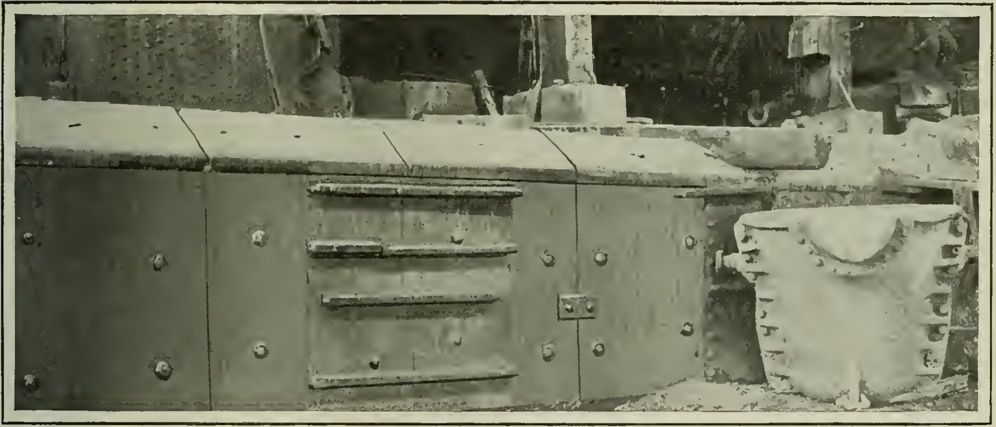
AN IMPROVED SAFETY CAR STOP

Resuscitation from gas asphyxiation, drowning or electric shock is the subject of a chart recently issued by the United States Bureau of Mines, showing the Schaefer, or prone pressure, method of artificial respiration, the latest and most approved system advocated by eminent physiologists of the country. The chart will be sent to those who desire it free of charge upon request as long as the edition lasts.

Details of Milling and Smelting

Tapping Floor Retaining Wall

At the smeltery of the Granby Consolidated Mining, Smelting and Power Co., Ltd., at Anyox, B. C., there is a 9-ft. retaining wall in front of the settlers. This separates the tapping floor from the crane runway floor. The concrete wall was getting badly broken up from hot material running over it and from the ladles bumping it when tapping. In changing the feed system there were left a lot of cast-iron bevel plates, and the plan of putting them in front of this wall was decided upon. The charge slid in at an angle of 37½° and the plates were 5 ft. long and made in sections 5 ft. wide. Bolted to this, and extending to the top of the upper jacket, was the feed-plate extension, 2 ft. high and 5 ft. long. These plates were of heavy cast iron, with lugs for holding them in place and webs for reinforcing. The plates were firmly anchored to the concrete, and all the voids were taken up with molten slag. The accompanying illustration shows the plates in place. This solution of the trouble might be of interest to others.



CAST-IRON RETAINING WALL FOR TAPPING FLOOR AT ANYOX, B. C.

Tabulated Air-Lift Data

By A. W. Allen

Metallurgical Engineer, 309 Broadway, New York

In response to Douglas Muir's request I append a table giving free-air requirements for air lifts used in metallurgical plants. This may be used in conjunction with the tables already published,[1] from which capacities may be estimated. Output in gallons has not been given as I am hoping that this most undesirable unit may ultimately be eliminated from calculations in hydraulics and metallurgy.

The free-air requirements given in the table are only roughly approximate, and in view of the wide elasticity of operation of this class of pump any greater precision has been considered unnecessary. The figures given are based on theoretical calculations, plus a wide margin to allow for work in ordinary installations. If care is taken in the design of the lift, the amount of air actually required will be found to be below the estimated volume; but it was thought advisable to allow an ample margin as excess of air is used in so many installations as a remedy for defective design. On the other hand, it is almost impossible to estimate with accuracy in a case in which there is much constriction at the intake, bends or elbows in the rising main, or in which the air inlet is nozzled in a mistaken idea that the water is forced up with the pressure of the air.

The figures given cover submergences of 60% and 66%, the point of maximum efficiency probably being somewhere between the two for lifts up to 50 ft. The flexibility of the system is an advantage, however, and it is often found desirable to sacrifice efficiency and de-

AIR VOLUME REQUIRED TO OPERATE AIR LIFT

		Size of Lift Pipe						
Lift Ft.	Submergence Ft.	2 in.	2½ in.	3 in.	3½ in.	4 in.	5 in.	6 in.
		Cubic Feet of Free Air per Minute						
5	7.5	13	22	31	45	56	90	126
10	15.0	15	24	34	49	61	98	137
15	22.5	16	26	37	53	66	105	147
20	30.0	17	28	39	56	70	112	157
25	37.5	18	30	42	60	75	120	167
30	45.0	19	32	44	63	79	127	177
35	52.5	20	33	47	66	83	133	186
40	60.0	21	35	49	70	86	139	194
45	67.5	22	36	51	73	90	145	202
50	75.0	22	37	52	75	93	150	210
5	10.0	10	17	24	35	43	69	97
10	20.0	11	19	27	39	48	77	107
15	30.0	12	21	30	42	53	85	117
20	40.0	13	23	32	45	57	91	127
25	50.0	14	25	35	49	61	98	136
30	60.0	15	26	37	52	65	104	145
35	70.0	16	28	39	56	69	111	154
40	80.0	17	30	41	59	73	117	164
45	90.0	18	31	43	62	77	123	173
50	100.0	19	32	45	65	81	129	182

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[1] "Eng. and Min. Journ.," Apr. 14, 1917, pp. 672 and 669.

crease the percentage of submergence. For a constant length of rising main, the amount of free air required decreases as the submergence increases, and increases as the lift increases. The amount of air used does not materially vary with the specific gravity of the fluid being lifted other than in the exceptional case in which excessive velocity in the rising main and correspondingly high air volume are necessary to prevent the settlement of solids. In this case the air lift is not a suitable apparatus for the purpose.

Changing a Krupp Dry-Grinding Mill Into a Wet-Grinding Mill

By Albert E. Hall

The mill of the old Calumet & Massey mine near Massey, Ont., was taken over by the Kenyon Copper Mines, Ltd. Previously, water concentration and the Elmore process had been in use. The mill was rearranged to suit the Callow flotation process. It was found, after several runs, that the capacity could be increased except for a Krupp mill that acted as a throttle on the whole process. While it was not expedient to buy any new machinery at the time, it was desirable to have greater capacity.

The ore from the mine contained a certain amount of moisture and, when ground fine in the Krupp mill, formed a cement and choked the screen, cutting down the capacity of the machine. There was also some ore stocked on the surface and in the wintertime, when a little snow became mixed with it, the Krupp mill would choke altogether.

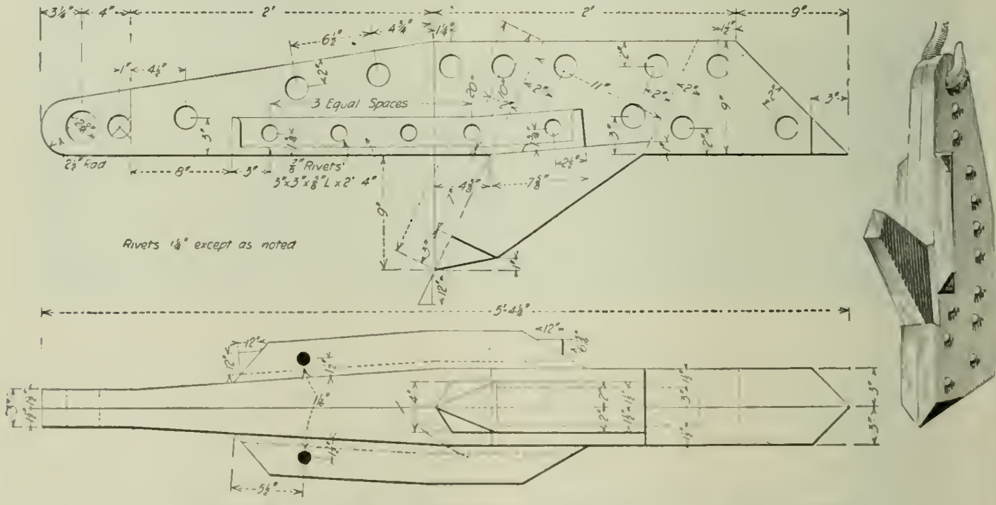
It was suggested by W. Wielding, of Minerals Separation, W. Groch, of Growards Co., and Dr. Francis Church Lincoln that this Krupp mill be run wet. Therefore, during a shutdown, I made the change from the dry to the wet mill.

The casing was taken off the Krupp mill altogether. A large iron tank was placed under the drum and blocked up as high as possible. A lead was then taken from one end of the tank. An iron pipe was used for this purpose and was run into a launder. At the top of the drum was placed the water supply, being simply a water pipe with a tee and a header arranged with three feeds on each side of the tee.

Wet-grinding proved to have other advantages besides increased capacity. From the top of the Krupp mill there was a stack to take care of the dust. The dust loss was considerable, and the wet arrangement, of course, stopped it entirely; also further damage to men and machinery from dust in the mill air.

Converter-Nose Hook

To remove the collars or accretions that form around the nose or snout of a copper converter, various types of hooks have been used. With the customary form of bent hook, difficulty is often experienced in securing a "bite" and finally the hook becomes heated and bends, losing its hold. The particular advantage of the hook employed at the Steptoe plant of the Nevada Consolidated Copper Co., at McGill, Nev., and shown in the accompanying illustration, is its great strength due to the fact that the grain of the metal in both shank and barb is straight and unstrained. This device is practically the same as that developed by Thomas Taylor at the smeltery of the United Verde Copper Co. at Jerome, Ariz., and described (but not illustrated) in an earlier issue of the *Journal*.[1] At the Phelps-Dodge works in Arizona, some hooks involving a similar principle have been adopted. These hooks, however, have the "biting" bar pivoted in the vertical element with one leg of the bar longer than the other; this causes the short end, in which is inserted a special steel tool, to assume a "biting" angle, while the long leg assists in lifting the collar.



HOOK USED TO REMOVE ACCRETIONS FROM CONVERTER NOSE AT McGILL, NEV.

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[1] Vol. 96, No. 8, p. 342, Aug. 23, 1913.

Events and Economics of the War

The interest of the week has centered upon the progress of the second Liberty Loan, the success of which now seems assured. Coal miners and operators have been warned by the Fuel Administration that it may take over mines unless production is maintained. The American destroyer *"Cassin"* was hit by a U-boat, but reached port; the transport *"Antilles"* was sunk by a torpedo on its return trip, with a loss of 67 lives. Return of Swedish pouches, seized by the British at Halifax and now held at their embassy in Washington, is demanded by the Swedish ambassador. Announcement has been made by the Shipping Board that it will have one million tons of new ships on the sea by March 1. A vast amount of German property held in this country is to be turned over to the newly appointed Alien Property Custodian and will probably be sold to help finance the war.

In England the air ministry has been reconstructed and proposes to make reprisals on German cities; raiding German cruisers sank nine convoyed merchantmen and two destroyers in the North Sea. In France, Malvy, former minister of the interior, has been declared innocent of treason; Ribot has been forced out of the cabinet; five zeppelins were destroyed returning from a raid on England; French troops have taken 7500 prisoners on the Aisne. The Italian Parliament has convened in Rome. Conquest of Oesel and Dagö Islands in the Gulf of Riga has been completed by the Germans who have also gained a foothold on the mainland in Esthonia; the Russian battleship *"Slava"* was sunk and a number of German warships put out of action in the engagement. Russia has authorized the export to America of all merchandise hitherto forbidden. In Argentina the railroad strike has ended.

Hoover Says Retailers Hold Up Food Prices

Blaming the retailers for the maintenance of high food prices, Food Administrator Herbert C. Hoover said in part:

"The Food Administration considers that, subject to coöperation from the farmers and the retailers, the corner has now been turned in high prices and that most of the essential commodities should, one after another, continue to show reductions between now and the end of the year. The Food Administration has no control either of the grower, or his organizations, or of the great majority of retailers. The foundations have been laid for regulations of the intermediate trades, and, where these regulations have come into force and the trades are coöperating finely, considerable results are evident in the wholesale prices.

"The current prices at which flour is being sold at the mill door in jute bags vary somewhat with the locality and freight charges on wheat, Toledo showing the lowest prices at $10 for first patent and $9 for second patent, the highest being Buffalo at $10.70 for first patent and $10.70 for second patent, Minneapolis being $10.60 for first patent and $10.46 for second patent. This shows a large reduction from August.

"The average retail price on first patents in 796 cities on Oct. 13 was $13.77, or from $1.50 to $2 a barrel higher than is warranted by the price being made by the millers. In other words, the retail price has not wholly responded to the reductions made by the millers. The rise in retail prices of sugar in the Eastern States is solely due to the advancement of these prices by retail dealers in the face of a short supply and does not bear any relation to the prices at which these sugars have been purchased.

"Since the Food Administration came into existence on Aug. 10 a great deal of exertion has been required to remedy food situations growing out of the over export and short supplies of the 1916 harvest. There were no reserve stocks in practically all the main staples with which to enter the new harvest year, and in fact in some of the principal staples the exports had proceeded to such lengths that there was an absolute under supply of our own necessities during the last two months.

"On the top of this situation various factors have interfered with the earlier arrival of the new harvest. The farmer in preparing for a 30% increase of winter wheat acreage in the face of the shortage in agricultural labor has prevented the free marketing of many commodities, and, in addition to these difficulties, there exists through the country, owing to the large coal and munitions shipments, a considerable car shortage.

"Resulting from these causes there have been periodic shortages in one commodity after another, in one locality in the United States after another, and a large part of the energies of the Food Administration has been absorbed in procuring a distribution and a redistribution of existing supplies in such a manner as to keep the country generally supplied with foodstuffs, and, but for the coöperation of the railways in meeting first one emergency situation after another, we should have had local famines in one commodity after another in a great many sections."

The situation will be watched carefully by the Food Administration, and it is probable that Congress, when it convenes in December, will be asked for further legislation to control prices asked by retailers and possibly by producers, unless conditions change decidedly.

Demand for Coal Exceeds Production

The coal situation is characterized by the optimism of the Fuel Administrator, on the one hand, and by a widespread demand for coal, on the other. The shortage that is said to exist is only apparent, according to Dr. Garfield, and is due to the greatly increased demand. Car shortage and labor troubles have cut down the country's production of fuel. Miners in Illinois, who had just been benefited by an increase in the central-field wages, struck again on Oct. 16 because this increase did not take effect immediately; the men have been ordered back to work by union officials under pain of having their local charters revoked for violating the agreement reached with the Government. A strike of 35,000 miners in the Southwest, including union men of Oklahoma, Missouri, Kansas and Arkansas, has been indefinitely postponed; miners and operators have agreed to disregard the points of difference which led to the issuance of the strike order. Union officials had been promptly warned by the Fuel Administrator that the strikes must not take place and that he would use all the power committed to him to prevent them. Commenting on the fuel situation, the last issue of *Coal Age* says:

> Practically every section of the United States reports a scarcity of fuel. Cooler weather is awakening people to the seriousness of the situation more definitely than all the alarming newspaper talk that has gone before. However, more coal is stored in the bins and cellars of the consuming public than in any preceding year. This fact is the one truth on which all hope hangs. Here and there, from day to day, the statement is made that coal is being held back, that production is lagging, that the mine owners are not expending their greatest efforts to relieve the situation. The fact of the matter is coal production is running at a greater rate of output than ever before. This is true, notwithstanding the unwisdom of the price-fixing policy at Washington.
>
> New York, New Jersey and the New England States depend largely on anthracite, especially for domestic purposes. The output of this grade of coal will show an increase of not less than 5% and probably as much as 10%. However, anthracite constitutes but one-seventh of the country's fuel production, and therefore it is the bituminous production with which the people are most vitally concerned. The production of bituminous coal so far this year shows an increase of about 10% over the production for the corresponding period of last year, and last year's tonnage exceeded that of the year before by about 13%. Thus the tonnage of 1917, if the present rate of production continues, will exceed that of 1915 by nearly 25 per cent.

Use of Foreign-Owned Patents

Under the Trading-with-the-Enemy Act any citizen or corporation in the United States may secure from the President a license to use any foreign-owned patent, trade-mark or copyright, if the President thinks that the grant is for the public welfare and that the applicant is able and intends in good faith to make, or have made, the article patented, etc. Before the present war the Germans had obtained a number of valuable patents in the United States. As we had no "working clause" requiring patented articles to be manufactured here, the patents simply tended to prevent anyone from making the goods here. This created a foreign monopoly in those particular articles. When the war began, production of many of these articles was undertaken to supply domestic necessities. This expedient the new act now legalizes, although it provides an elaborate process which must be followed by those who want to make use of such patent rights.

"What will be the situation as to these patents when the war is over?" asks the *Journal of Commerce*. "The country might conceivably go back to the condition which existed before the war, in which case old conditions of exclusive patent rights would probably be restored, with the incidental effect, perhaps, of destroying a good deal of capital invested in the production of given articles here at home. This is not likely to be tolerated, and the choice of some other course appears to be more or less unavoidable. One plan that is evidently looked upon with favor by some is the familiar one of enacting a "working clause." This would necessitate the production of the articles in the United States in the future. Incidentally it might result in foreign-patent owners taking over plants, constructed during the war, at a reasonable figure.

A. Mitchell Palmer Appointed Alien-Property Custodian

A. Mitchell Palmer, of Stroudsburg, Penn., formerly Representative in Congress, has been appointed Alien-Property Custodian, under the Trading-with-the-Enemy law. Until his retirement from Congress Mr. Palmer was one of the Administration spokesmen in the House.

Men Wanted To Follow Their Trades in Quartermaster Corps

Publication of the following notice has been requested by the officer commanding:

> The Quartermaster Enlisted Reserve Corps, with recruiting headquarters at 357 Broadway, New York, has received authorization to enlist men to follow their civilian trades in the Army, for duty in this country and abroad.
>
> The men particularly needed at this time are electricians, tinsmiths, iron workers, carpenters, plumbers, mechanics (auto and general), masons, bricklayers, farriers, horseshoers, saddlers, blacksmiths, teamsters, cooks, chauffeurs, stenographers and wagonmasters. Enlistment is open to citizens of the United States, or to those men who have declared their intentions of becoming citizens. They must be between the ages of 18 and 45 years and have no one depending upon them for support. Men who can qualify for the above positions will be examined physically at recruiting headquarters, 357 Broadway, New York, and immediately sworn into service, and will be given a week or more time in which to arrange their private affairs before being called for active service.

Drafted Coal Miners May Work French Mines

Organization of coal mining regiments for service in France is under consideration by Secretary Baker. In view of France's delicate labor problems, informal negotiations are being conducted between American Government officials and members of the French High Commission to ascertain whether such units would be acceptable. National Army men would be assigned to the mining regiments only on a volunteer basis, but Government officials in touch with the unions believe that most of the 15,000 miners taken on the first draft call would offer themselves for the special service. The plan does not contemplate withdrawing any men from civil employment. Army officers do not look with favor on most schemes for using men drafted for fighting service in labor units, but this particular proposal is understood to have received special consideration, owing to the shortage of coal in France and the scarcity of miners. Many fields in southern France are not being worked, because labor is not available, and it is suggested that many more men will be needed as French coal districts in the northeast are retaken from the Germans.

War Trade Board's Conservation List Again Increased

The War Trade Board, which has replaced the Exports Administrative Board, has added many articles to the so-called conservation list issued by the former board, thereby practically prohibiting the export of such articles at all. Among the things thus newly included are the following:

Amorphous phosphorus, babbitt and other antifriction metals, bichromate of potash, bismuth salts, boring machines (horizontal), brass and bronze articles (the latter with over 10% copper); copper or insulated cable, caustic potash, caustic soda, chrome steel, chrome ore or any metal, ferroalloy or chemical extracted therefrom; cobalt ore or any metal, ferroalloy or chemical extracted therefrom; copper ore or any metal, ferroalloy or chemical extracted therefrom, unless containing less than 10% copper; crucibles, diamonds (industrial), drilling machines (radial), ferrochrome, ferrocobalt, ferromolybdenum, ferronickel, ferrosilicon, ferrotungsten, ferrovanadium, graphite electrodes, hardware containing more than 10% copper; hydrofluoric acid, manganese ore or any metal, ferroalloy or chemical extracted therefrom; mercury, molybdenum, molybdenite, Naxos emery, nickel and its alloys, nickel ore (containing more than 5% nickel) or any metal, ferroalloy or chemical extracted therefrom; plumbago (imported graphite) and articles manufactured therefrom; sal ammoniac, scheelite, sodium phosphate, solder, tin and any metallic alloy containing tin; tin chloride, tin ore, tin cannisters, tin boxes, except where used as food containers; tin foil, tungsten ore or any metal, ferroalloy or chemical extracted therefrom; type metal, vanadium, wolframite, yellow phosphorus.

Export licenses may be granted for these articles when destined for actual war purposes of the Allies or when they will directly contribute thereto; also in certain unusual cases where such exports will contribute directly to the immediate production of important commodities required by the United States; also in certain other cases where these commodities may be exported in limited quantities without detriment to this country.

Germans Lower Safety Factor To Save Steel

In the interests of national defense, instructions have been issued by the German Minister of Public Works to limit the use of iron and steel to the lowest possible minimum and to substitute other materials in building construction where possible. The circular, says *Iron Age*, states that there is no objection to exceeding, within certain bounds, the limits of the maximum working stress which are imposed by the regulations in force in Germany, so far as they apply exclusively to war constructions designated as such by the Minister of War. The limits may be extended to 1200 kg. per sq.cm. and even 1500 kg. per sq.cm., but they should never exceed 1600 kg. The other official regulations will remain in force, and it is understood that the calculations of stability must be rigorously exact and the pieces of iron and steel will be reduced to the minimum dimensions.

Delay in Munitions Manufacture

Manufacture of cartridges for the American army cannot proceed until the remodeled Enfield rifle is perfected, says the New York *Tribune*. Five big plants have been marking time all summer and fall, and the army's rifle ammunition is millions of rounds behind. On declaration of war, the ordnance board preëmpted the three private plants that were producing Enfield rifles for the British. These plants have been idle since then. Their combined output was 9000 to 10,000 rifles a day. A few hundred Springfields a day are made at the Government arsenals.

First Standardized Truck Ready

The first standardized motor truck was completed for the army on Oct. 8 at Lima, Ohio. It was built in great secrecy and the plant was closely guarded during the three weeks of its construction. The parts of the machine were made at about 60 factories and assembled at Lima. No one company is said to know the whole design or what company made the other parts. The engine used is the Liberty motor. The truck is said to be the strongest ever built for the load it is to carry and, owing to its increased weight, to be unsuited for normal use because of the large quantity of oil and gasoline required for its operation. It will be used only for the army and will not be placed on the market, according to Government officials.

Spending a Billion a Month

Government expenditures since the beginning of the fiscal year, July 1, are nearing the $3,000,000,000 mark. The total, reported in the daily Treasury statement of Oct. 15, was $2,921,075,341. This is nearly $800,000,000 more than receipts during this period, including that portion of the first Liberty Loan paid since the fiscal year began. The greatest single item of expenditure was $1,571,200,000 advanced to the Allies. Ordinary disbursements, including military and naval expenditures and the cost thus far of the shipbuilding and aircraft production programs, totaled $1,029,976,541. A total of $286,711,722 had been expended in the retirement of short-time certificates of indebtedness.

Recruiting Lenses for Aero Service

The Signal Corps is facing such a serious problem in supplying lenses for cameras for observation airplanes now being built for service with the American army in France that the chief signal officer has appealed to private owners to enlist their lenses in the army. The Bureau of Standards of the Department of Commerce, it is announced, is perfecting a substitute for the German "crown barium" glass used for lenses, and will later be able to supply the air fleet. In the meantime, however, the Signal Corps must depend on American owners for lenses.

Dry Zones for Coal Mines

Steps were taken recently by leading manufacturers of munitions and by coal operators of the Pittsburgh district to have the Federal Government create "dry" zones in the vicinity of their plants and mines. The movement had its inception in an appeal to Washington by the Bessemer Coal and Coke Co., the Superior Coal Co., and the Ford Colliery Co., which claim the operating efficiency of their mines has been reduced 2000 tons of coal a day on account of illegal drinking places near the mines.

Industrial News from Washington

By Paul Wooton, Special Correspondent

Conference on Explosives Act

Tentative drafts of regulations for administering the Explosives Act met with no particular objection from representatives of the mining industry who attended the recent conference called by Van H. Manning, Director of the United States Bureau of Mines. A large number of minor changes were suggested, all of which will be considered before the regulations are promulgated. Analysis of the Act shows that it conflicts with a number of existing laws. Statutes conflicting with the new law are the Embargo Act, Trading-with-the-Enemy Act, River-and-Harbor Act, many municipal and state laws and the Interstate Commerce Commission Act. The Act also overlaps the jurisdiction of the Federal Trade Commission over the use of foreign patents. These conflicts will be remedied as much as possible before the regulations are issued.

Great apprehension was voiced at the conference by representatives of the police departments of New York and Philadelphia, who fear that the regulations will conflict with the carefully prepared ordinances governing the handling of explosives in cities. In reply to this, F. W. DeWolf, the assistant director of the Bureau, who presided at the meeting, said that where local regulations were adequate there would be a disposition on the part of the Director to follow them. He said further that the administration of the Act would be delegated to a special assistant of the Director yet to be named; that to gain efficiency local licensing agents must be appointed in addition to the state inspectors provided for in the Act, and that the extent of such agents' territory would necessarily depend on the number of mines in their localities.

The principal difficulty in administering the Act is expected to arise in regulating the sale of ingredients of explosives without interfering with their proper distribution and use. Other troubles that will probably be encountered are: Checking up miners to whom explosives are issued; selling or issuing explosives to contractors in mines; investigation of explosions and accidents occurring in the jurisdictions of the military department and the Interstate Commerce Commission; the large number of men required to guard magazines, and the difficulty of enforcing the law where it may be unpopular throughout the community.

That mines accustomed to distribute explosives among their men will have to abandon the practice became evident during the discussion. Under the new regulations the only feasible plan will probably be the assignment of particular men to handle explosives and do the shooting. Otherwise it will be necessary to search workmen as they leave the mine. It has been suggested to the Bureau that the wording of the phrase, "in such manner as to be detrimental to the public safety," should be defined in detail; that the procedure to punish guilty persons be specified; that the Federal district judge be looked to for interpretations of the law; that the shot-firing system be made general. United States marshals, state mine inspectors and deputies of the state inspectors have been suggested as the officials to serve as licensors.

Farmers Urged To Sell Scrap Metal

Marketing of scrap metal is being urged upon the farmers of the country by the Secretary of Agriculture at the suggestion of Director George Otis Smith, of the United States Geological Survey. The purpose is to make available additional supplies of iron and steel; to effect a saving in coke and lessen the strain on iron mines and the transportation system, and thereby contribute to the successful prosecution of the war. In addition to this patriotic incentive an opportunity is offered to reap material profits. It is pointed out that old binders, plows, mowers and rakes are found on nearly every farm, while discarded stoves, pumps, pipe and small utensils rust about the barns and sheds.

In 1910 agricultural machinery to the value of $1,265,000,000 was reported by the census collectors as being in use on American farms. As the annual sales of these implements aggregate $165,000,000, the scrap from this source is enormous. While by far the greater portion of the metal contained in these implements is iron and steel, some brass, copper, lead and babbitt metal might be obtained from them.

Ore Imports in 1917 Show Increase

Zinc ore to the extent of 324,767 tons was imported during the fiscal year ended June 30, 1917, according to statistics compiled by the Bureau of Foreign and Domestic Commerce. The imports of zinc ore in the fiscal year of 1914 amounted to 18,280 tons. Other notable increases shown during the last fiscal year are: Copper ore, 613,593 tons, as compared with 478,679 tons in 1914; manganese ore, 656,088 tons, as compared with 288,706 tons in 1914; nickel ore, 60,132 tons, as compared with 36,420 tons in 1914. Iron ore, which was imported in 1914 to the amount of 2,167,662 tons, shows a decrease in the fiscal year ended in 1917, when 1,149,958 tons were imported. The last fiscal year is noteworthy from the fact that imports of raw materials passed the billion-dollar mark for the first time in the history of American trade.

Muscle Shoals Nitrate Plant

Selection of Muscle Shoals, near Sheffield, Ala., as the site of the Government's experimental ammonia and nitric-acid plants came as a surprise to official Washington. While a liberal interpretation of the nitrate board's recommendation would include Muscle Shoals as being in the "contiguous region" to southwestern Virginia, it is generally considered that the selection of this site amounts to a reversal of the finding of the board of experts.

Editorials

War Taxes on Mining Companies

IT IS a ghastly exhibition of the inefficiency of the Congress of the United States that a month after it enacted a piece of major legislation—for, certainly, the War Tax Law may be so characterized—nobody yet knows what its most important section—the War Excess Profits Tax—really means. Both the Senate and the House repudiated the recommendations of their own committees of experts, tore their respective drafts to pieces, failed to come to an agreement with each other, let an entirely new bill be drafted in the conference committee, wherein the uncouth and unlettered Kitchin buffaloed his colleagues with threats of holding up the whole business—and, finally, the two houses of Congress enacted blindly this bill, whereof they did not know the terms and the meaning, such as they were. Nor have the ablest legal minds of the country since then been able to unravel them. One distinguished lawyer has remarked that it will require a hundred hearings before the Commissioner of Internal Revenue before the Excess Profits Law can be made clear. We arrive, therefore, at the conclusion that the important subject of taxation is really to be determined for us by a division of the bureaucracy rather than by the duly elected representatives of the people. The only redeeming feature is the hope that when Congress reassmbles in December, it will correct things.

In the meantime we get some clearer ideas respecting the bearing of the War Tax Law on mining companies, although nobody yet has the temerity to say with assurance approximately what any company will have to pay. In the case of the Utah Copper Co., for example, estimates of the excess-profits tax range all the way from $3 per share to $10 or $12, or more. The only things about which we have clearer views relate to the matters of capital and deduction from income on account of depletion.

In the matter of capital, corporations are allowed to include surplus used or employed in the business. Many corporations, including mining companies, accumulated previous to 1917 large sums that had not been distributed and probably were in excess of what was needed in the business. The War Tax Law as enacted is in favor of companies of large capital, like Anaconda, and adverse to those of small capital, like Utah, which have failed to write upon their books their actual increase in value. The more such companies are able to take advantage of their surpluses as a basis of figuring, the better it is for them. It appears now that the law permits any company to include in capital such sums as are invested in Liberty Bonds. Therefore any company possessing a surplus in excess of the needs of its business may remove any doubt or controversy on that score by investing such surplus in Liberty Bonds. This has already been done on an extensive scale by many companies.

The other ameliorating condition is the provision for a reasonable allowance, out of net income, for exhaustion of property, which in the case of mines is put in the following obscure language, which exhibits a high degree of turbidity of thought: "In the case of mines, a reasonable allowance for depletion thereof, not to exceed the market value in the mine of the product thereof, which has been mined and sold during the year, for which the return and computation are made."

There is, without any doubt, comprised within the above provision the idea, eminently correct, that the income from mines includes a portion that is simply return of capital, for which allowance should be made. But just how the allowance is to be made is uncertain. The idea in the minds of the persons who drafted this clause seemed to have been something like this: If a mine was valued at a certain time as containing 1,000,000 tons of ore, worth $1,000,000 in the ground, and 100,000 tons was extracted during the taxable year, the proprietor of the mine is authorized to deduct $100,000 from gross income on account of depletion. This may or may not be the exact interpretation. What is the correct interpretation remains for the Commissioner of Internal Revenue to say.

In the matter of capitalization the manifest intention of the framers of the law was to limit capital to money actually put into the business, without allowance for increase in value that may be connected with the theory of "unearned increment." The law further allows the reckoning of value of intangible property, like good will, which is of no particular concern to mining companies, although it may be to some metallurgical companies; but on the theory of cash paid in there are troubles and inequities. Take, for example, the case of four companies, A, B, C and D, operating in the same district, each with a capital of $1,000,000 actually paid in. Suppose that in the course of time each of these companies had developed orebodies and provided plant and equipment for the extraction thereof, so that each has a present market value of $10,000,000, with its shares selling in the market on that basis and with a large part of the present stockholders buyers on that basis. We might have, under the War Tax Law, conditions of these four similar companies varying as follows:

Company A never altered its original capitalization, and therefore has a maximum exemption of 9% on $1,000,000, or $90,000.

Company B, having purchased company C for $5,000,000 a few years ago, without, however, writing up its own original capital, gets an exemption of 9% on $6,000,000, or $540,000.

Company D, having been resold a year ago by its original owners for $10,000,000, and having been recapitalized at that figure, gets an exemption of 9% of $10,000,000, or $900,000.

While the above are imaginary instances, closely similar conditions exist in our industry. Utah Copper Co., for example, will get the benefit only of a capital of 1,624,490 shares, at $10 per share, plus cash premium realized on the sale of some subsequent securities ($8,290,620), plus a surplus of $43,153,137, if all of that surplus be used in the business or invested in Liberty Bonds, the total coming to $67,688,657. The Kennecott Copper Co., on the other hand, which owns a large interest in Utah, will get the benefit of its investment in Utah on the basis of something like $110 per share.

There will be many perplexing conditions: What of the company that year after year has been putting money back into its business, and would at the present time show a cash value in excess of its capitalization, although the latter might be large? What of the company that has purchased property, paying therefor with its own shares at a time when the latter had a market value in excess of their par value, the present law recognizing nothing in excess of par value? These are only a few of the problems that are now engaging the attention of the administrators of public companies.

The Price for Lead

A COLLAPSE in the price of lead was anticipated by good judges of the market months ago, when the short-sighted were experiencing the ecstasy of a 12-cent price, but nobody thought that it would come as suddenly and dramatically as it did. The strange advance in the market early in the summer was ascribable chiefly to Governmental bungling in talking about military requirements on a scale much larger than they were. It is very likely that the authorities themselves did not know what was needed. However, they ought not to have talked about anything. The big talk, leaking around in a market wherein the major part of the supply is preëmpted by average-price contracts, caused buyers to think, and quite naturally to think, that the supply of free lead would be diminished extraordinarily, wherefore anybody needing lead would better grab it while the grabbing was good. This was done with the result of putting up the price to 11@12c., while the producers had previously agreed to supply the Government at 8c., both the Government and the producers considering that a fair price. The labor trouble in southeastern Missouri that happened about this time added to the acuteness of the situation.

Now the consumption of lead for certain important purposes, especially corroding, had begun to contract in 1916. The extravagant prices of 1917 had the natural effect of strangling consumption. Almost before they knew that anything was happening, producers found that unsold stocks were accumulating in their hands, whereas but a short time previously they were unable to keep control of enough metal to conduct their business with reasonable safety. Probably the production of lead in other parts of the world has been increasing somewhat, enabling certain foreign countries that had previously been buying from us to obtain supplies elsewhere. But that the sudden reversal of form in the American lead market was due chiefly to the contraction in domestic consumption is indisputable, for the statistics for the first half of 1917 show nothing but a trifling increase in production.

The Government had first contracted with the producers for its requirements of one month at 8c. per lb., and then made arrangements for its supply during three ensuing months, ending with October, at the same price. But before October had arrived, the lead market was already below the stipulated price, with every indication that it was going lower. In business between private parties, both would, of course, expect to live up to their contract in such a juncture, but the lead producers exhibited their patriotism by voluntarily releasing the Government and offering to supply its lead requirements at the market price, not, however, claiming the latter above 8c. This arrangement was naturally satisfactory to the Government.

Last week the situation in lead had become so unpromising that one of the principal producers instituted a curtailment of 50% in its production. It is very unfortunate that the collapse in lead had to go so far as to necessitate such a thing, for, once a working force is dispersed, there is difficulty in reorganizing it, as the copper-mining companies are now experiencing. This is one of the mischievous results of allowing a market to get out of hand and soar to extravagant figures. In justice to the principal producers we are bound to say that this was thoroughly appreciated by them at the time, and they did everything that was humanly possible to retard and check the advance.

The recent events in lead are another illustration, like the previous case of spelter, of how a market will take care of itself if a little patience be exhibited. In lead, where the Government has kept its hands off in the matter of price fixing, we have seen consumption reduced by the natural deterrent of high prices that consumers did not care to pay, whereas in copper the Government is curtailing consumption by strong-arm tactics, telling consumers that they shall not have it and, incidentally, wrecking the whole machinery of the market. We imagine that the swiftness in natural curtailment of lead consumption is due to the fact that with respect to a large part of that consumption there is less of a gap between the ultimate consumer and the producer than there is in the case of other metals. It is a simple thing for hundreds of thousands of citizens to say that they will postpone contemplated painting and, once they have so decided, the corroder, and through him the producer, feels the reduction in demand very promptly.

Gold Production in Australia

The gold production of Australia for the first half of 1917 again showed a considerable loss. Western Australia had a small decrease, while the falling off in the three important states of Victoria, Queensland and New South Wales was from 20 to 30%. The figures given in the table below are from official sources, with the exception of South Australia, where the output had to be estimated.

New Zealand has made public no monthly returns of gold shipments this year.

The half-year shows decreases of 103,397 oz., or 12.2%, as compared with the first half of 1916, and of 257,852 oz., or 25.6%, as compared with 1915. All the divisions showed decreases except Tasmania, where there was a gain from the copper mines; and the Northern Territory, where the output is very small.

The causes of the continued decrease are the same as those which have been prevailing for some years past.

Prospecting and the opening of new mines have been at a standstill. The older mines are gradually being exhausted and no new discoveries are reported. Above all there has been a serious shortage of labor for the mines, which has this year been accentuated by the drafts made for the war and by the strikes at Mount Morgan and Broken Hill.

GOLD PRODUCTION OF AUSTRALIA, FIRST HALF-YEAR

(In Fine Ounces)

	1915	1916	1917
Western Australia	626,920	525,035	507,852
Victoria	164,101	135,000	99,676
Queensland	128,635	116,893	86,985
New South Wales	71,942	61,000	39,868
Tasmania	9,500	8,750	8,925
South Australia	2,800	2,975	2,850
Northern Territory	1,275	1,075	1,175
Total fine ounces	1,005,173	850,728	747,331
Total value	$20,777,133	$17,584,548	$15,447,332

A turn in the tide and an increase in gold production can hardly be expected until labor conditions improve and there are not only a sufficient number to work the present mines but also a surplus to engage in prospecting and exploration work.

BY THE WAY

Commenting on the second Liberty Loan, President Hulbert of the Merchants' Loan and Trust Co., Chicago, says: "The one weak spot in the situation is the attitude of farmers. They will neither buy Liberty bonds, pay taxes, sell their produce, nor fight. I have learned of but one instance in which a farmer paid an income tax. They have profited throughout the entire period of the war, but are unwilling to help the Government. The comptroller of currency has estimated the gross income of the United States to be about $40,000,000,000. Of this he estimates farm produce and animals to bring a gross return of about $17,000,000,000. The farmers, according to this estimate, are getting 42½% of the country's income and giving nothing out of it."

To those who feel the desire to buy stock offered with flamboyant promises, Irving T. Bush relates in *World's Work* the following experience of an old friend: "This man, the son of a country doctor, tells of how, when he reached man's estate and was about to go into business, his father took him into the little back office and swung open the door of the rusty old safe and took out a formidable bundle of stock certificates. 'My son,' said he, 'you are going into business, and I hope, will make some money and want to save it. When the time comes, you will wish to buy some mining stock. Every one does. When that time arrives come to see me. I will sell you some of mine. They are just as good, and will keep the money in the family.' "

"We are not of the opinion that dollars and lives are proper subjects for comparison in measuring the sacrifices of war," says the New York *Sun*, "but since Senator La Follette and his associates persist in relating the 'conscription' of wealth to the drafting of men for military service we should like to ask them a question or two based upon their own favorite analogy. If it should be discovered by some future registration similar to that of June 5 last that there were in the United States twice as many men of military age as had been estimated, and twice as many without causes for exemption or discharge as had been estimated, would these Senators in Congress favor drafting twice as many men as the Government had expected to obtain? As a matter of expediency, if from no better motive, we suspect they would not. The effect on the birth rate might strike them. Does it occur to them that money has a birth rate? That to drain the wealth of the country too rapidly may fatally decrease the growth of national wealth? That a nation's wealth, the sinews of war, is ultimately measured not by its size but by its reproductive power? That the more money a nation is able to leave in the hands of its citizens the more money it will be able to command when it needs it most?"

An engineer writing from the platinum region of the Ural Mountains, in July, gives an interesting sidelight on conditions in that section of the Russian mining field: "America must be quite in the dark as to what is going on now in Russia generally, and in our Ural district particularly. First of all, the platinum industry is now in the hands of the government and every producer is forced to hand over to the government all his output. The next thing is that the people in the platinum country have invaded the platinum mines, work there and feel themselves as the proprietors of the estates. Besides this the general manager of one of the principal platinum estates has been given three days time to clear out of the place and he and his family are now staying with us. In such circumstances it will be understood that at present nothing can be said definitely about the future of the platinum industry. The future is in the dark. We all hope that the crisis will be over after some time and that we may then resume operations on something like the old basis."

Perhaps we shall some day have the full story of how Gelasio Caetani blew up the Col di Lana, but we are sure that his modesty will prevent us ever from getting it from his own lips. In fact, this feat involved repeated exhibitions of the greatest bravery and engineering skill on his part. In laying out the tunnel, it was necessary, in the first place, to make a survey. Caetani attended to that, using a Brunton pocket-transit. In the use of that standard and valuable instrument, the personal factor enters largely. Some operators perform admirable work with it, while others do not, owing to their own lack of skill. Caetani was known as an adept with this instrument even before he rejoined the Italian Army in the present war. In order to make the survey for running his tunnel in the Col di Lana, he had to crawl through the Austrian lines in order to get the necessary courses and angles. He did that at night, using an instrument with a radium dial, which permitted the readings to be taken. At another time he had to take observations with himself suspended by a rope from a cliff, during which time he was exposed to Austrian fire. His tunnel was directed under the principal Austrian fort. It is related that the results showed that the heading wherein the explosive charge was fired was only 3 ft. out of the way.

Settlement of the Globe-Miami Strike

The strike in the Globe-Miami copper district in Arizona has been settled through the efforts of the labor commission appointed by President Wilson. According to a telegram from the commission received by the President, the chief features of the settlement are stated to be as follows:

1. The establishment of a workers' committee for each mine wholly independent of any influence, direct or indirect, to be exercised by the company. This committee is to be composed exclusively of men working at each mine, with the right, however, of union members to have a union representative in the presentation of grievances.
2. The employment of those now on strike, except those guilty of seditious utterances against the United States or those who have membership in an organization that does not recognize the obligation of contracts. In providing for the reëmployment an important principle introduced is that the district is treated as an industrial unit, instead of the individual mine. Reëmployment is to be secured through a central employment committee for the district. This provision is made because the labor shortage of the district as well as the growing labor shortage throughout the country requires the full utilization of all available man power and the regular employment of the men on strike.
3. The impartial and effective working of the scheme is assured through the appointment of a United States arbitrator acceptable to both sides, who is to determine all disputed questions of fact as to which the managements and the men cannot in the first instance agree. The success of the settlement rests on the loyal spirit of all parties in carrying out the agreement. But the arbitrator is necessary to secure the settlement of any difficulties as to which in perfect good faith the two sides may not agree.

The commission has left Globe and is proceeding to Morenci, to take up the settlement of the differences between the miners and the companies in the Clifton-Morenci-Metcalf district of Arizona.

Mining Dividends and the Income Tax

An income-tax ruling just promulgated by the Treasury Department will interest stockholders in a number of mining companies which have adopted the plan of declaring dividends out of reserve set aside to meet depreciation and depletion of property. The ruling follows:

> Referring to the practice of certain corporations of declaring dividends out of reserve set aside to meet depreciation and depletion of property, and of advising stockholders that such dividends represent a distribution of capital assets, your attention is directed to the ruling made herein as follows:
>
> All such dividends received by stockholders declared out of such reserves, accumulated subsequent to Mar. 1, 1913, constitute income to the stockholder under the act of Sept. 8, 1916, and must be accounted for in returns of net income.
>
> A stockholder's investment is in the stock of a corporation. If he disposes of his stock for more than its fair market value on Mar. 1, 1913, or its cost if acquired since that date, the profit realized must be returned as income; if he disposes of it at a loss, the loss sustained is deductible from gross income within the limits of the taxing act. In computing the profit or loss sustained, there must be taken into account dividends paid from reserves accumulated prior to Mar. 1, 1913, which were not returned as income for the year in which received, under the provisions of the act of Sept. 8, 1916.

The gist of this ruling is to make subject to the income tax dividends which have been called a distribution of capital assets. Hitherto, says the *Boston News Bureau*, it had been supposed in some quarters that dividends representing distribution of capital were not subject to the tax. Such dividends have been declared by Utah, Chino, Nevada Consolidated, Ray Consolidated and St. Joseph Lead, among others.

Use of Manganiferous Iron Ores in Steel Making

Washington Correspondence

Despite the increased development of domestic manganese ore, since the outbreak of the war in Europe, E. C. Harder, who is engaged in a study of the iron ores in Minnesota for the United States Geological Survey, thinks it not unduly pessimistic to say that the deposits of high-grade manganese ore in the United States probably never will be able to supply the manganese consumed in domestic industries. Summing up his views as to the possibility of the further utilization of the manganiferous iron ores, Mr. Harder says:

> There are in the United States large quantities of manganiferous ores containing varying amounts of manganese. A small proportion of these can be used in the production of high-grade iron-manganese alloys, but a large proportion can be used for lower grade alloys, and nearly all can be used in making high-manganese pig iron. Compared with the manganiferous (iron) ores, the reserves of high-grade manganese ores in this country are insignificant. Hence, although a search for manganese ore is desirable, a more promising solution of the manganese problem would seem to lie in the direction of the utilization of low-grade manganiferous ores. Up to the present the use of these ores has been slight. Until a few years ago they were considered to have little value and were mined only incidentally. In the West manganiferous ores would not be mined were it not for their association with the ores of other metals.
>
> There are several ways in which the utilization of manganiferous ores may be brought about. It has been suggested that by methods of concentration, resulting in the elimination of iron, silica or other constituents, a product high in manganese might be derived from them. Such concentration has been attempted locally, but with little success, owing mainly to the intimate mixture which manganese generally forms with associated materials. The steel-making practice might be changed so that more spiegeleisen and less ferromanganese would be used for deoxidizing. By the addition of small quantities of high-grade manganese ore, much of the manganiferous iron ore could be used in the manufacture of spiegeleisen. The most effective solution, however, as has previously been suggested, seems to be to change the practice in the manufacture of basic openhearth steel, so as to make possible the use of high-manganese pig iron. Experimentation along this line is extremely desirable. The successful application of such a change would make large reserves of manganiferous iron ore commercially available and would decrease greatly the quantity of high-grade manganese ore consumed.

New Manganese Operation in Brazil

That manganese ore is being shipped from Brazil by a new American company is reported by United States Consul General Alfred L. M. Gottschalk of Rio de Janeiro. The company is said to have purchased four mines in the State of Bahia. The largest of these is in the municipality of Bom-Fim, northwest of the city of Bahia. It is accessible by the Central Ry. of Brazil but has not yet been explored to any extent. Three other mines are near the town of Nazareth, southwest of Bahia. They have no railroad outlets at present, and such ore as is mined must be taken by lighters to the Bay of Bahia and there placed aboard ship. These properties are said to be smaller than the one at Bom-Fim. Only two ships have been loaded at Bahia with ore from these mines, the steamer "*Suffolk*" taking 4000 tons in the month of May and the "*Peter H. Crowell*" 4300 tons in April. In the absence of later reports from this district it is not possible to say whether further shipments have been made.

Correspondence and Discussion

The Second Liberty Loan

In the article headed "The Second Liberty Loan," appearing on p. 614 of the Oct. 6 issue of the *Journal*, the following sentence appears: "The new bonds bear 4% interest and are exempt from all taxes except state taxes, super-income, excess-profits and inheritance taxes." Since getting my allotment of 3½% bonds of the first Liberty Loan, I have received a statement printed by the Treasury Department at Washington in regard to the second issue, containing the following:

> Q. Are Liberty Bonds exempt from taxation?
>
> A. The bonds are exempt both as to principal and interest from all taxes imposed by the United States, any state or any of the possessions of the United States, or by any local taxing authority, except: (a) Estate or inheritance taxes; (b) graduated additional income taxes, commonly known as surtaxes and excess profits or war-profits taxes now or hereafter imposed by the United States upon the income or profits of corporations, individuals, partnerships or associations. The interest on an amount of bonds and certificates, not in excess of $5000 in one ownership, is exempt from the taxes provided for in Clause (b).
>
> Q. Does this mean that the bonds are free from all local taxation?
>
> A. Yes; the local assessor or tax collector cannot assess these bonds as personal property.

It would seem from this statement that the article is wrong, and I am passing this on for the information of the *Journal* and its readers. ROSS BOWLES.

East St. Louis, Ill., Oct. 15, 1917.

[Mr. Bowles is right. The article referred to in the Oct. 6 issue should read "except estate taxes" and not "except state taxes."—Editor.]

Observations in Attracting Capital

From time to time I have read in the *Journal* sketches on the subject of getting capital for mining ventures. The article by J. F. Kellock Brown in the issue of Sept. 1 seems to describe the situation very well indeed. But it appears that he has overlooked the fellows in the Lake Superior region who have for sale iron-ore lands of real, prospective, or doubtful value. The multitude of vendors and the variety of their modes of approach is truly amazing, even to one of some experience. Most all of them have wonderful embryonic propositions that will yield fortunes, but need money in divers amounts to start things. It may be set down as axiomatic, that, in 90% of the approaches to capital, the vendor is either dishonest, visionary, or just a plain fool.

The real-estate dealer who has for sale a large tract of land in northern Minnesota, Wisconsin, or Michigan has also numerous "talking points," one of which includes the well-known and familiar story of the place or places on the tract where the compass will not work. In his mind this adds at least $5 per acre to the value of the lands. Moreover, the dealer always tells of the developments in opening an iron mine anywhere within a radius of 50 miles of the particular lands he is offering. For that reason, the lands must have merchantable iron ore. Then as a clincher to his sales argument comes the deposit of bog iron ore. This deposit is large and of high grade. Samples are then shown and analysis card of high-grade iron ore presented. The sample of bog ore looks to be typical of such deposits and the analysis to be of an ore from any one of the Lake Superior districts. Usually, as a personal favor to you, the dealer can cut his price 20%—it will remain anywhere from 50 to 500% higher in price than its true value as wild land. Sometimes, for the sake of making his appeal stronger, the broker will insist on getting an interest in the fee-simple title or at least in the mineral rights. In about 99% of such proposals, capital is in for a skinning if it is not keen enough to see the knife. In the hundredth case the knife can not be seen, but will be felt if one is patient.

Next on the list comes the fellow who has had some experience either as an explorer, diamond-drill hand or miner. He is usually a rank visionary and to be compared with the ignorant prospectors of the West. The fellow is honest, sincere and hard to convince that his samples are of lean-iron formation; that his prospect is situated in an area that has been studied and explored by competent men and methods and found to be commercially worthless. He knows himself to be ignorant and is therefore suspicious. The chap departs with the fear in his heart that he has disclosed a good thing to you, and that through the mysterious power of money you will somehow take his valuable prospect away from him.

The mining men, the chaps with the technical knowledge, can be immediately set down as being either scoundrels or honorable men. Sad to relate, the former are in the majority. They are easy to recognize, for their schemes have all the earmarks of crooked propositions. Perhaps his proposition is a bit smoother than the gold mine of the stock salesman, but the essential point is a thousandfold return on a comparatively small initial investment. The capital is to be used in development or exploration, as the case may be, under the direction of one of his friends. This friend has a great record as a developer of mines, etc. The fellow neglects to state that the friend is his silent partner in his attempt to "bleed" the capitalist.

In contrast to the others is the honorable, intelligent chap with a legitimate proposition. He will come in, lay his samples, data, and maps out on the table, state his proposition briefly and concisely, and ask you to think it over. He willingly gives you ample time to make a decision. Never, though, will he offer personal references as to his character, but will gladly "come through" when asked for them. If at the end of a reasonable time you decide not to venture, he will return for his stuff, chat a while and, as he leaves, remark with confidence, "You have turned down a good thing. Good day." JOHN R. ROBERTS.

Minneapolis, Minn., Sept. 10, 1917.

Personals

Edwin J. Collins, of Duluth, Minn., has returned from an examination trip in Colorado and Nevada

John Seward has returned from a trip to Ticonderoga, N. Y., where he has been on professional business.

J. B. Tyrrell, of Toronto, Ont., has returned from a trip of several weeks to Newfoundland and Nova Scotia.

Burr J. French, engineer for the Cinco Minas company at Magdalena, Jalisco, Mex., paid a recent visit to New York.

E. S. Bastin is lecturing on geology at the Massachusetts Institute of Technology during the absence of Waldemar Lindgren.

March F. Chase has been summoned to Washington by Mr Baruch to assist the War Trade Board, as expert in sulphuric acid.

John Russell is assistant superintendent of the Monclova unit at Monclova, Coah., Mex., for the American Smelting and Refining Company.

Byron M. Johnson, engineer with the American Smelting and Refining Co., has been transferred to the company's property at Matehuala, San Luis Potosi, Mexico.

T. J. Coulter, of Duluth, Minn., and **E. A. Separk**, chief chemist of the Oliver Iron Mining Co., have been investigating the Athapapuskow district, north of The Pas, Manitoba.

W. N. Thayer recently returned to Cincinnati after several weeks in the Wyoming oil fields, and will spend the next two weeks in geological investigations on the Vermilion Range, Minnesota.

H. N. Blake, former assistant superintendent of the foundry of the Anaconda Copper Mining Co., at Anaconda, Mont., has been commissioned a major and will shortly report for duty in ordnance work.

S. Yamaki, superintendent of the Tsudo copper mine at Ashio, Japan, and **H. Toyoda**, a Japanese mining engineer, are investigating the mining and milling methods employed in the Cobalt and Porcupine camps.

F. L. Ransome, of the United States Geological Survey, will take up the studies pertaining to quicksilver, which work has been handled by **H. D. McCaskey** for several years. The change is made to allow Mr. McCaskey more time for administrative work.

Henry A. Wentworth has been appointed a vice-president of the American Zinc, Lead and Smelting Co. He will take charge of the exploration department recently formed for investigating new properties, processes, etc., which may be offered to the company.

James Furman Kemp has replaced **Whitney Lewis** in the firm of Hager, Bates & Lewis, petroleum and mining geologists, of Tulsa, Okla., Mr. Lewis having accepted a commission in the Engineer Officers Reserve Corps. The firm is now known as Hager, Bates & Kemp.

Charles W. Merrill, of San Francisco, who recently joined the staff of the Food Administration in Washington, will direct the work of the newly formed division of chemicals. This division will endeavor to find and control chemicals used in insecticides, preservatives, refrigeration, and fertilizers, and in particular to increase the production of sulphuric acid on which the preparation of superphosphates depends

Obituary

James H. Geggle, owner of mine properties on the Vermilion Range, in Minnesota, died at his home in Minneapolis on Oct. 21, aged 83 years

Joseph T. Goodman, editor and owner of the "Territorial Enterprise" at Virginia City, Nev., in the early Comstock days, died in San Francisco on Oct. 1, aged 80 years

Societies

American Society of Civil Engineers—At a meeting held in New York on Oct 17, the following papers were presented "Detention Reservoirs with Spillway Outlets as Agencies in Flood Control," by the late H M Chittenden, and "Hydraulic Phenomena and the Effect of Spreading Flood Water in the San Bernardino Basin, Southern California," by A L Sonderegger

Industrial News

E. L. Hawes, engineer-salesman with the Ingersoll-Rand Co., at Duluth, Minn., is in the East inspecting some of the company's plants.

Macleod Co., Cincinnati, Ohio, makers of sand-blast equipment and metallurgical furnaces, have enlarged their plant and increased their capital to $100,000 in order to take care of the rapidly expanding business.

Stebbins Dry Concentrator, Los Angeles, Calif., announces that it made shipment on Oct 9 of a carload of concentrators and other machinery for a 300-ton plant to be erected by the Red Cloud Consolidated Mines Co., of Yuma, Arizona.

Indiana Leboratories Co., Hammond, Ind., announces the opening of a sampling and analytical laboratory in the Philipsburg, Mont., manganese district; also the erection of a laboratory and sampling plant at Hammond, which it is now occupying

Maritime Motor Car, Ltd., of Vancouver, B. C., is manufacturing for Canada the Lilly Hoisting-Engine Controller developed by W. J. Lilly at the Anaconda mines in Butte. J. T. Lilly, a brother of the inventor, is looking after the installations in the Dominion.

Pacific Electro Metals Co. has been formed to manufacture silico-manganese. The company's plant is at Bay Point near San Francisco, Calif. Low-grade California manganese ores will be used and an alloy containing 60% manganese and 20% silicon will be made.

Vulcan Steel Products Co. has opened an office in Havana, to care for its rapidly growing business in Cuba. G. O Simpson is in charge. In connection with this office, there will be maintained a permanent exhibit of machinery and steel and iron products, in which the company deals.

"85% Magnesia" and Heat Insulation—Magnesia Association of America, 702 Bulletin Bldg., Philadelphia, Penn. Booklet. Pp. 40; 6 x 9 in.; illustrated. A study of the cause and prevention of heat-losses in the transmission of steam for power or heating purposes and a description of the manufacture and application of "85% Magnesia" coverings.

Union Smelting and Refining Co., secondary smelters and manufacturers of solder, is building a modern plant on its 11-acre tract in Newark, N. J. The main building is of steel and brick and is 110 x 450 ft. All material within the plant proper is to be handled by traveling cranes. The plant has been so designed as to allow future expansion and will be in full operation by the end of the year.

Trade Catalogs

Sullivan Diamond Core Drills. Sullivan Machinery Co., Chicago, Ill. Catalog No. 69. Pp. 63; 6 x 9 in.; illustrated.

Form Q Squirrel-Cage Induction Motor. Crocker-Wheeler Co., Ampere, N. J. Bulletin No. 180. Pp. 4; 8½ x 11in.; illustrated.

Electric Mine Hoists. The Wellman-Seaver-Morgan Co., Cleveland, Ohio. Bulletin No. 5. Pp. 12; 8½ x 11 in.; illustrated.

Steam and Electric Shovels, Dredges, Unloaders, Etc.—Marion Steam Shovel Co., Marion, Ohio. Catalog. Pp. 56; 5½ x 8 in.; illustrated

Sullivan Submarine Rock Drills. Sullivan Machinery Co., 122 S. Michigan Ave., Chicago, Ill. Bulletin 70-E. Pp. 16, 6 x 9 in.; illustrated.

Duplex Piston Pattern Pumps.—Worthington Pump and Machinery Corp., 115 Broadway, New York. Bulletin W308. Pp 52; 6 x 9 in.; illustrated.

Locomotives for Industrial and Contractors' Service. The Baldwin Locomotive Works, Philadelphia, Penn Record No 86. Pp. 10; 6 x 9 in., illustrated.

Sullivan Rock Drills, Tripods, Columns and Bars, etc. Sullivan Machinery Co., 122 S Michigan Ave., Chicago, Ill Bulletin 70-D. Pp. 48; 6 x 9 in., illustrated.

Bremer-Waltz Corporation announces that it can now supply aluminum sheets rolled at its new plant at St Louis, Mo., and makes a specialty of rolling them to specifications within a few weeks after receipt of order, it is now ready to accept contracts to the end of 1918 It can also supply aluminum powder made at its own plant, which has a capacity of 5000 lb daily

Edison Storage Batteries for Use in Storage Battery Locomotives. Edison Storage Battery Co., Orange, N. J. Bulletin No. 608. Pp. 24; 6 x 9 in.; illustrated.

Outside Packed Plunger Pattern Pumps.—Worthington Pump and Machinery Corp., 115 Broadway, New York. Bulletin W-400. Pp. 32; 6 x 9 in.; illustrated.

Jeffrey Stepped Multi-Bladed Fans for Mine Ventilation. The Jeffrey Manufacturing Co., 974 North Fourth St., Columbus, Ohio. Catalog No. 229. Pp. 24; 6 x 9 in.; illustrated. This describes complete line of centrifugal mine fans and shows typical arrangements of same.

New Patents

United States patent specifications listed below may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

Automatic Mine Door. James C. Allan, Riddlesburg, Penn. (U. S. No. 1,242,411; Oct. 9, 1917.)

Briquetting Machine. Christian Korte, Leeds, England, assignor of two-thirds to Cambells and Hunter, Limited, Leeds, England. (U. S. No. 1,242,704; Oct. 9, 1917.)

Calcium and Magnesium—Method of Separating Calcium from Magnesium contained in Saline Solutions. Charles Glaser, Baltimore, Md. (U. S. No. 1,242,434; Oct. 9, 1917.)

Compressors—Apparatus for Operating the Blowoff Valves of Centrifugal Compressors or Pumps. Hans Guyer, Zurich, Switzerland, assignor to Aktiengesellschaft Der Maschinenfabriken Escher, Wyss & Co., Zurich, Switzerland. (U. S. No. 1,241,372; Sept. 25, 1917.)

Concentration—Process of Concentration of Metalliferous Ores. Selden Irwin Clawson, Salt Lake City, Utah. (U. S. No 1,240,824; Sept. 25, 1917.)

Dump Car. John O. Neikirk, Lombard, Ill., assignor to Rodger Ballast Car Co. (U. S. No. 1,242,226; Oct. 9, 1917.)

Electrical Distilling Apparatus. Charles H. Fulton, St. Louis, Mo., assignor, by mesne assignments, to Metallurgical Laboratories, Incorporated, Chicago, Ill. (U. S. Nos. 1,242,337; 1,242,338; 1,242,339; 1,242,-340; Oct. 9, 1917.)

Electric Furnace—Electric Metallurgical Furnace and Method of Operating the Same. William E. Moore, Pittsburgh, Penn. (U. S. No. 1,242,464; Oct. 9, 1917.)

Electric Furnace. Irving R. Valentine, Schenectady, N. Y., assignor to General Electric Co. (U. S. No. 1,242,275; Oct. 9, 1917.)

Electric-Furnace Control. John A. Seede, Schenectady, N. Y., assignor to General Electric Co. (U. S. No. 1,242,250; Oct. 9, 1917.)

Electrode Holder. Raymond O. Jackson, St. Louis, Mo., assignor, by mesne assignments, to Metallurgical Laboratories, Incorporated, Chicago, Ill. (U. S. No. 1,242,554; Oct. 9, 1917.)

Filtering Process. Mark R. Lamb, Santiago, Chile, assignor to Allis-Chalmers Manufacturing Co., Milwaukee, Wis. (U. S. No. 1,242,355; Oct. 9, 1917.)

Grinding Mill. John W Cover, Tacoma, Wash. (U. S. No. 1,242,423; Oct. 9, 1917.)

Hammer Drill. George H. Gilman, Claremont, N. H., assignor to Sullivan Machinery Co., Boston, Mass. (U. S. No. 1,242,882; Oct. 9, 1917.)

Hoist Signal—System of Signaling for Mine Hoists. Max A Whiting, Schenectady, N. Y., assignor to General Electric Co. (U. S. No. 1,242,625, Oct. 9, 1917.)

Iron and Steel—Process for the Treatment of Iron or Steel. Albert Hayes, New York (U. S. Nos. 1,241,112, 1,241,113, Sept 25, 1917.)

Making Pig Iron in Electric Furnace. Ernest Humbert Welland, Ontario, Canada (U. S. No 1,242 412, Oct 9, 1917.

Mine Doors, Means for Automatically Opening Albert M Hopper and James O Hopper, Pittsburg, Kan. (U. S. No. 1,242,-190; Oct. 9, 1917.)

Mineral Wool, Art of Making William Fay, St Louis, Mo (U. S. No. 1,242,537; Oct 9, 1917.)

Roasting Furnace. Andrew W. Livingston, Oakland, Calif (U. S. No. 1,242,455, Oct 9, 1917.)

Smelting Process and Apparatus. Ezra A. Mathers, New York, N. Y. (U. S. No. 1,242,833, Oct 9, 1917.)

Tunneling. Thomas Malcolm McAlpine, Westminster, London, England. (U. S. No 1,242 217, Oct 9, 1917.)

Editorial Correspondence

SAN FRANCISCO—Oct. 20

California Petroleum Production in September from all fields totaled 8,344,679 bbl., a decrease of 217,442 bbl. from August. The daily average yield of the wells was about 2000 bbl. greater than in August, but this was due to the increase in one well in Whittier-Fullerton field, which increased 4500 bbl. daily. The September shipments amounted to 8,912,233 bbl., a decrease from August of 985,577. The stocks on hand on Oct. 1 amounted to 34,800,198 bbl. against 35,367,742 on Sept. 1. In September, 76 wells were completed, an increase of 14 over August; 63 new rigs were installed, an increase of 2 over August; 372 wells were being drilled, a decrease of 12 from August. The increased demand for new development is generally recognized among oil men. Regardless of the unsettled legislation affecting the industry there is a disposition to improve every opportunity for the advancement of development by the starting of new wells. In the first half of October, drilling was begun on 13 new wells, making the total for the 9½ months of the year, 821, as reported by the oil and gas supervisor of the State Mining Bureau. Discussions at various meetings of the deputy supervisors and district boards indicate a strong tendency toward enforcement of the law regulating the drilling and maintenance of wells for protection from water infiltration. The Coalinga district, however, has failed to organize; but no reason for this failure to comply with the law has been made public. It is possible that a test of the constitutionality of the law is contemplated. No other district is reported to have objected to full compliance with legislative requirements. Whether or not there may be found legal flaws in the Act there is no question that full compliance with its provisions will result in large benefit to field operation. Further, there is no question as to the sincere purpose of the state mineralogist and the oil and gas supervisor to accomplish beneficial results without detriment to any field, district or operator. If the law should be found faulty, the fault may be remedied by legislative action, and strict obedience to its essential requirements, will the sooner disclose any possible fault.

BUTTE—Oct. 20

Liberty Loan Subscriptions for this district are well in advance of the allotted amount, according to returns. Butte was allotted $2,800,000 and up to close of banking hours on Oct. 20, had subscribed $3,600,000. Anaconda company was reported to have made a local subscription of $1,100,000, and $2,500,000 for entire state. Montana Power Co. subscribed $125,000 for Butte and $500,000 for the state. C. F. Kelley, managing director of the Anaconda, subscribed $25,000. Butte & Superior subscribed $200,000 and employees, $37,000.

Miners Responsible for Coal Shortage in Montana according to the report submitted Oct. 13 to Governor Stewart by State Labor Commissioner Swindlehurst. It is stated that many miners cannot be induced to work long enough to get out a sufficient amount of coal to meet the demand. In many of the state's coal mines, miners earn from $6 to $12 per day in from four to six hours' work, due to the liberal contracts the men have secured from the operators. As a result it seems impossible for the operators to keep the men in the mine after having earned that much, although under the agreement they are expected to work a full eight-hour day. While this does not make for efficiency, the operators are powerless to prevent the men leaving the mine at any time they may choose, and are practically compelled to start hoisting them before noon and continue this intermittently until quitting time. This in itself interferes materially with the hoisting of coal and greatly reduces production. The report further states that a large percentage of the miners are controlled by methods which are socialistic and anarchistic and are therefore not amenable to reasonable demands on the part of the operators. What action the governor or the Federal officers will take to remedy the situation, has not yet been made public. That something must and will be done seems certain, however.

SALT LAKE CITY—Oct. 20

Car Shortage and Smelter Embargo are being felt by Tintic operators and have complicated the situation from which the district is suffering. When the mines have in prospect the delivery of accumulated ores the shortage of railroad cars prevents shipment. It is the feeling in the camp that the favorable weather should be made use of for marketing the ores of the camp, as in the winter there is always more or less difficulty, even under normal conditions. All through last summer lead ores produced in the intermountain country probably exceeded the smeltery capacity by about 20%. Lead ores are still being offered but it is likely that the recent drop in price will curtail shipments. Various embargoes by the smelters have been necessary. The lead smeltery of the American Smelting and Refining Co., at Murray, had an embargo on for about six weeks or from Sept. 1 to Oct. 10, and is getting congested again. The United States Smelting Co. at Midvale had an embargo from Sept. 2 to Sept. 20, and will have a new embargo, starting Oct. 20 of indefinite duration. Both of these embargoes were caused by the railroad companies not being able to furnish enough cars. There is a large number—250 to 300 cars or more—constantly under load and tied up in the yards. The embargo is on all kinds of ore, including contracts, but excludes fluxes and mill ores. Large stockpiles have been accumulated. The International smeltery at Tooele had an embargo on from May 19 to Aug. 24, but has had no embargo since. Neither the lead nor the copper furnaces at this plant are being operated at capacity, owing to lack of fuel. It has been impossible to operate the copper furnaces at capacity for some time on this account. The coal shortage has existed on and off for the last year and a half.

LEADVILLE—Oct. 18

Iron and Manganese Discoveries, mainly in the Down Town area, have opened such extensive deposits that the production of these ores is rapidly becoming an important factor in the output of the district. Stimulated by a high market, both for silver-bearing iron and for fair-grade manganese, development has speedily spread to the old properties of the Down Town area—many of them abandoned long ago—and to newer enterprises in other sections of the district, where the presence of these ores has more recently been discovered. Operations at 14 iron or manganese properties have been started during the year, and, with the exception of the Davis shaft on Fryer Hill, which was sunk from surface last spring, all of them are mines prominent in the early days of the district but which have been idle for many years. Of this number, six—the Bohn, Grey Eagle, P. O. S., Northern, Carbonate and Seneca—are in the so-called Down Town area, with the Penrose, which, although active for two years, began production only a few months ago. Important among the others are the Blaine, O. K. and Davis shafts on Fryer Hill, the Bulls Eye on Iron Hill, and the Nisi Prius Nos. 1 and 2, on Rock Hill. These mines now have a combined output of iron and manganese amounting to 425 tons daily. The majority of them are just entering the productive stage and will double their output before the end of the year. Previous to the marked increase in development of such ores, the output of the district was 675 tons daily and was extracted from 13 mines, notably the Star properties on Carbonate Hill, including the Ladder, Star No. 5, Porter, Waterloo Nos. 1 and 2, Yankee Doodle, Catalpa and Crescent. The Home Extension in the Down Town area, the All Right and Jason, on Poverty Flats, the Penn, on Breece Hill, and the Little Chief, on Fryer Hill, completed the list. At this time, the total production of iron and manganese from Leadville mines is 1100 tons daily, practically double that of a year ago. In grade, the material varies from a low product to ore that is now considered fair. The ore just opened in the Down Town area is the best of the recent discoveries, particularly in the Bohn and Grey Eagle. The Bohn shoot, which has been developed to a distance of 60 ft. long and 20 ft. high without reaching the limits of the ore, is rich in manganese and iron. Assays show the ore to contain 40% manganese, 17% iron, and from 6 to 8% silica. The deposit is the largest discovered in the district recently. An output of 50 tons daily is now being maintained and will be doubled within the next few weeks. At the Grey Eagle, two other large shoots have been opened on the 500-ft. level. One of them, an immense body of manganese, is stated to contain from 32 to 38% and as low as 1% silica. The other is an extensive shoot of iron carrying from 10 to 18 oz. silver to the ton. Work is now under way to uncover still another deposit on the 580-ft. level, near the old Bison shaft. Like the Bohn, this property is just beginning to produce steadily and is now putting out 50 tons daily. This tonnage will be greatly increased as development proceeds. The Penrose is now producing 100 tons of iron and manganese from several large stopes recently opened in the upper workings This property of the Down Town Mines Co is shipping four distinct kinds of ore—iron, manganese, zinc carbonate and lead-zinc sulphide, with a combined output of 200 tons daily. The Northern shaft, operated by the Dold Mining Co., is another property in the Down Town area that is just entering upon steady production. At a depth of 800 ft., bodies of iron and manganese have been opened from which a present output of 25 tons is maintained. At the Seneca and Carbonate properties, a good manganese product is being mined, and silver-iron orebodies are being developed. These are the most important among the new discoveries made this year, and form the group from which the big output of iron and manganese ores will be extracted in the future. Of the old producers the Star properties on Carbonate Hill have been shipping iron and manganese ore steadily from the Ladder, Star No. 5 and Porter shafts; a combined output of 300 tons of manganese is now being hoisted daily. The total production of the 83 producing mines in the Leadville district is placed at approximately 61,000 tons a month at the present rate.

WALLACE, IDAHO—Oct. 20

Bunker Hill & Sullivan's Second Furnace at the smeltery at Kellogg was blown in a few days ago. The company has been operating steadily for several months with one furnace. A third furnace, completing the plant as now planned, will be blown in about Nov. 1, giving a capacity up to 600 tons of ore or concentrates a day.

Subscriptions for Liberty Bonds are being urged among mining men in the following letter sent out by Stanly A. Easton, of Kellogg, general manager of the Bunker Hill & Sullivan mine and president of the Idaho Mining Association: "Congress having saved hundreds of thousands of dollars to the mining men of Idaho through the enactment of the law exempting mining claims from assessment work during the current year and 1918, it is up to the mining men to show their patriotism by investing the amount saved in the purchase of Liberty bonds. You can subscribe through any bank, but kindly see that the county chairman of the Liberty Loan committee of your county is notified of your action and that the mining industry receives credit."

PHOENIX, ARIZ.—Oct. 18

Labor Situation at Globe is, practically settled. The labor commission appointed by President Wilson recommended that the strike be called off and the men taken back by the companies. The commission was scheduled to leave for Morenci on Friday night to resume their labors at that place. Formal announcement regarding the terms of settlement under which the men will return to work is expected to be made by Secretary of Labor, W. B Wilson. The men have been on strike in this district since July.

CALUMET, MICH.—Oct. 20

Annual Report for Marquette County of Mine Inspector John T. Quine shows 15 fatal mine accidents for the year ended Oct 1. Total accidents amounted to 832, of which 261 incapacitated the injured for more than 20 days and are classified as serious accidents; of these, 205 occurred underground. Of the slightly injured, 488 were hurt underground Eight of the fatalities occurred underground About 500 more men were employed than in the previous year. Number of men employed on surface was 1842; underground, 3655; quarries, 71. Fatal accidents per 1000 men engaged in the mining industry, 2.3. Number of mines in the county is 117, of which 35 were in operation.

Coal Shipments Are Arriving at a good rate again, and the copper-mining companies in general probably have 80% of their winter needs already at their docks. The Mineral Range R R. is at present handling a cargo of 6000 tons, brought to Portage Lake by boat, for the Mohawk and Wolverine mills at Gay. The Gay Harbor is too shallow to permit of the entrance of heavily laden steamers, and it is therefore impossible to ship the coal directly to Gay by water. The Mohawk and Wolverine have large supplies on hand at their mines, while the Calumet & Hecla, Copper Range, Quincy, Calumet & Hecla subsidiaries and most of the smaller companies are well supplied. The Calumet & Hecla always brings in from 25 to 50% more than its estimated needs. It is understood that this company is getting its coal this season at a remarkably low rate per ton, under $3 in fact, according to report. Shipments of copper-bearing rock from mines to mills are increasing slightly, with labor more plentiful at many of the properties.

Baltic Mining Co.'s Tax Case against Adams Township is scheduled to come up before Judge O'Brien, in the circuit court on Nov. 12. The mining company is seeking to recover taxes paid under protest in 1915, when its valuation was set at $2,600,000. Supervisor F W. Denton, of Adams Township, has attacked the work of the equalization committee contending that, because of the involved ownership of the Champion mine, the St. Mary's Canal Co. owning half the stock, it is not equable to base the value of this property on the quoted value of St. Mary's Canal Co. stock, nor is it equable to assess the mine without considering the stock. It was held by other members of the board that the present method of equalizing the property of mining companies, basing the equalization on average stock quotations for a year, is a fair one, has been in use many years and has been approved by the state tax commission. Mr. Denton, who formerly was the general manager of the Copper Range, seeks to have the taxes of the Copper Range companies reduced, it is believed. The suit brought by the Baltic against the township, after protesting the taxes, and his contention in regard to the equalization of the Champion, would indicate this.

DULUTH, MINN.—Oct. 12

Shipment of Ore on Mississippi River from mines to steel mills will be supervised by the Shipping Board, which will put into operation a fleet of barges. The cost of the project will amount to about $3,000,000. The purpose of the plan is to relieve congestion on the railroads and traffic on the Great Lakes. On return trips, the barges will carry freight to intermediate points.

JOPLIN, MO.—Oct. 20

Interest in New Fields continues. A drill strike of 15% blende east of Asbury, Mo., about 14 miles northwest of Joplin, during a recent week, has increased interest in that field, and there has been a new scramble for leases. The Stoddard Mining Co. has taken lease on 400 acres of land immediately northeast of Columbus, Kan., and will prospect.

Ontario Smelting Co. announces it will soon be in the local lead-ore market. Progress on new refinery just north of Quapaw, Okla., has been delayed, but C. V. Jones, of Joplin, president of company, hopes to have it in operation in December. Buying will be started soon in order that plenty of material may be on hand when needed. It was originally intended to sell all by-products of company and ship the pig lead to Canada, but now arrangements have been made to erect a large blast furnace and run over all slag coming from the Jumbo furnaces.

Mining Land Transfers Continue in this field, despite deterrent of poor market for ore. R. D. Talmage, of Joplin, this week announced sale of a lease situated just northeast of the rich Blue Goose mine tract in Oklahoma field to John R. Baker, trustee for investors of Fulton, Mo. Purchase price was $125,000, to be paid $25,000 at regular intervals beginning as soon as $1000 worth of drilling has been done. This lease is for 5%, which made it particularly attractive. Talmage also was principal in Elk Valley Mining and Development Co., which sold a first lease on 607 acres in the Ozark camp, north of Aurora, Mo., for $15,000, and a one-fourth interest in the company, the buyer being Boston interests represented by B. J. Baker.

TORONTO—Oct. 20

British Mica Supply has been commented upon in a recent report of J E Ray, Canadian Trade Commissioner at Birmignham, England. He notes that Canadian imports are declining at a time when British purchases are on the increase. Though the total imports of mica last year were 46,643 cwt., as compared with 40,565 cwt. in 1912, the supplies from Canada have fallen from 1078 cwt. to 879 cwt. during that period.

Discovery of Gold reported in Eby Township between three and four miles west of Swastika A wide vein is said to carry visible gold. Owing to there being much rock exposure a number of quartz veins occur. The usual rush of prospectors has taken place and many claims have been staked. Preparations have been made by some of the claim holders to erect camp buildings and proceed with surface explorations.

Shifting of Attack on Flotation Patents owned by Minerals Separation has been made by Cobalt mine owners, from the former charges of German affiliation to the ground that the process was not originally available for economic treatment of Cobalt ores. The mine owners demand a Government investigation and have received the endorsement of the directors of the Standard Stock and Mining Exchange of Toronto As the Canadian government is at present undergoing a re-organization, action on their part is likely to be somewhat delayed, but assurances have been received from Hon. Frank Cochrane, Minister of Railways, that in view of war requirements the question will be closely looked into. The main contention of the mine owners and their supporters now is that the flotation process was perfected by Cobalt mineralogists to suit the needs of the district. It is recalled that when a sample of Cobalt ore was tested in the Mineral Separation laboratory in England in 1914, it resulted in the recovery of a concentrate carrying only 43.5 oz per ton, which was altogether unsatisfactory, and that the results now obtained are due to the modifications of the process consequent on local research. The claims of the Minerals Separation corporation for royalties dating back to the period when the process was thus perfected are stated to aggregate $2,000,000, and the daily royalties from present operations are estimated at $2000. The suggestion is made that even if the validity of the patents is sustained, the government should purchase all Canadian rights to the process for the benefit of the mining industry.

EL PASO—Oct. 20

Tentative Embargo Agreement reached in Washington between Ambassador Ignacio Bonillas and representatives of the United States Government has not been approved by the Mexican government. The agreement specifies that shipments of gold and silver would be made to and from Mexico However, what some observers believe caused the hitch at the last moment was the clause prohibiting the reëxportation of this United States gold to any other country. The outcome of the situation is difficult to foresee. At present, American operating companies cannot get bullion out of country. It is understood that Carranza is preparing a counter proposition, but details of what it will be are unknown Sale of 6,000,000 pesos to the United States did not occur as was expected. The United States agreed entirely to the terms proposed by the Mexican government, and it is not known what caused the latter to call off the negotiations.

The Mining News

ALASKA

COPPER SHIPMENTS from Alaska in September amounted to 19,532 tons containing 8,501,806 lb. copper.

ALASKA TREADWELL (Treadwell)—Arranging for treatment at cyanide plant of concentrates from Alaska Jualin Mines Co. and Chicagoff Mining Co. Terms not yet decided At present treating Ready Bullion concentrates and "cleanup" from several mills.

ALASKA UNITED (Treadwell)—Ready Bullion mine produced in August 8155 tons, yielding $21,433; operating expenses, $28,142, operating loss, $6709; construction expenses, $3919, net loss, $10,658 The 700 Claim mine produced no ore, 23 tons concentrate being saved from cleanup Ready Bullion had total of 629 ft. development work done on 450-, 2400-, and 2600-ft. levels; increase of stock of broken ore was 1817 tons.

ALABAMA

Calhoun County

ANNISTON STEEL PRODUCTS CO to be formed by consolidation of Anniston Steel Co., Southern Munitions Corporation, and the Southern Manganese Corporation. Property of Illinois Car and Equipment Co, now under lease by Anniston Steel Co., will be purchased and buildings erected

Jefferson County

TRUSSVILLE IRON CO (Birmingham)—Reopening Nixon mines at Curdup, near Gadsden; expects to ship ore in about 10 days.

GULF PRODUCING CO. (Birmingham)—Struck gas at 230 ft in Aldrich dome in Cahaba Valley. Planned to drill several more holes. C. A. Owens, chairman.

ARIZONA

Maricopa County

RED MOUNTAIN CONSOLIDATED (Prescott)—At annual meeting held in Prescott voted to resume work at once.

NEW TENNESSEE (Chloride)—Completed lateral work on 240-ft. level; sinking to 500-ft. level completed

SWANSEA LEASE (Swansea) — Great Western Smelters Corporation at Mayer is defendant in suit filed by Swansea Lease, Inc., for $15,642, alleged to be due for ore shipped in May, June and July, 1917.

COPPER AGE (Chloride)—Owned by Arizona Ore Reduction Co. Ordered electric locomotive for new working tunnel, which is being widened to 6 ft. Will install own electric generating plant. New mill running one shift. Furnace department 95% complete. E. E. Northrup, superintendent.

Pinal County

SOUTH RAY COPPER (Kelvin) — Ordered hoist and mining equipment preparatory to opening up old Norman or Ripsey mine.

PINAL DEVELOPMENT (Kelvin)—Recently shipped carload of copper ore to the Sasco smeltery of American Smelting & Refining Co.

ARIZONA RAY (Ray)—At recent meeting decided to change name to New Arizona Ray and increase capital stock from one to five million shares.

SHANNON COPPER (Florence)—Operating Alta mine north of Price. Good ore encountered in new shaft at 330-ft. depth. Work suspended temporarily because of labor conditions.

Santa Cruz County

WANDERING JEW (Alto)—New mill in satisfactory operation. Water has been scarce, owing to small rainfall during summer. Ore is lead carrying copper and silver. Belief is that ore will carry more copper with depth. Concentrate shipped to Luna smeltery Tonnage in sight increasing, in spite of shortage of men.

Yavapai County

HALF MOON (Mayer)—Hoist and compressor installed and sinking 500-ft. shaft

BLACK CANYON (Turkey)—Silver-lead orebody opened Drift in ore for 500-ft Face shows 12 ft. of ore. Kansas City men interested.

POCAHONTAS (Mayer) — Operations temporarily suspended pending arrival of hoist and compressor Testing ores for flotation plant Recently financed by W H. Skinner, president.

ANDERSON & BIRCH (Humbolt) — Shipped car of high-grade lead-silver ore recently. Mill treating by flotation, ore averaging $15.

SILVER BELT CONSOLIDATED (Humboldt)—Sinking discontinued at 290-ft. level and drifting begun. Excellent results reported in drift.

JEROME-PORTLAND (Jerome) — Ore reported from face of southwest drift on 500-ft. level; driven through 5 ft. of schist between diorite walls.

ARIZONA BINGHAMPTON (Stoddard) At 500-ft. level extension of main orebody from 400-ft. level has been crosscut. New strike made in raise from 600-ft. level.

CALIFORNIA

Amador County

LINCOLN CONSOLIDATED (Sutter Creek)—Dividend of 10% will be paid from sale of this property to James Hoatson and associates, of Michigan, who have also purchased adjoining property, known as Lincoln-Wildman-Mahoney, situated north of Old Eureka.

Calaveras County

VICTOR LAND AND MINERAL CO. (Angels Camp)—Permitted to issue 50,000 shares to net 32c. per share for payment on Reiner property. Will start development in December.

ALLISON (Melones)—Situated on Carson Creek, west of Melones mine and adjoining the Jones on both sides and ends. Investigation shows orebodies averaging about $5 a ton, with some high-grade ore. Two 5-ft. Huntington mills will be installed. Incorporators are A. W. Copps and John T. Murphy, of San Francisco, and Frank B. Pattee, of Oakdale.

Contra Costa County

PACIFIC ELECTRO METALS CO. (Baypoint)—Will produce silico-manganese and carbon electrodes according to report. Will also produce ferro compounds of manganese, molybdenum and chromium. Two 3000-kw. and three 300-kw. furnaces installed and expect to have a third 3000 kw. furnace in operation in January.

Eldorado County

SEVEN BELLS (Placerville) — Copper property reopened by Christina Copper Co. Developed in early days and shipped copper to Wales. F. C. Fox, of Nevada, superintendent.

Humboldt County

SUNNYSIDE (Eureka) — Work started on foundations and retaining walls of new mill. Dismantling Gold Prince mill, steel frame of which will be used in constructing new mill at Eureka. Expect to continue all winter. Both properties purchased by United States Smelting, Refining & Mining Co.

Plumas County

LUCK (Oroville) — Situated in Granite Basin. Installed 5-stamp mill. Owned by Frank and Charles Toland.

PLUMAS BASIN MINES CO. (Oroville) —Reported United States Exploration company has completed development; operating company found good ore in 300-ft. level. Situated in Granite Basin.

WALKER MINING (Portola)—Completing 16-mi. electric power line. Employing 200 men. Reported labor strike for increase of 50c. a day not serious. Most of employees refused to walk out.

MADERO (Portola)—Copper ore reported mined and stored for shipment. Will develop during winter. Being developed by United States Smelting, Refining, Mining and Exploration Co.

NOBLE ELECTRIC STEEL (Heroult)—Developing high-grade manganese ore in Braito mine. Survey being made for aerial tramway to Indian Falls. Other manganesese deposits in district being prospected.

SENECA CONSOLIDATED — Reported working crew will be decreased as in heavy snow districts, winter work is confined to necessary development. Contract for tunneling 400 ft. on vein will proceed. J. J. Reilly, superintendent, reported to have ordered machinery and supplies, and contemplates installation of cyanide plant.

Sacramento County

NATOMAS CO. (Natoma)—William Vigen arrested on charge of robbing gold-saving tables of dredge near Folsom. Believed to have been working with others, who arranged sale of amalgam in Sacramento. Similar thefts occurred about six years ago, when five men were convicted.

Stanislaus County

SIERRA & SAN FRANCISCO POWER CO. authorized by State Railroad Commission to use $450,000 obtained from sale of 5%, 40-year gold bonds for purchase of Lagrange division of Yosemite Power Co. Mines and gold dredges in district using electric power.

Tuolumne County

COLUMBIA MARBLE (Columbia) — Shipping marble to New York. Reported contracted for shipping 75 tons to Kansas City.

CHROME ORE from several deposits in Jamestown district being shipped to Chicago. Eight lots shipped in first half of October by W. E. Booker, Richard brothers, Mr. Quigg and T. J. Williams.

COLORADO

Boulder County

GRANDVIEW (Ward)—Leased to C. J. Walter and being reopened.

INDEPENDENCE (Eldora)—Will be reopened. Henry Martin, of Nederland, in charge.

MODOC (Ward) — Leased to George Hackstaff & Co. of Denver. Remodeling mill and installing flotation equipment.

MOORE MINING AND MILLING CO. (Sugar Loaf)—Crosscut tunnel advanced total of 500 ft. Estimated about 40 ft. further to cut Livingstone dike.

UTICA MINING AND MILLING CO. (Ward)—Incorporated for $250,000 to develop property. Main shaft being unwatered, with steam pumps and bailer. Buildings repaired. Contemplates installation of electric power. May remodel old mill and erect aerial tramway. Will also reopen Stoughton mine; now employing 15 men constructing shaft house and overhauling 80-hp. steam plant. C. A. Neal, superintendent.

Clear Creek County

LAKE (Idaho Springs) — Lessee retimbered old workings and installed hoist and air lines. Developing and shipping. Lake dump at lower tunnel sub-leased to W. White. Block of ground in Tunnel No. 1, in Virginia Canyon, leased to Clarence Marchington.

Ouray County

BARSTOW (Ironton)—Opening up fluorspar deposit at unusual depth of 1100 ft. Vein cuts across main vein and shows 3 ft. high-grade fluorspar. Not sufficient development done yet to prove extent. Leased by Engineers' Corporation of Boulder, represented by H. S. Thayer, of Boulder.

San Juan County

SHIPMENTS FROM SILVERTON for September as follows: To outside smelters, Sunnyside and Silver Lake custom mill, 24 cars each; Mears-Wilfley mill, 22 cars; Iowa-Tiger, 19; Koehler, 18; Barstow Leasing, 17; Mayflower Leasing, 9; Highland Mary, 5; Summit, 4; Dives Leasing and Pride of the West, 3 each; Congress, [illegible]; Snow Flake, 2; Ohio and Oklahoma, Pittsburg, S. D. & G. Lease, Big Giant, K. Leasing Co., Stockton, Colorado Metals, St. Paul, Skoog Brothers, Plata Rey Leasing Co., Hicks Brothers, Wyoming, Telescope Mining and Milling, North Star, Allerton, George Boss & Co., 1 car each; miscellaneous small shipments, 19 cars; total, 189 cars. The Silver Lake custom mill received the following shipments: From Congress, 26 cars; Barstow, 17; Carbonate King, 11; St. Paul Leasing, 10; Guston, and Champion Leasing Co., 3 each; Allen & Fattor, 2; Paymaster, Nero, Pittsburg, and Summit Copper, one car each; total, 76 cars. The North Star mill received the following shipments: S. D. & G. Leasing, 47 cars; Guston, 7; Koehler Tunnel, 5; total, 59 cars. Grand total for the month, 324 cars of ores and concentrates.

San Miguel County

SHIPMENTS FROM TELLURIDE during September, as follows: Smuggler-Union, 32 cars; Black Bear, 33; these concentrates shipped to Pueblo, Florence, and Durango. Tomboy shipped 55 cars to Pueblo and one to Durango. Liberty Bell, 11 to Durango. Carruthers Lease, one to Durango. Total 133 cars. Shipments for September, 1916, were 124 cars.

LEWIS MINING AND LEASING CO. (Telluride)—Organized to operate Lewis mine in Bridal Veil Basin. Shaft being unwatered and flotation equipment ordered.

Summit County

DRILLING ON YUBEDAM FLATS near Breckenridge, for extension of blanket vein opened in Fox Lake, Mollie B and Sultana mines. Blanket vein, producer of gold-bismuth ore.

Teller County

HIAWATHA (Victor)—This Beacon Hill property developed by Charles Hill and associates. Shipping.

CRESSON (Cripple Creek)—Rich oreshoot, may be extension of high-grade shoot on 14th level, opened on 15th.

BIG TOAD (Cripple Creek) — Operating Dante mine under lease; will have Reed mill ready to operate in 60 days.

PORTLAND (Victor) — Will receive shipments of custom ore at Independence mill within 30 days. Has adopted semi-monthly pay day. G. M. Taylor, mill manager.

ROOSEVELT TUNNEL (Victor)—Advanced 166 ft. during September; heading passed out of Big Banta claim of United Gold Mines and entered Rose claim of Rose Nicol Gold Mining Co. Back of tunnel near breast is dry, but water is up 4 ft. above track. Flow at portal, 5123 gal. per min. Charles Fuller, superintendent; T. R. Countryman, consulting engineer.

IDAHO

Shoshone County

TAMARACK & CUSTER (Wallace)—Capitalized for 2,000,000 shares and 1,776,250 issued. Large surplus used in purchase and remodeling of Northport smeltery, of which company owns half.

HYPOTHEEK (Wallace)—Situated near Kingston. Has 5-ft. shipping ore on intermediate level between 900-ft. and 1100-ft. and new ore found in extending drift east on 900-ft. level. Diamond drill located parallel vein from 1200-ft. level, having 4 ft. of ore, showing 20.5% lead. Debt reduced from $132,500 to $48,000 and balance will be paid by Jan. 1. Present output, 25 tons crude ore and concentrates per day.

ST. LAWRENCE (Wallace, Idaho) — Angus Sutherland made final payment on bond for half interest, amount being $8000 and is now sole owner. Situated near Saltese, Mont., being operated under option for $50,000, held by H. M. Lancaster. Ore is copper; shipping to Tacoma smeltery, two carloads a week. Two crosscut tunnels being run, one to cut vein about 150 ft. below present tunnel in about 60 days, and other will be permanent working adit, 700 ft. below present workings.

MICHIGAN

Copper

NEW BALTIC (Houghton)—Has now large tonnage between drifts.

LA SALLE (Calumet)—Long drifts toward old Osceola showing good copper. Output of rock close to 15,000 tons monthly.

ISLE ROYALE (Houghton)—Daily tonnage little over 2600. Sinking of five shafts becoming intermittent owing to lack of men.

BEAR LAKE "POOL" (Calumet)—Starting another diamond drill hole, as caving and large inflow of water prevented continuance of first at 500-ft. depth.

WINONA (Winona)—Averaging 300 tons daily. H. W. Fesing, mining engineer and stockholder, protests in open letter to directors against leasing No. 1 King Philip shaft area.

AHMEEK (Ahmeek) — North Ahmeek furnishes 40% of total, which may be 110,000 tons this month. Rock maintains its quality. Both fissure veins producing. Mill has two heads, permits of increase in output.

NEGAUNEE (Negaunee)—August Lisko reported killed, on Sept. 15, by fall of ground.

MINNESOTA

Cuyuna Range

NORTHERN MINNESOTA ORE CO. (Deerwood)—Has 12 fee interests on Cuyuna, eight already drilled showed good iron and manganiferous ores. Four leased on royalty basis. One property on Mesabi range leased to Oliver Iron Mining Co. Charles W. Potts, of Deerwood, president; H. M. Miller of St. Paul, secretary and treasurer. General office, Pioneer Bldg., St. Paul.

Menominee Range

M. A. HANNA CO. holds option on property known as Russel farm near Ravenna property. Orebody discovered said to be high-phosphorus, non-bessemer grade. One of three drills still in operation to determine extent of deposit and average grade. Expect renewed activity in district as result of discovery.

MISSOURI

Joplin District

INTERSTATE (Miami, Okla.) — Constructing 200-ton mill on Smith land, 4 miles west of Picher, Okla., in new territory.

BUTTE-KANSAS (Joplin) — Rebuilding 400-ton Meadeville mill, moved from Carterville, on lease of Bennett land at Waco.

MUSKOGEE LEAD AND ZINC (Quapaw, Okla.)—Sinking new shaft 25 ft. a week; will construct mill soon.

ADMIRALTY ZINC (Douthat, Okla.)—Opened richest zinc- and lead-lined cave in district's history.

COYNE, BALL & CO. (Webb City)—Sinking big drill hole at lease at Waco, Mo., where rich ore disclosed; will install Pomona pump while sinking.

ANNA D. (Stinsonville, Mo.)—Unworked since 1907, recently leased by I. L. Burch, of Joplin, and associates. Drains ground where good drill strikes made recently.

FORT WORTH (Miami, Okla.)—Building 200-ton mill on lease adjoining Mihomi, south of Picher, Okla. Two shafts in 35-ft. orebody. E. T. Renfrow, of Miami, and Forth Worth men, own property.

ONAMENA (Webb City)—Started No. 4 mill at Duenweg; delayed by late machinery shipments. Operations at 208 ft. depth, where sheet-ground run developed. Operating two other mills. George J Kusterer, Webb City, manager

METROPOLITAN ZINC (Wentworth)—Re-erecting North American 300-ton mill on lease just north of Georgette tract, one mile northeast of here. Ground drilled and 165-ft. drift shows 25-ft. ore face averaging 4% in sulphides. George Saunders, manager.

HARE MINING AND MILLING (Miami, Okla.)—Will start 300-ton mill operating west of Picher, Okla., by Nov. 10. Steam plant with Bessemer engines. Machinery on concrete foundations, but concrete base for mill only few feet above ground with heavy timbers to sill. This because in instances 10 ft. or more concrete pillars have crumbled under mills in this camp in recent months. Equipment includes 50 ft. Dorr thickener and 12 Butchart tables. Later a Butchart flotation machine will be tried. A. S. Hunsiker, manager.

MONTANA

Mineral County

TARBON (Saltese)—Shaft nearing 800-ft. level. Will build flume and pipe line for water power for contemplated mill. Silver, lead and zinc ore opened. Concentrator not yet completed.

Sanders County

VERMILION SILVER AND LEAD CO. (Trout Creek)—Building 40-ton mill using, 5-ft. ball mill instead of stamps, crusher, amalgamating plates, flotation apparatus and three concentrating tables. Vein, traced 2000 ft. on surface, developed by two tunnels; upper has been explored for 350 ft. and lower, 300 ft. Ore is galena carrying gold and silver. William Kittrell, superintendent.

Silver Bow County

ANACONDA (Butte)—Reported mines operating at about 75% normal capacity. Number of men returning to work is increasing daily. Hoisting about 11,000 tons daily.

MOOSE MINING AND MILLING CO (Butte)—Filed articles of incorporation on Oct 10 Capital stock $75,000, divided into 1,500,000 shares at 5c. each Directors are: Thomas W Clayton, of Wallace, Idaho; John M. Elliopulon, T N Bailey, C Lucas and Fenner Tidball, of Butte.

BUTTE & SUPERIOR (Butte)—On Oct 13, Percy Lebeau, electrician at Black Rock mine was killed by 2200-volt current Lebeau and partner were splicing wires when he touched live wire. In falling down pole, struck his partner, causing both to fall. Latter is recovering in local hospital.

NEVADA

Elko County

TECOMA CONSOLIDATED MINING (Tecoma)—Formerly worked in 1873, producing lead-silver ore from workings 60 ft. deep; also tonnage of oxidized zinc ore blocked out from parallel vein. Main shaft sunk 100 ft. by present operators and machinery purchased for sinking to 500 ft. Eleven carloads shipped since June. C. S. Woodward, manager. General offices, 1407 Walker Bank Bldg., Salt Lake City, Utah.

Esmeralda County

COPPER DISCOVERY near Goldfield stimulated activity in this section.

Nye County

TONOPAH ORE PRODUCTION for week ended Oct. 13 amounted to 8982 tons, valued at $157,185, comparing with 8914 tons the previous week. Producers were: Tonopah Belmont, 2322 tons, Tonopah Mining, 2250 tons; Tonopah Extension, 2380 tons; Jim Butler, 800 tons; West End, 902 tons, Montana, 134 tons; Rescue, 191 tons.

WHITE CAPS (Manhattan)—Drift 317 ft. from shaft now in 50 ft. in east orebody showing good ore

MANHATTAN RED TOP (Manhattan)—Will install Cameron sinking pump, recently shipped from San Francisco. Large amount of water coming from broken formation.

NEW MEXICO

EMPIRE COPPER (Santa Rita)—Voluntary dissolution filed with State Corporation Commission

ATWOOD (Lordsburg)—This and Valedon mine sold to Globe, Ariz interests Will begin operations soon

SILVER BELL (Lordsburg)—Lease and option secured by H H Sholly from G Trimmer owner Will begin work Oct 1

NEW MEXICO MINING AND MILLING CO (Hanover)—Working on Mountain Home group adjoining Empire Zinc on west.

OREGON

Jackson County

CEMENT PLANT, at Gold Hill, will reopen, and are overhauling machinery; 85 men required to operate plant.

BLUE LEDGE (Medford)—Ladysmith smeltery syndicate negotiating for last several months for purchase of this copper mine; announced deal is off. Towne estate, owners.

Josephine County

CHROME DEPOSITS near Holland being developed by R. Grimmett. Hauling to Waters Creek, terminal of California-Oregon Coast R.R. Many other small chrome deposits being developed by local parties.

REYNOLDS COPPER (Waldo) — L. Whitsett and Tony Ross of Gold Hill, Ore., leased this copper mine. Owned by A. C. Wertz and I. A. Reynolds. Shipping point is Waters Creek, 20 miles distant. Consists of five claims.

SOUTH DAKOTA

Fall River County

REFINITE (Ardmore)—Plant for treatment of kaolin will be in commission in 30 days. Capacity 10,000 lb. dried product per day.

Lawrence County

NEW PURITAN (Deadwood)—Machinery being added to present equipment; expected to have mill ready for operation by Jan. 1. Will have capacity of 100 tons per day by cyanidation.

TENNESSEE

AMERICAN ZINC (Mascot) — Said to have made settlement with Minerals Separation. Past infringements of flotation patents adjusted by payments of certain sums at intervals during next 12 months. Director D. C. Jackling reported to have resigned because of the settlement, with which he was not in sympathy.

TEXAS

SULPHUR DEPOSIT about 35 miles north from Kent on the Texas & Pacific Ry. has been found by cowboys during a "round up" acording to report from Toyah. H. L. Frost and I. E. Brown, of Toyah, have staked large area.

UTAH

Juab County

TINTIC STANDARD (Eureka) — Shipping about 300 tons weekly.

CENTENNIAL-EUREKA (Eureka) — Closed down four days owing to car shortage; again operating.

Salt Lake County

SOUTH HECLA (Alta)—Conditions satisfactory, but transportation difficult.

SELLS (Alta)—Shipping two cars weekly; transport conditions prevent increase in this amount.

KENNEBEC CONSOLIDATED (Salt Lake)—Company reorganized, and Ezra Thompson, of Cardiff mine, president. Situated near Cardiff.

COLUMBUS REXALL (Alta) — New strike showing improvement. Stated ore in No. 3 south drift 20 ft. across. Car being loaded. Hauling to railroad direct.

MICHIGAN-UTAH (Alta)—Arranging to haul by teams from the Tanners Flat end of aerial tramway, to terminus of Salt Lake & Alta railroad at Wasatch. Railroad unable to meet camp requirements. Shipping 250 to 300 tons weekly, which can be increased when desired.

MONTANA BINGHAM (Bingham) — Mill reported to have been brought up to 200-ton daily capacity Two cars of concentrates and two of shipping ore from Fortuna workings on way to market and several cars awaiting shipment Tunnel approaching Mayflower vein, will be connected with Fortuna workings 1400 ft. above. Shipping ore reported in Valentine end of property also.

Tooele County

WESTERN UTAH COPPER (Gold Hill) —Shipping 200 to 300 tons ore daily.

DEEP CREEK COPPER KING (Gold Hill)—Strike of high-grade copper ore on Moonlight claim reported

WESTERN UTAH COPPER EXTENSION (Gold Hill)—Tunnel opened good grade copper ore

POLE STAR (Gold Hill)—Two cars of ore shipped week ended Oct. 6, more ore at loading station.

WESTERN UTAH EXTENSION COPPER CO. (Gold Hill)—Incorporated in Delaware; capitalization, $2,500,000 Has 15 lode claims situated in Clifton district developed by tunnel on National Claim, and tonnage of ore ready for shipment Churn-drill testing depth of veins. Reports of engineers are favorable P S Chambers, president; A E. Custer, general manager Western office, Newhouse Building, Salt Lake City, Utah.

WISCONSIN

Zinc-Lead District

NEW ROSE (Platteville)—Considering removal of mill to Seitz land, where churn drill indicated zinc ore.

IDA BLENDE (Benton)—Claude Musselman and associates moving Long Range mill to this old producer.

COULTHARD (Cuba City)—John Anthony and others developing Dahl and Coulthard tracts; penetrated body of zinc ore by shaft just west of Dahl mine.

KRAEMER (Platteville)—James Harms and local company found zinc ore in several drill holes on this tract southeast and adjoining the Blockhouse.

CANADA

Alberta

PEACE RIVER OIL CO. (Peace River) —Oil struck at well, 12 miles from Peace River village at depth of 980 ft. Report confirmed by Board of Trade, after inspection of well. Pumping capacity, about 100 bbl. per day.

British Columbia

CONSOLIDATED MINING AND SMELTING CO. (Trail)—Receipts of ore amount to 12,594 tons for first week in October. Because of overstock, cannot accept more silver ore carrying over 4% in zinc from independents. Has affected silver-lead production and many mines will close unless situation is relieved. Provincial and federal governments asked to take action.

Manitoba

McCAFFERTY CLAIMS (Herb Lake)—Shaft being put down 50 ft.

MANDY (Schist Lake)—Contracted with B. Morgan for taking out 7500 to 10,000 tons copper ore during winter. Will be hauled by teams to Sturgeon Landing, 40 miles distant, and thence shipped by boat to The Pas, next season.

Ontario

ORE SHIPMENTS from Cobalt for September over Temiskaming & Northern Ontario Ry. as reported by Arthur A. Cole, mining engineer, were: Alladin Cobalt, 64 tons; Buffalo, 32; Buffalo Silver Queen, 25; Coniagas, 93; Dominion Reduction, 387; Hudson Bay, 33; Kerr Lake, 60; La Rose, 139; Mining Corporation o. Canada, 86; McKinley-Darragh, 236; National Mines, 27; Nipissing, 915; O'Brien, 32; Penn Canadian, 53; Right of Way, 51; Temiskaming, 33; Trethewey, 63; total of 2334 tons from Cobalt proper; Miller-Lake-O'Brien (Elk Lake), 34 tons; Alexo mine (Porquis Junction), 477 tons.

KERR LAKE (Cobalt)—Producing about 7000 oz a day.

DAVIDSON (South Porcupine)—Contracted for 5000 ft. additional diamond drilling

LA ROSE (Cobalt)—Will dissolve American corporation and transfer assets to La Rose Mines, Ltd, the operating company which has Ontario charter

McKINLEY DARRAGH (Cobalt)—Drifted for over 300 ft in ore on Cobalt Lake fault New flotation plant will not be operated on tailings until next year

MINING CORPORATION (Cobalt)—Profits for the first eight months of 1917 are $1,786,011, as against $1,205,276 for corresponding period of 1916. Optioned Waldman claims

DOME EXTENSION (South Porcupine) —Option held by Dome definitely dropped on account of inability to develop property because of labor shortage Two Dome shareholders own over 50% of Dome Extension, so option can be taken up again

DOME (South Porcupine)—Report for six months ended Sept 30, shows net of $164,863 and for September, $35,000. Cash on hand is $108,000, supplies valued at $315,000 Open pit work will be stopped for winter and mill capacity will be down to 15,000 tons a month of $5 to $6 grade There are 300,000 tons of $6 ore broken in stopes Drift on 7th level passed 10 ft over top of orebody cut by diamond drilling

Quebec

CANADIAN UNION (Quebec) — New company with million dollar capital formed to operate iron mines near Sutton, Quebec

MEXICO

BOLEO (Santa Rosalia, Baja Calif)—Production of copper for September amounted to 1,151,880 lb., comparing with 1,433,040 lb. for August

VENEZUELA

CARRIBEAN PETROLEUM CO. (Caracas)—Reported to have started oil refinery in operation at San Lorenzo, 60 miles south of Maracaibo, on Aug 16. Has struck oil in 19 wells Company is subsidiary of General Asphalt Co. of Philadelphia.

The Market Report

SILVER AND STERLING EXCHANGE

Oct.	Sterling Exchange	Silver		Oct.	Sterling Exchange	Silver	
		New York, Cents	London, Pence			New York, Cents	London, Pence
18	4 7515	84⅜	42⅞	22	4.7515	83	42⅛
19	4 7515	83⅞	42⅝	23	4 7515	82½	41⅞
20	4.7515	83½	42⅜	24	4.7515	82½	41⅞

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

DAILY PRICES OF METALS IN NEW YORK

Oct.	Copper	Tin	Lead		Zinc
	Electrolytic	Spot.	N. Y.	St. L.	St. L.
18	*23½	61⅜	6.25 @6.75	6.42½ @6.75	7 80 @8 00
19	*23½	61½	6 25 @6.50	6.20 @6.40	7 75 @7.95
20	*23½	61½	6.00 @6.25	6.00 @6.25	7¾ @7⅞
22	*23½	61½	6 00 @6.25	6.00 @6.25	7⅝ @7⅞
23	*23½	61½	5⅞ @6⅛	6 @6⅛	7⅝ @7⅞
24	*23½	61½	5 50 @5.55	5.42½	7⅝ @7¾

* Price fixed by agreement between American copper producers and the U. S. Government, according to official statement for publication on Friday, September 21, 1917.

The above quotations (except as to copper, the price for which has been fixed by agreement between American copper producers and the U. S. Government, wherein there is no free market) are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

The quotations for electrolytic copper are for cakes, ingots and wirebars.

We quote electrolytic cathodes at 0.05 to 0.10c. below the price of wirebars, cakes and ingots.

Quotations for spelter are for ordinary Prime Western brands. We quote New York price at 17c. per 100 lb. above St. Louis.

Some current freight rates on metals per 100 lb. are: St. Louis-New York 17c.; St. Louis-Chicago, 6.3c.· St. Louis-Pittsburgh, 13.1 cents.

LONDON

Oct.	Copper			Tin		Lead	Zinc
	Standard		Electrolytic				
	Spot	3 Mos.		Spot	3 Mos.	Spot	Spot
18	110	110	125	249	247	30½	54
19	110	110	125	249	248	30½	54
20							
22	110	110	125	248¼	247¼	30½	54
23	110	110	125	247¼	246¾	30½	54
24	110	110	125	247¾	247¾	30½	54

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2,240 lb. For convenience in comparison of London prices, in pounds sterling per 2,240 lb., with American prices in cents per pound the following approximate ratios are given, reckoning exchange at $4.75½. £30½ = 6.474c.; £54 = 11.462c.; £120 = 25.473c.; £137 = 29.082c.; £240 = 50.946c. Variations, £1 = 0.212277c.

Metal Markets

NEW YORK—Oct. 24

Lead again occupied the center of the stage, a spectacular decline being experienced. Tin was about stationary, while zinc was rather weaker. Respecting copper, nothing need be said.

Copper—Government orders have been received from day to day, and some further requisitions by the Allies were entered. The requirements of domestic manufacturers have been so adjusted that they have been taken care of very well.

The administration of the copper business has now been pretty well organized. The Copper Producers Committee is the controlling and distributing body. The actual business is done through the United Metals Selling Co. and the American Smelting and Refining Co., which have become practically the business agents in the dealings with the governments. The United Metals Selling Co. handles the business with the United States Government, while the American Smelting and Refining Co. takes care of that for the foreign countries. Orders being received, these agents requisition the several producers to fill the orders according to information respecting their ability to supply just the kinds and shapes of copper that are needed. There is no question about the several producers obtaining their proper share of business, for there is not enough copper to meet the demand, if the demand were free. The United Metals Selling Co. and the American Smelting and Refining Co. render their bills to the respective governments, and upon receipt of the money they remit to the producers who have filled the orders. These two concerns are therefore clearing houses for the business. Domestic orders are billed and payment is collected by the individual producers in the old-fashioned way. All of the copper is sold at 23½c., f.o.b., New York, cash basis. In deliveries to domestic consumers, the business is done on that basis, and freight is added, while, in the event of a desire to arrange for payment in any other way than cash against bill of lading, private arrangements covering interest charges, etc., are made.

In order to facilitate business with the Government, the Copper Producers Committee has established an office in the Munsey Building, in Washington, D. C., with Edward Mosehauser, of the United Metals Selling Co., in charge.

Copper Sheets are quoted at 35c. per lb. for hot rolled, and 1c. higher for cold rolled. Wire is quoted nominally at 31c. per lb., f.o.b. mill.

Tin—Business in Straits tin was insignificant and there was scarcely any change in price. More business was done in the lower grades of tin, and the previous differential for them contracted At the close, Straits tin was quoted at 61½c., Banka at 60c. and Chinese at 58c., the last having risen from 56½c. at the beginning of the week.

Lead—At the close of last week, the price had already sunk below that of the American Smelting and Refining Co., which was maintained at 7c. During the morning of Thursday some sales were made at 6¾c., but that was subsequently shaded, and during the afternoon the American Smelting and Refining Co. announced a cut to 6½c., immediately after which lead was offered in New York at 6¼c. This sharp decline failed to develop any considerable business, and by Saturday lead was being freely offered at 6@6¼c. On Monday, some rather large sales, including one round lot for export, were made at 6c., New York, December delivery, while some November lead was reported sold at the same price, but the broad market was not yet quite so low. A firm bid for a round lot at 6c., St. Louis, failed to secure it. A similar irregularity was noted on the following day, when a round lot for prompt delivery was sold in the New York market at 6c., while a bid at the same price in St. Louis did not find anybody to accept it. Early on Wednesday it was in the air that the American Smelting and Refining Co. was going to make another cut, and one producer accepted 5.55c. for a fairly large lot. About 11 a.m. the news became public that the American Smelting and Refining Co. had reduced its price to 5½c. This drastic cut rather staggered the trade, and, although during the day there was considerable inquiry for carload lots for prompt delivery, for which a premium of $2 a ton was asked and was paid, no business of major character developed. It is thought, however, that such business will develop as soon as consumers become accustomed to the new figure, at which the market is considered to be on bed-rock. Certain important producers declared themselves out of the market at this price.

The reason for this spectacular decline is simple. Stocks of lead were accumulating and certain interests were unwilling to carry an accumulation at the prices prevailing recently. Therefore, they steadily offered the market down, fishing for the level at which buyers would be interested. The American Smelting and Refining Co. trailed afterward, seeing each of its reductions immediately undercut, and finally took the bull by the horns, making a drastic cut to what it conceived to be a minimum figure, looking for stimulation of demand and a rebuilding of the market from the low level. On the decline from 9c. but very little lead was sold. Around 8c. there was one time when a rather large tonnage was placed, and it looked for a day or two as if the market had come into equilibrium, but such proved not to be the case, and on the further decline from 8 to 5½c. the aggregate of all sales was relatively small.

Within a day or two the sale of 2400 tons to the Russian government was concluded. This, however, is not new business, being simply an acceptance of the offer made on Oct. 2.

All arrangements between the United States Government and the Lead Committee expire on Nov. 1, and no provisions for further supplies to the Government have been made. The Government has not yet arranged for its November lead requirements in any way.

The Federal Lead Co. closed its No. 4 mill (3000 tons daily capacity) at Elvins, Mo., as we reported last week, and discharged 800 men. This action was taken owing to the unfavorable situation in the lead market. Stocks of pig lead are steadily increasing at the smelteries in Missouri, and the Joplin mills are unable to sell their galena concentrates, buyers being out of the market.

Zinc—This market was again dull, although there were transactions in 100-ton lots nearly every day, and occasionally a 250-ton lot. Stocks continued to accumulate and spelter for prompt delivery is pressed for sale, being freely offered at 7⅝c. at the close, while 7¾c. was asked for future delivery.

Zinc Sheets—Price of zinc sheets has not been changed. Market is still at $19 per 100 lb. f.o.b. Peru, Ill., less 8% discount.

Aluminum—This market continues dull with small transactions taking place at 37@39c. per lb. for No. 1 ingots at New York.

Antimony—This market was lifeless and somewhat lower. We quote spot at 14½c., and futures at 13½c., c.i.f., in bond. China is not offering. Winter conditions, low water, etc., will soon restrict output. Moreover, the high and shifting price of silver is disturbing Chinese operations.

Bismuth—Unchanged at $3.50 per pound.

Cadmium—This metal is quoted at $1.40@1.60 per pound.

Nickel—Steady at 50c. per lb., premium of 5c. per lb. for electrolytic.

Quicksilver—Firmer at $100@102. Stocks in this market are light. Considerable demand is developing, and the opinion in the trade is that the price might get higher but for fear of Government regulation. In consequence of that fear, there is little speculative buying. San Francisco reports, by telegraph, $101, firm.

Silver—Tendency of this metal has been downward owing to absence of demand, except at daily concessions in prices. Today the market seems more steady at the decline with some business based on 41⅞d. per oz. at London. Shipments to London last week were about 500,000 ounces.

Mexican dollars at New York: Oct. 17, 64c.; 18, 63¾c.; 19, 63½c.; 20, 63c.; 22, 62½c.; 23, 62¼c.; 24, 62¼c.

Platinum—Quiet and unchanged at $103@105.

Palladium—A brisk demand, with sales reported at $120@125.

Zinc and Lead Ore Markets

Joplin, Mo., Oct. 20—Blende, per ton, high, $74.10; basis 60% Zn, premium, $75; medium to low, $70@60; calamine, per ton, 40% Zn, $38@35; average selling price, all grades of zinc, $61.42 per ton.

Lead, high, $84.30; basis 80% Pb, $80; average selling price, all grades of lead, $81.21 per ton.

Shipments the week: Blende, 8203 tons; calamine, 368 tons; lead, 665 tons.

Value, all ores the week, $580,440.

All mines using electric current were idle all week, and a number using coal were compelled to cease milling to have enough coal to keep pumps going. It is estimated the output was cut in two this week, while purchases were continued as usual. The shipment has varied but little in several weeks.

Platteville, Wis., Oct. 20—Blende, basis 60% Zn, declined to $62 base for premium grade down to $57 base for medium grade. No sales or offerings of lead ore are reported. Shipments reported for the week are 2851 tons of zinc ore, 85 tons of lead ore, and 821 tons of sulphur ore. For the year to date the figures are: 116,926 tons of zinc ore, 6201 tons of lead ore, and 23,071 tons of sulphur ore. Shipped during week to the separating plants, 3785 tons of zinc ore.

Other Ores

Manganese Ore—Continues in good demand at $1 per unit for metallurgical ore on the basis of 48% manganese. Chemical ore of good quality was reported sold in large quantity at prices of about $100 per ton.

Molybdenum Ore—A little more molybdenite was offered than in previous weeks, but there was no difficulty in obtaining the old price of $2.20 per lb. on the basis of 90% molybdenum sulphide. No sales of lower grade material were reported.

Pyrites—Spanish lump quoted at 15c. per unit, on basis of 10s. ocean freight, buyer to pay war risk. Cargo of Spanish ore sold on above basis for delivery at northern port, ocean freight amounting to 35s. Ocean rates now fixed by British government are 35s. for Northern, 40s. for Southern and 42s. 6d. for Gulf ports; these are practically the rates that have prevailed for some months; no U. S. ships yet allotted for this service. Domestic ore has recently sold in Georgia for 25c. for lump and 23c. for fines, f.o.b., point of origin. Sulphur is still being supplied at $22, f.o.b. mines in Louisiana and Texas for certain fertilizer works.

Tungsten Ore—We quote high-grade (70%) unchanged at $23@25. A fair amount of business was done in scheelite, for which $26 was paid. Wolframite assaying 65% was sold at $22, not guaranteed as to impurities. A lot assaying 62 to 63%, 3 to 4½% of tin, and 0.1% copper, fetched only $20.

Iron Trade Review

PITTSBURGH—Oct. 23

Government orders for steel are being placed in somewhat larger volume, but details of individual transactions are withheld by request of the Government. Considerably less inconvenience attends the filling of Government orders than formerly, as the mills are getting more used to giving the priority required, and the pressure from the general trade for deliveries is decidedly relaxed, though still rather great. The Navy Department is about to allot a large tonnage of sheets, running well into five figures.

No additional steel prices have been announced at Washington. Prices for wire products, sheets, tubular goods and scrap have been awaited for more than a week. It is stated that price recommendations on these products have passed through the War Industries Board and are in the hands of the President, but it is rumored that another meeting on the subject is to be held in Washington tomorrow.

Pig Iron—Altogether there has been a fair volume of business done in valley pig iron since prices were fixed, there having been about 50,000 tons of bessemer and basic sold, with quite a number of small lots of foundry iron, all for early deliveries. Consumers are more incommoded by railroad embargoes, affecting deliveries of iron already bought, than by inability to buy in the open market. Furnaces assert that they will take good care of regular customers. Production is about the same as formerly, restricted by shortage of coke. We quote basic and foundry at the set price of $33, valley, and bessemer at the tentative price of $36.30, valley, prices delivered Pittsburgh being 95c. higher. An announcement at Washington as to other grades as well as other districts is still awaited, the recommendations of the blast furnacemen having been placed before the War Industries Board three weeks ago.

Ferroalloys

Ferromanganese—Rumor has it that a ferromanganese price of $285 has been recommended to the War Industries Board by the manufacturers. The Government would prefer a lower price, but in the absence of means for controlling the cost of ore no drastic reduction may be made. The market has been extremely quiet, consumers having stocks equal to several months' consumption and being less disposed than formerly to maintain large stocks. While $340 was quoted as the spot market 10 days ago $325 is now freely quoted and it is probable some material could be picked up at $300.

Coke

Connellsville — Last week's car supplies were poor, but this week, the third week of the priority order in favor of cars for the Connellsville coke region, the outlook is improved. There is heavy inquiry—more than for a fortnight—while offerings are limited. A differential for foundry coke above furnace coke has not been announced. Occasional sales of furnace coke are being made, and at the set price of $6 per net ton at ovens. Now and then a carload of foundry coke is sold at this price, purely as an accommodation.

MONTHLY AVERAGE PRICES OF METALS

Silver	New York			London		
	1915	1916	1917	1915	1916	1917
Jan.	48.855	56.775	75.630	22.731	26.960	36.682
Feb.	48.477	56.755	77.585	22.753	26.975	37.742
Mar.	50.241	57.935	73.861	23.708	27.597	36.410
April	50.250	64.415	73.875	23.709	30.662	36.963
May	49.915	74.269	74.745	23.570	35.477	37.940
June	49.034	65.024	76.971	23.267	31.060	39.065
July	47.519	62.940	79.010	22.597	30.000	40.110
Aug.	47.163	66.083	85.407	22.780	31.498	43.418
Sept.	48.680	68.515	100.740	23.591	32.584	50.920
Oct.	49.385	67.855		23.925	32.361	.....
Nov.	51.714	71.604	.	25.094	34.192	.....
Dec.	54.971	75.765	..	26.373	36.410	.. ..
Year	49.684	65.661		23.675	31.315	.

New York quotations cents per ounce troy, fine silver. London, pence per ounce, sterling silver, 0.925 fine.

Copper	New York		London			
	Electrolytic		Standard		Electrolytic	
	1916	1917	1916	1917	1916	1917
Jan.	24.008	28.673	88.083	131.921	116.167	142.895
Feb.	26.440	31.750	102.667	137.895	133.167	148.100
Mar.	26.310	31.481	107.714	138.750	136.000	151.000
April	27.895	27.935	124.319	133.842	137.389	147.158
May	28.625	28.788	135.457	130.000	152.522	142.000
June	26.601	29.962	112.432	130.000	137.455	142.000
July	23.865	26.620	95.119	128.409	125.500	140.409
Aug.	26.120	25.380	110.283	122.391	128.304	137.000
Sept.	26.855	25.073	113.905	117.500	134.071	135.250
Oct.	27.193	.	122.750		142.523	
Nov.	30.625	.	134.659		155.432	.
Dec.	31.890	. ..	145.316	.	162.842	
Year	27.202	.	116.059		138.281	.

Tin	New York		London	
	1916	1917	1916	1917
January	41.825	44.175	175.548	185.813
February	42.717	51.420	181.107	198.074
March	50.741	54.388	193.609	207.443
April	51.230	55.910	199.736	220.171
May	49.125	63.173	196.511	245.114
June	42.231	62.053	179.466	242.083
July	38.510	62.570	168.357	242.181
August	38.585	62.681	169.870	243.978
September	38.830	61.542	171.345	244.038
October	41.241		179.307	
November	44.109		188.932	
December	42.635		183.368	
Av. year	43.480		182.096	

Lead	New York		St. Louis		London	
	1916	1917	1916	1917	1916	1917
January	5.921	7.828	5.828	7.530	31.167	30.500
February	6.246	8.636	6.164	8.595	31.988	30.500
March	7.136	9.190	7.375	9.120	34.440	30.500
April	7.630	9.288	7.655	9.158	34.368	30.500
May	7.463	10.207	7.332	10.202	32.967	30.500
June	6.936	11.171	6.749	11.123	31.011	30.500
July	6.352	10.710	6.185	10.644	29.137	30.500
August	6.244	10.594	6.088	10.518	29.734	30.500
September	6.810	8.680	6.699	8.611	30.786	30.500
October	7.000		6.898		30.716	
November	7.012		6.945		30.500	
December	7.513		7.405		30.500	
Year	6.853		6.777		31.359	

Spelter	New York		St. Louis		London	
	1916	1917	1916	1917	1916	1917
Jan.	16.915	9.619	16.745	9.449	89.810	48.329
Feb.	18.420	10.045	18.260	9.875	97.762	47.000
Mar.	16.846	10.300	16.676	10.130	95.048	47.000
April	16.695	9.459	16.525	9.289	99.056	54.632
May	14.276	9.302	14.106	9.102	94.217	54.000
June	11.752	9.371	11.582	9.201	68.591	54.000
July	8.925	8.643	8.755	8.473	50.750	54.000
Aug.	8.730	8.360	8.560	8.190	51.597	54.000
Sept.	8.990	8.136	8.820	7.966	52.095	54.000
Oct.	9.829		9.659		54.159	
Nov.	11.592		11.432		56.023	
Dec.	10.665		10.495		55.842	
Year	12.804		12.634		72.071	

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton.

STOCK QUOTATIONS

N. Y. EXCH.†	Oct. 2
Alaska Gold M.	3
Alaska Juneau	3
Am.Sm.& Ref.,com.	87
Am. Sm. & Ref., pf.	104
Am. Sm. Sec., pf., A	95
Am. Sm. Sec., pf. B.	‡93
Am. Zinc	14
Am. Zinc, pf.	44
Anaconda	63
Batopilas Min.	1
Bethlehem Steel.	85
Bethlehem Steel, pf.	91
Butte & Superior	19
Cerro de Pasco.	32
Chile Cop.	15
Chino	44
Colo. Fuel & Iron	38
Crucible Steel.	66
Dome Mines	7
Federal M. & S.	15
Federal M. & S., pf.	39
Great Nor., ore ctf.	28
Greene Cananea.	36
Gulf States Steel	93
Homestake	95
Inspiration Con.	44
International Nickel	31
Kennecott.	33
Lackawanna Steel	81
Miami Copper	31
Nat'l Lead, com.	47
National Lead, pf.	100
Nev. Consol.	18
Ontario Min.	4
Quicksilver	1
Quicksilver, pf.	1
Ray Con.	22
RepublicI.&S.,com.	79
Republic I. & S., pf.	98
Sloss-Sheffield.	40
Tennessee C. & C.	14
U. S. Steel, com.	105
U. S. Steel, pf.	114
Utah Copper.	79
Va. Iron C. & C.	58

N. Y. CURB†	Oct. 23
Big Ledge.	1
Butte & N. Y.	
Butte C. & Z.	8
Butte Detroit.	
Caledonia	.59
Calumet & Jerome.	1
Can. Cop. Corpn.	1
Carlisle	3
Cashboy	05
Con. Ariz. Sm.	1
Con. Coppermines.	8
Con. Nev.-Utah.	08
Emma Con.	
First Nat. Cop.	2
Goldfield Con.	34
Goldfield Merger.	04
Greenmonster.	
Hecla Min.	5
Howe Sound	4
Jerome Verde	1
Kerr Lake.	5
Louisiana	75
Magma	42
Majestic	‡ 31
McKinley-Dar-Sa.	55
Milford	1
Mohican	‡ 25
Mother Lode	33
N. Y. & Hond.	13
Nipissing Mines.	8
Ohio Cop.	1
Ray Hercules	3
Richmond	56
Rochester Mines	.42
St. Joseph Lead.	17
Standard S. L.	
Stewart	25
Success	14
Tonopah	5
Tonopah Ex.	2
Tribullion	25
Troy Arizona	16
United Cop.	50
United Verde Ext.	31
United Zinc	2
Utica Mines	16
Yukon Gold	2

SAN FRAN.*	Oct. 23
Alta	02
Andes	11
Best & Belcher	02
Bullion	02
Caledonia	10
Challenge Con.	05
Confidence	05
Con. Virginia	11
Gould & Curry	1 01
Hale & Norcross	03
Jacket-Cr. Pt.	03
Mexican	16
Occidental	60
Ophir	16
Overman	04
Savage	03
Seg. Belcher	‡ 02
Sierra Nevada	14
Union Con.	80
Utah Con.	01
Belmont	3 95
Jim Butler	75
MacNamara	23
Midway	10
Mont.-Tonopah	15
North Star	07
Rescue Eula	14
West End Con.	71
Atlanta	08
Booth	03
Comb. Frac.	‡ 02
D'field Daisy	‡ 02
Florence	11
Jumbo Extension	17
Kewanas	08
Nevada Hills	12
Nevada Packard	20
Round Mountain.	23
Silver Pick	11
White Caps	1 10
Big Jim	50
United Eastern	3 65

BOSTON EXCH.*	Oct. 23
Adventure	1
Ahmeek	89
Algomah	25
Allouez	55
Ariz. Com., ctfs.	9
Arnold	25
Bonanza	21
Butte-Balaklava	50
Calumet & Ariz.	65
Calumet & Hecla	480
Centennial	13
Copper Range.	49
Daly West	1
Davis-Daly	4
East Butte.	10
Franklin	4
Granby	70
Hancock.	9
Hedley	16
Helvetia	.25
Indiana	1
Isle Royale.	26
Keweenaw.	1
Lake	6
La Salle	2
Mason Valley	4
Mass	6
Mayflower.	1
Michigan	1
Mohawk	70
New Arcadian	2
New Idria	10
North Butte	14
North Lake.	.60
Ojibway.	1
Old Dominion	40
Osceola	62
Quincy	69
St. Mary's M. L.	57
Santa Fe	.95
Seneca	7
Shannon	5
Shattuck-Ariz.	20
So. Lake.	2
So. Utah	.15
Superior	5
Superior & Bost.	2
Trinity	4
Tuolumne	1
U. S. Smelting	51
U. S. Smelt'g, pf.	47
Utah Apex	2
Utah Con.	12
Utah Metal.	3
Victoria.	2
Winona	2
Wolverine.	36
Wyandot.	50

BOSTON CURB*	Oct. 23
Alaska Mines Corp.	‡ 37
Bingham Mines.	10
Boston Ely	65
Boston & Mont.	39
Butte & Lon'n Dev.	.13
Calaveras	2
Calumet-Corbin.	‡ 01
Chief Con.	2
Cortez	10
Crown Reserve.	18
Crystal Cop.	.54
Eagle & Blue Bell.	2
Houghton Copper.	70
Intermountain	1
Iron Cap, Com.	14
Iron Cap Cop., pf.	15
Mexican Metals	.31
Mines of America	1
Mojave Tungsten.	.47
Nat. Zinc & Lead.	.28
Nevada-Douglas	1
New Baltic	1
New Cornelia	15
Oneco.	40
Pacific Mines	‡ 35
Rex Cons.	12

SALT LAKE*	Oct. 22
Bannack	26
Big Four	01
Cardiff	4 00
Colorado Mining	13
Daly	1 50
Daly-Judge	8 25
Empire Copper.	1 27
Gold Chain	16
Grand Central	55
Iron Blossom	63
Lower Mammoth.	03
May Day	05
Moscow	11
Prince Con.	93
Rico Wellington.	26
Silver-King Coal'n	2 92
Silver King Con.	3 77
Sioux Con.	04
So. Hecla	93
Tintic Standard.	1 47
Uncle Sam	01
Wilbert	22
Yankee	08

TORONTO*	Oct. 22
Adanac	15
Bailey	05
Beaver Con.	35
Chambers Ferland.	12
Coniagas	3 40
Hargraves	08
La Rose	37
Peterson Lake	10
Temiskaming	28
Wettlaufer-Lor.	07
Davidson	34
Dome Exten.	11
Dome Lake	15
Hollinger	4 75
McIntyre	1 37
Newray	45
Porcu. Crown.	35
Schumacher	‡ 42
Teck-Hughes	40
Vipond	21
West Dome	17

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Ammonia Leaching of Copper Tailings at Kennecott, Alaska

BY HORACE M. LAWRENCE[*]

Leaching of tailings at Kennecott was preferred to flotation because of the greater concentration possible and consequent saving in freight and treatment charges. The ore, which occurs in limestone, contains about 8% Cu, of which an average of 36% is in carbonate form. The present 300-ton plant uses a 15-ft. leaching column and a steam wash preceded by water spraying. Plant now being increased to a capacity of 800 tons daily.

KENNECOTT, where some of the Alaskan properties of the Kennecott Copper Corporation are situated, is at the eastern terminus of the Copper River and Northwestern Ry., which extends inland 195 miles from Cordova, the seaport on Prince William Sound. At Kennecott, at an elevation of 2000 ft., are the offices and main works of the company, including the ammonia-leaching plant and the discharge terminals of the aërial tramways which connect the mill and railroad with the company's Bonanza and Jumbo mines. These, each about four miles away from the main plant, are at an elevation of 5870 ft. and 5740 ft. respectively.

Though Kennecott is only about 100 miles from the coast, the climate is dry. The winters are little colder than those of northern Minnesota and the temperature only occasionally goes below —30° F. For the months of November to March, inclusive, in 1915-16, the average mean temperature was 5° F. and the average minimum was —2° F., which was, if anything, colder than the usual winter season. Under these conditions, with a few refinements in operation to conserve water, maximum capacity is maintained throughout the year.

AMMONIA-LEACHING PLANT AT KENNECOTT, ALASKA

OCCURRENCE AND CHARACTER OF THE ORE

The orebodies at both the Bonanza and Jumbo mines occur in limestone close to its contact with an underlying greenstone series. These bodies are the result of the replacement of limestone by copper minerals along well-defined steeply inclined fractures approximately normal to the strike of the limestone beds, and also along bedding-planes in the limestone and in faults which cut them at a low angle. This replacement has resulted in three forms of orebodies: (1) Elongated vein-like bodies of a maximum width of 60 ft., dipping from 60° to 90° and cutting across the bedding-planes; (2) flat orebodies developed along bedding-planes or flat faults and dipping from 15° to 35°; (3) bodies at the intersection of the two forms above mentioned, where intense mineralization has resulted in large irregular orebodies, pear-shaped in plan. The two large deposits of almost pure chalcocite developed in the Bonanza and Jumbo mines belong to the third type. Up to date a large proportion of the milling ore has been mined from the vertical fissures. Table I gives an idea of the character of the ore:

TABLE I. SHOWING ANALYSIS OF BONANZA AND JUMBO ORES

Chemical Analysis		Mineralogical Analysis	
Cu*	7.99%	Chalcocite, Cu_2S	5.50
CaO	36.76	Covellite, CuS	1.23
MgO	10.4	Bornite, Cu_5FeS_4	0.13
Al_2O_3	0.15	Malachite $CuCO_3$ $Cu(OH)_2$	4.75
Fe	0.47	Dolomite (Ca Mg) $(CO_3)_2$	87.37
S	1.58	Hematite, Fe_2O_3	0.64
Insoluble	0.70	Miscellaneous Al_2O_3—Insoluble	0.85
CO_2	41.15		
H_2O	1.08		
O	0.19		
	100.47%		100.47

* 2.73% Cu in carbonate form.

Metallurgically, the ore may be looked upon as consisting of chalcocite and its oxidation products, malachite and azurite, in a gangue of gray limestone and dolomite. Covellite and enargite are found occasionally, and chalcopyrite and bornite are present in minute amounts with the other sulphides. The chalcocite occurs chiefly in seams and bunches in the limestone, permitting easy recovery by coarse crushing and water concentration. A small proportion of the chalcocite occurs intergrown with calcite, and requires fine crushing to liberate the sulphide. The occurrence of the other copper sulphides is similar to that of chalcocite, and in the absence of any heavy gangue mineral these offer no difficulty in concentration.

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Malachite and azurite are found throughout the mines as oxidation products of the copper sulphides. The proportion of carbonate ore varies from 10 to 90% of the total copper value and for the ore developed to date has averaged 36%. A general decrease in the proportion of carbonate occurs with depth, although where intense fracturing has permitted free water circulation, the proportion of carbonate is as high as it is near the surface. The vertical orebodies, as a rule, contain a much greater proportion of carbonate ore than either the flat or intersection bodies. The rich chalcocite body of the Bonanza outcrop is of the intersection type, so the condition arises of slight oxidation on the surface in comparison with that found in the open vertical fissures at a depth of 900 ft. in the Bonanza mine.

Calcite occurs with the ore minerals in small amounts and, with limestone and dolomite, forms the gangue. The limestone and dolomite occurring in the orebodies are slightly iron-stained near the surface, but otherwise are generally fresh and unaltered, even in the center of wide orebodies.

Mining and Milling Methods

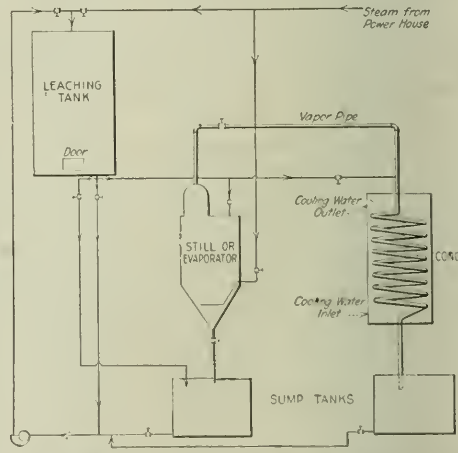
Most of the milling ore from the Bonanza and Jumbo mines is mined from vertical stopes by overhead stoping on the shrinkage system. Levels are driven 100 ft. apart vertically, and raises approximately 200 ft. apart to furnish ventilation and access to the level above. Chute-raises are then driven at 25-ft. intervals and holed into one another. The stope above the chute is then cut out to full width, and overhead stoping on broken ore continued to the level above. No timbering is necessary except at the chutes, due to the solid character of the limestone and the fact that the ground remains frozen the year round except on the levels close to the surface. Up to the present time no "horses" of waste have been found which cannot be left as stope-pillars.

At the Bonanza mine the ore close to the surface has been mined by the "glory-hole" method of underhand stoping and drawn off in chutes below the limits of the body. This method of "glory-holing" or "milling" is used on the flat-lying orebodies at both mines, and the broken ore drawn into the chutes by open-bottom scrapers.

In the mill the ore is broken to about four-inch size and hand-sorted to separate large pieces of sulphide and carbonate minerals from the leaner material. The remainder is then further crushed for concentration on jigs and tables. The coarse-crushing system consists of Blake-type jaw and Symons disc crushers with finer grinding in Traylor rolls. Coarse concentration on bull, Harz and Hancock jigs is followed by further treatment on Wilfley and James sand tables and James slimers. Sliming is avoided as much as possible, since the carbonate contents of the slimes are recoverable with difficulty except in a product too low for profitable shipment. Ninety-five to ninety-six per cent. of the sulphide and about 60% of the carbonate values are recovered in the mill. Part of the tailings are re-treated in the leaching plant, and the remainder stored for future handling.

The reasons for experimenting with leaching, rather than sulphide-filming and flotation as a further treatment of the mill tailings, were primarily the difference in the concentration ratio with the consequent difference in freight and treatment charges. By using sulphide-filming and flotation a concentrate greatly in excess of 30% Cu could not be expected, while the precipitates from ammonia leaching approximate 70% Cu. Alaskan freight rates, both rail and boat, are high, and the saving of a 70% product over a 30% product is more marked there than would be the case in a more accessible district.

The first experiments with ammonia leaching were conducted by the testing plant of the Federal Lead Co. in Flat River, Mo., in the winter of 1913-14. These tests were purely of a laboratory character, and no attempts were made to prevent the loss of ammonia. However, it was apparent that Kennecott ore would lend itself to ammonia leaching, as a satisfactory recovery was obtained. Consequently a small experimental plant, consisting of a leaching tank, still, condenser, and storage tanks, all of the simplest character, but designed to be ammonia-tight and to give results somewhat comparable to those obtainable under actual operating conditions, was erected in the summer of 1914.



FLOW SHEET OF EXPERIMENTAL AMMONIA-LEACHING PLANT FIRST BUILT AT KENNECOTT

The experimental leaching tank provided for a leaching column of five feet, and ordinarily one-ton charges were leached. The ammonia still, or, more properly, evaporator, used direct heat in the form of live steam to distill off the ammonia and precipitate the copper from the copper-ammonia liquors, though occasionally, in an endeavor to diminish the volume of the waste solutions, indirect heat was used.

From the series of experiments conducted, it was concluded (1) that, with a heads assay of 1.2% carbonate copper, an extraction of 75% of the carbonate contents might be expected; (2) that, since the use of water to wash the tailings would prove impracticable, due to the fact that the final volume of solution would be large and that therefore the amount of solution to be distilled would prove excessive, a steam wash would be economical in point of time, amount of NH_3 recovered, ultimate volume of solution to be distilled, and amount of steam consumed in the entire process. It was estimated that 100 lb. of steam per ton leached would be sufficient to wash the tailings to a point such that the ammonia retained in the residues would not exceed 0.25 lb. per ton leached; (3) that in the distillation of copper-ammonia liquors the steam used would not be more than 400 lb. per ton leached, the ammonia loss would not exceed 0.25 lb. per ton leached, of which amount the greater portion would be in a waste liquor or boiled-out solution assaying at a maximum 0.03% NH_3, and that precipitates assaying 70% Cu would be produced; (4) that other ammonia losses need not exceed 0.25 lb. per ton leached or a total ammonia loss of 0.75 lb. per ton leached.

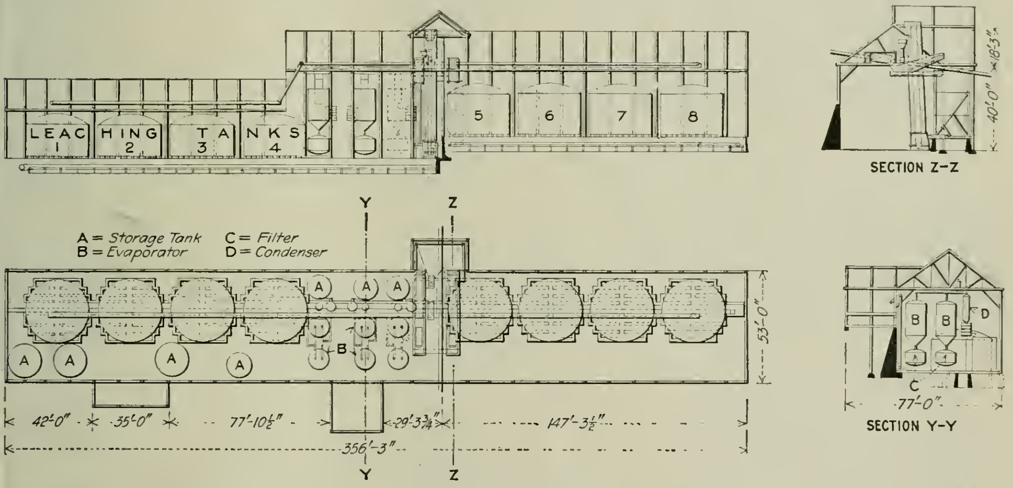
DESCRIPTION OF 300-TON PLANT

In view of the results obtained with the experimental apparatus, a plant to have a daily capacity of 300 tons was erected. The leaching tanks, four in number and 30 ft. in diameter, with a leaching column 15 ft. high, were designed with a dome-top capable of withstanding a vapor pressure of 10 lb. They each have a capacity of 500 tons of mill tailings per charge. Before they are charged, the tailings are dewatered and partially deslimed. Were the material to be treated an oxide ore, such that dry crushing could be used in preparation for leaching, slime in reasonable amounts could be satisfactorily treated as there would be less tendency for it to segregate and interfere with the leaching and washing of the charges. For charging the tanks a revolving plate was provided to distribute the feed evenly over the whole area and to give a uniform mixture of coarse and fine material. After washing, the tailings are removed from the tank by a mechanical excavator through the bottom doors to a belt conveyor which carries them to the dump.

The distillation apparatus installed was of the continuous type. It consisted of an evaporator equipped with two salt filters, and surmounted by a standard ammonia concentrator or still. Connected with the top of the still was the usual condensing and absorbing system common to ammonia distillation. The distillation apparatus was designed to distill 100 tons per 24 hours of a solution assaying 6% NH_3, and to yield a waste solution containing not more than 0.02% NH_3. The above volume of solution was considered to be the maximum that would have to be distilled from the leaching of 300 tons of mill tailings containing 1.2% carbonate copper.

In March, 1916, operation commenced. From the first the expectations of a satisfactory extraction of the carbonate copper have been fully realized. Also the recovery of ammonia from the leached tailings, about which some uncertainty was felt, has proved to be as complete as the early experiments indicated. On the other hand, difficulties only partially foreseen were encountered in the distillation of the rich copper-ammonia liquors. Before operations had commenced the possibility of precipitates clogging up sections of the ammonia concentrator had been considered, but serious trouble was not anticipated as ammonia stills using lime to break up stable ammonia salts are regularly operated. Clogging, however, of precipitates in sections of the still occurred as soon as distillation commenced, accompanied by incrustations of a mixture of copper oxide and carbonate upon the walls and steam chest of the evaporator. This proved so serious that single-stage, continuous distillation was replaced by a two-stage process, wherein the primary operation reduced the rich solution from 4% Cu and 7.5% NH_3 to a filtrate assaying 0.4% Cu and 0.9% NH_3. This filtrate was then re-treated in a secondary operation to precipitate the balance of the copper and produce a waste solution assaying 0.025% NH_3.

After the plant had been in operation for some months, experiments with the idea of simplifying the distillation



PLAN AND SECTIONAL ELEVATIONS OF NEW 800-TON AMMONIA-LEACHING PLANT UNDER CONSTRUCTION AT KENNECOTT, ALASKA

Leaching tanks are shown with overhead distributing conveyor and tailings-discharge conveyor underneath. Section Z-Z shows mill-tailings launder leading to the 275-ton storage bins; also elevator to Vezin sampler. Section Y-Y shows absorber beneath the condenser and securing an economy in steam consumption led to the installation of an evaporator of the periodic type. It is simpler in operation and, as no incrustation takes place on the walls or heating coils in the boiling chamber, its use avoids the frequent cleaning periods of the continuous system. Furthermore, the precipitates produced are of a higher copper content, and a considerable steam economy has been effected.

ABSORPTION OF CO_2 BY LEACHING SOLUTION

The original lixiviant solutions contained little CO_2, as all ammonia was purchased in the form of aqua ammonia or ammonium hydrate, but, due to the absorption of CO_2, they soon became practically aqueous solutions of ammonium carbonate. The only objection thus far advanced to the presence of CO_2, is the slight increase in time necessary to secure a satisfactory extraction of the carbonate copper. To remove the large amount of CO_2 evolved from the circulating solution it has been found necessary to leave vents open in the top of the tank. The high leaching column has proved satisfactory, though 15 ft. is somewhat greater than is ordinarily used in leaching processes.

TABLE II SCREEN TESTS AND COPPER CONTENTS OF HEADS AND TAILS OF AMMONIA-LEACHING PLANT

In any leaching process there is a shrinkage in the size of the particles during the leaching period, which is evident in the increased weights of the finer sizes in the tails.

HEADS

Size	% Wt	% Carb. Cu	Lb. Carb. Cu In 100 Lb. of Sample	% Total	Cumulative
On 12 mm.	10.8	0.89	0.0958	9.0	
On 9 mm.	21.6	0.96	0.2069	19.5	28.5
On 6 mm.	28.7	1.04	0.2978	28.1	56.6
On 2 mm.	26.9	1.10	0.2958	27.9	84.5
On 1 mm.	4.4	1.04	0.0456	4.3	88.8
On 40 mesh	2.8	1.36	0.0382	3.6	92.4
On 60 mesh	1.4	1.76	0.0246	2.3	94.7
On 100 mesh	1.3	1.48	0.0192	1.8	96.5
On 150 mesh	0.5	1.69	0.0085	0.8	97.3
On 200 mesh	0.5	1.39	0.0369	0.6	97.9
— 200 mesh	1.1	2.04	0.0225	2.1	100.0
Totals	100.0		1.0618	100.0	

TAILS

Size	% Wt	% Carb. Cu	Lb. Carb. Cu In 100 Lb. of Sample	% Total	Cumulative	$\frac{H-T}{H}$
On 12 mm.	7.8	0.28	0.0218	9.0		68.6
On 9 mm.	18.5	0.23	0.0426	17.5	26.5	76.1
On 6 mm.	26.0	0.22	0.0572	23.6	50.1	78.9
On 2 mm.	29.9	0.19	0.0568	23.3	73.4	82.7
On 1 mm.	5.8	0.25	0.0145	6.0	79.4	76.0
On 40 mesh	4.4	0.33	0.0145	6.0	85.4	75.8
On 60 mesh	2.1	0.35	0.0074	3.1	88.5	80.2
On 100 mesh	2.3	0.36	0.0083	3.4	91.9	75.7
On 150 mesh	0.9	0.39	0.0035	1.4	93.3	77.0
On 200 mesh	0.9	0.41	0.0037	1.5	94.8	70.5
200 mesh	1.4	0.89	0.0125	5.2	100.0	56.4
Totals ...	100.0		0.2428	100.0		77.1

As a result of a great deal of experimenting during the first months of operation, the following cycle has gradually been evolved and is the most satisfactory system tried up to the present.

CHARGING AND LEACHING

The dewatered and partially deslimed mill tailings are run into the tank by means of a chain-drag conveyor, which extends from the dewaterers over the top of the tanks. While charging, the drains are left open in the bottom of the tank, allowing the water that enters with the tails to filter through and escape. The leaching solution is pumped into the tank at the bottom, and rises through the charge, completely covering it. This solution contains enough concentrated ammonia from the stills or from the ammonia-storage tanks to dissolve the copper contained in the charge, and is diluted or mixed with enough rich copper-ammonia solution from a previous leach to give the mixture sufficient volume to cover the charge. In this case, the rich copper-ammonia solution acts merely as a vehicle for the "available" or uncombined ammonia and ammonium carbonate, and is not itself a solvent. Its use enables the charge to be covered without introducing an excessive amount of ammonia, or any fresh water into the tank, and keeps the distilling solution rich in copper.

The moisture remaining in the charge after the leaching solution has been turned in is displaced by the latter and rises, practically unmixed with it, to the top. Here a certain amount can be drawn off to waste without losing any of the leaching solution. The remainder of the moisture mixes with the solution, but is later removed from the system, together with the water introduced in the wash, as the effluent boiled-out solution from the ammonia stills.

TABLE III ANALYSES OF HEADS AND TAILS OF LEACHING PLANT

	Heads, %	Tails, %
Cu	1.46	0.58
Cu. as carbonate	1.14	0.26
Fe	0.38	0.36
S	0.14	0.17
Insoluble	0.39	0.42
$CaCO_3$	72.82	72.20
$MgCO_3$	22.22	2[illegible].30

The leaching solution is next circulated downward through the charge, a small centrifugal pump returning the filtrate to the top of the tank. Circulation continues till tests show that it has ceased to dissolve copper, or for about 30 hours on the average.

WASHING THE CHARGE

The leaching solution is now drained off, part going to the evaporators, and part reserved as make-up for the next charge. While this rich solution is being drawn off from the bottom of the tank, about 20 tons of weak copper-ammonia solution is pumped on top of the charge as a preliminary wash and follows the rich solution down through the charge. When this weak solution begins to appear at the bottom of the tank, the effluent is turned over from the rich-solution storage tank to the wash-solution storage tank.

Immediately following the preliminary wash comes the steam wash. Steam is admitted at the top and gradually heats the charge to the bottom. Pressure in the tank is kept below 5 lb. per sq.in. to avoid distorting the tank and subsequent leakage. The incoming steam condenses in heating the charge, so that a film of condensed water precedes the steam down through the tank, displacing most of the copper-ammonia solution. The remainder of the ammonia, volatilized by the steam, is carried out with it after it reaches the bottom openings in the tank, and is recondensed in a special condenser. This weak ammonia solution is saved in the wash-solution storage tanks.

When the ammonia content of the vapors issuing from the tank has fallen to 0.5% NH_3, the wash is considered finished, the steam is shut off and the tank excavated with mechanical excavators, as hereinafter described. The time necessary for steam washing, when carried out in connection with the preliminary wash with weak solution, will average 20 hours per charge, and the steam used amounts to only about 100 lb. per ton of material leached.

The steam wash is the greatest single factor in making the Kennecott leaching a success, and upon this portion of the process a patent has been granted. This method of washing enables one to leach rich ores with concentrated ammonia solutions, without incurring an excessive ammonia loss in the tailings, or without using a large volume of wash water, probably several times the volume of the leaching solution, instead of 20% of it as with the steam wash. A water wash is undesirable; first, because water consumption at Kennecott is no small consideration, and also because a large volume will dilute the distilling solution, thereby increasing the cost of distillation proportionately. In fact, the steam economy arising from distillation of solutions which contain upward of 4% copper more than counterbalances the steam used for the wash. In addition, there is the advantage that these rich solutions have little tendency to encrust the walls of the evaporators and stills. This is a point all operators are well able to appreciate.

As water for sluicing is not available at Kennecott and as the shape of the leaching tanks permits only about 35% of the charge to run out by gravity, a mechanical excavator has been designed and installed in the tanks. It consists of a central shaft supporting four radiating arms carrying blades which scrape the tailings to the center doors as the shaft revolves. It removes the tailings from the tank in about seven hours, using only 1½ hp. and requiring practically no attention.

In the present plant the tonnage of mill tailings leached has been gradually increased from 3000 tons in April, 1916, to 10,000 tons in April, 1917. The ammonia loss, at first excessive, has decreased from 2.6 lb. to 0.5 lb. per ton leached. The extraction has varied somewhat but has averaged better than 75% of the carbonate copper. The grade of precipitates has varied markedly but has averaged practically 70% Cu. In Table IV are the monthly summaries of results obtained in the operation of the plant from April, 1916, to April, 1917, inclusive.

TABLE IV. DATA SHOWING OPERATION FOR 13 MONTHS AT THE KENNECOTT AMMONIA-LEACHING PLANT

Month, 1916	Heads				Leaching Solution							Tailings	Extraction		Precipitates	Tailings Wash				
	% H_2O	Av. Tons per Chg.	Carbonate Cu %	Carbonate Cu Tons per Chg.	Tons per Chg.	Ratio to Chg.	% Cu	% NH_3	Percolation per Hour In.	Percolation per Hour Gal.	Time Hours	% Carb. Cu	% Calc. Carb. Cu	Lb. Cu per Ton	Assay % Cu	Av. Hours per Chg.	Depth of Chg. Ft.	Rate of Washing In. per Hr.	Final Condensate % Cu	Final Condensate % NH_3
April	5.6	569	1.50	8.54	218	1:2.6	0.33	5.24	29	4,050		0.33	78.2	20.0	72.0	40	15.25	4.58	0.03	0.35
May	6.3	509	1.53	7.79	174	1:2.9	0.33	4.99	24	3,350	38	0.41	73.4	22.3	69.7	27	14.83	6.60	0.02	0.26
June	6.3	474	1.26	5.98	145	1:3.3	0.28	5.56	22	3,075	28	0.42	66.8	16.9	68.2	33	14.63	5.31	0.04	0.38
July	6.2	483	1.12	5.43	149	1:3.2	0.20	5.25	22	3,075	32	0.34	69.6	16.1	71.3	36	14.83	4.94	0.04	0.43
August	5.9	505	1.14	5.76	160	1:3.2	0.77	6.09	24	3,350	32	0.27	76.3	17.5	67.5	36	14.85	4.95	0.04	0.45
September	6.8	518	0.91	4.70	152	1:3.4	0.20	5.53	26	3,630	32	0.18	80.5	14.6	66.6	32	14.96	5.79	0.04	0.41
October	6.1	533	1.05	5.62	180	1:3.0	1.18	7.25	29	4,050	37	0.22	79.2	16.7	70.4	27	14.83	6.61	0.05	0.40
November	6.0	534	1.03	5.50	192	1:2.8	1.53	8.35	27	3,770	29	0.20	80.7	16.6	73.1	32	14.83	5.57	0.05	0.48
December	5.5	539	0.85	4.59	143	1:3.7	1.87	6.67	28	3,910	31	0.20	76.7	13.1	71.8	30	15.00	6.00	0.05	0.42
Average	6.1	515	1.11	5.70	164	1:3.14	0.78	6.30	26	3,630	32	0.27	75.7	16.9	69.9	32	14.89	5.68	0.04	0.40
Jan., 1917	5.5	533	1.03	5.48	167	1:3.19	2.02	7.39	30	4,190	27	0.27	73.9	15.2	69.2	24	14.84	6.19	0.05	0.48
February	4.5	543	0.95	5.11	143	1:3.80	1.43	7.38	29	4,050	32	0.23	75.8	14.6	70.3	25	15.08	7.24	0.05	0.48
March	4.9	523	1.08	5.66	143	1:3.66	1.46	7.66	30	4,190	33	0.24	77.8	16.1	70.1	27	14.96	6.65	0.04	0.44
April	5.1	516	1.01	5.21	156	1:3.31	1.60	8.13	38	5,310	32	0.27	73.3	14.3	67.5	26	14.63	6.76	0.04	0.47

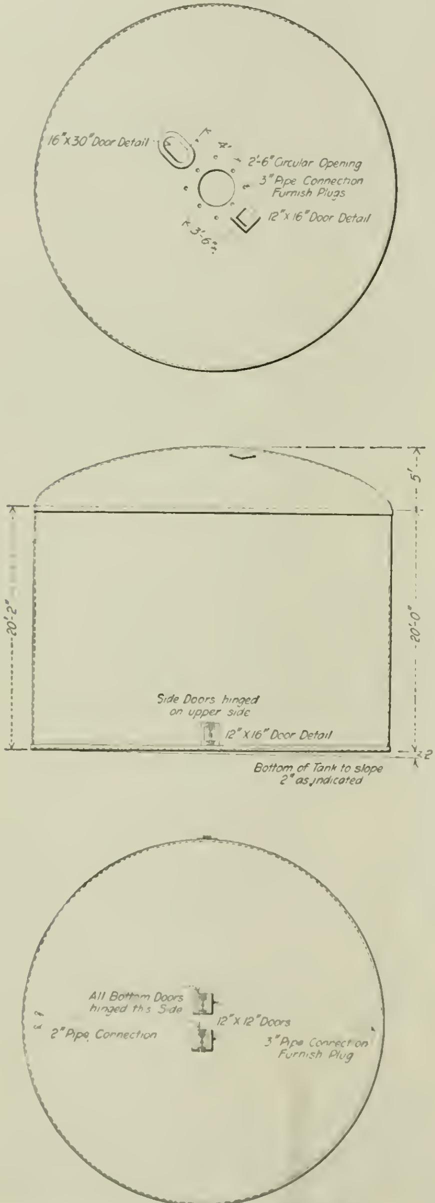
Details of the Distillation of the Copper-Ammonia Solutions

Month, 1916	Solution to Still				Boiled Out Solution					Concentrate			Details of Still Operation: Primary Still					Details of Still Operation: Secondary Still				
	Tons per Chg.	% NH_3	% Cu	Ratio NH_3 to Cu	Tons per Hr.	Tons per Chg.	% NH_3	Av. Tons NH_3 per Chg.	Ratio B.O.S. to S.T.S.	Tons per Chg.	% NH_3	Ratio of Conc.	Filtrate % NH_3	Filtrate % Cu	% Total NH_3 Dist.	% Total Cu Ppt.	Assay Ppt. % Cu	Filtrate % NH_3	Filtrate % Cu	% Total NH_3 Dist.	% Total Cu Ppt.	Assay Ppt % Cu
April	351	3.51	2.04	1.72:1	3.33	147	0.06	0.090	0.42:1	108	9.33	2.66	0.58	0.32	81.8	91.0	72.0					
May	211	4.10	2.94	1.39:1	3.59	172	0.05	0.079	0.82:1	87	8.79	2.14	0.94	0.69	71.9	76.7	68.4	0.049	0.01	16.6	14.7	76.2
June	143	5.27	3.10	1.70:1	3.46	133	0.03	0.037	0.93:1	68	10.29	1.95	0.98	0.56	79.9	74.5	67.5	0.028	0.0	12.9	12.6	76.6
July	141	5.27	2.88	1.82:1	3.52	136	0.03	0.036	0.97:1	60	11.40	2.16	1.00	0.52	77.3	83.8	70.3	0.027	0.0	14.7	13.6	77.1
August	142	5.40	3.19	1.70:1	3.85	135	0.02	0.032	0.95:1	61	11.69	2.16	1.00	0.44	79.1	84.3	66.6	0.024	0.0	13.9	10.4	76.3
September	145	5.65	2.76	2.05:1	3.90	142	0.01	0.021	0.98:1	68	11.56	2.05	0.94	0.40	84.3	83.4	66.1	0.015	0.0	12.7	11.9	75.6
October	113	6.82	3.80	1.79:1	3.14	138	0.02	0.022	1.22:1	65	11.58	1.70	0.91	0.41	85.9	87.0	69.6	0.016	0.0	12.1	9.7	77.0
November	103	8.11	4.34	1.87:1	2.62	127	0.02	0.026	1.24:1	55	15.00	1.85	1.01	0.46	87.3	87.4	72.8	0.020	0.0	11.3	10.5	76.2
December	70	6.65	4.47	1.49:1	2.26	89	0.03	0.031	1.27:1	39	11.75	1.77	0.78	0.27	86.3	89.4	71.5	0.017	0.0	12.2	7.1	76.3
Average	139	5.54	3.19	1.74:1	3.32	132	0.03	0.035	0.95:1	64	11.33	2.05	0.90	0.45	81.5	84.2	69.2	0.025	0.0	13.3	11.3	76.4
Jan., 1917	86	7.50	4.85	.....	2.26	104	0.019	0.020	1.21:1	57	10.83	1.45	0.84	0.28	87.6	91.8	68.7	0.015	0.0	10.6	4.8	76.1
February	90	7.24	4.32	.....	2.09	114	0.022	0.025	1.27:1	58	11.17	1.54	0.79	0.23	87.2	95.8	70.1	0.018	0.0	12.2	6.3	74.6
March	91	7.46	4.67	..	2.02	96	0.022	0.021	1.05:1	55	12.19	1.65	0.72	0.20	90.0	94.3	69.9	0.015	0.0	8.8	4.7	76.7
April	82	7.95	4.61	.....	2.22	109	0.018	0.020	1.33:1	51	12.62	1.59	0.78	0.24	83.1	88.6	66.7	0.016	0.0	15.7	8.9	75.0

Month 1916	Ammonia Lost								Steam Consumption: For Tailings Wash				Steam Consumption: Distillation					Steam Consumption: Grand Total		
	Tons per Chg.	Lb. per Ton Leached: In Tails	Lb. per Ton Leached: In B.O.S.	Lb. per Ton Leached: Est. Misc.	Lb. per Ton Leached: Total	% Distribution: In Tails	% Distribution: In B.O.S.	% Distribution: Est. Misc.	Tons per Chg.	Lb. per Ton Lchd.	% of L.S.	% of Chg.	Tons per Chg.	Lb. per Ton Lchd.	Tons per Ton S.T.S.	Lb. per Lb. NH_3 in S.T.S.	Lb. per Lb. Cu Ppt.	Tons per Chg.	Lb. per Ton Lchd.	Lb. per Lb. Cu Ppt.
April	0.74	0.17	0.32	2.10	2.59	6.6	12.4	81.0	35	122	15.9	6.2	188	662	0.54	15.3	32.3	223	784	38.3
May	0.67	0.15	0.31	2.19	2.65	5.7	11.7	82.6	29	114	16.6	5.7	102	399	0.48	11.7	18.3	131	513	23.4
June	0.51	0.23	0.16	1.76	2.15	10.7	8.4	81.9	30	126	20.7	6.3	96	406	0.67	12.7	25.7	126	532	33.7
July	0.36	0.26	0.15	1.08	1.49	17.5	10.7	72.5	33	136	22.1	6.8	97	402	0.69	13.0	24.4	130	538	32.7
August	0.23	0.27	0.13	0.51	0.91	29.7	14.3	56.0	33	131	20.6	6.5	93	368	0.66	12.1	21.7	126	499	29.4
September	0.26	0.25	0.08	0.67	1.00	25.0	8.0	67.0	35	135	23.0	6.8	94	363	0.65	11.5	25.5	129	498	35.0
October	0.23	0.24	0.08	0.52	0.84	28.6	9.5	61.9	35	133	19.7	6.7	93	348	0.82	12.0	22.3	128	481	30.7
November	0.23	0.29	0.10	0.49	0.88	33.0	11.4	55.6	39	146	20.3	7.3	91	341	0.88	10.9	20.7	130	487	29.6
December	0.21	0.25	0.12	0.41	0.78	32.1	15.4	52.5	37	137	25.9	6.9	59	219	0.84	12.7	19.0	96	356	30.9
Average	0.34	0.26	0.14	0.92	1.32	19.7	10.6	69.7	34	132	20.7	6.6	95	369	0.68	12.3	23.0	129	501	31.3
Jan., 1917	0.22	0.29	0.08	0.46	0.83	34.9	9.7	55.4	26	98	15.6	4.9	83	312	0.96	13.2	20.6	109	410	27.0
February	0.23	0.29	0.09	0.47	0.85	34.1	10.6	55.3	25	92	17.5	4.6	88	324	0.98	13.5	22.2	113	416	28.5
March	0.19	0.27	0.08	0.38	0.73	37.0	10.9	52.1	25	96	17.5	4.8	85	325	0.93	12.5	20.2	110	421	26.1
April	0.13	0.28	0.08	0.14	0.50	56.0	16.0	28.0	27	105	17.3	5.2	80	310	0.98	12.3	21.7	107	415	29.0

B.O.S.—Boiled Out Solution. L.S.—Leaching Solution. S.T.S.—Solution to Still.

In view of the results obtained, construction work has already commenced on the enlargement of the plant to one of a capacity of 25,000 tons per month. The four new leaching tanks are to be 30 ft. in diameter, the same as the present tanks, but are to be 5 ft. higher, thereby increasing the leaching column from 15 to 20 ft. and the capacity from 500 to 665 tons per charge. The four evaporators, which are periodic in type, are to be arranged in two double-effect units, each unit being equipped with a separate condenser and absorber. Arranging the evaporators in double effect will economize the steam used, as a higher grade ammonia concentrate can be produced. By the new arrangement the ammonia concentrate will assay at least 18% NH_3. This will effect a saving of 22% in the steam used for distillation. Should the heads for any extended period assay considerably above the present feed, the amount of solution to be distilled would exceed the capacity of the evaporators, so a third unit has been provided for.

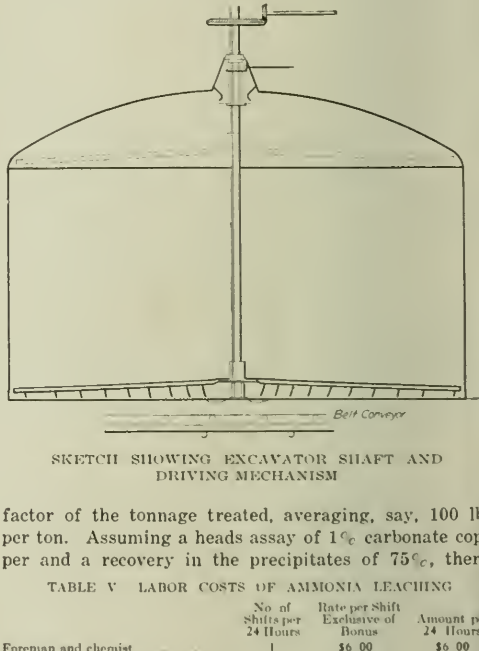

16"x30" Door Detail
2'-6" Circular Opening
3" Pipe Connection Furnish Plugs
12"x16" Door Detail
3'-6"
5'
20'-2"
20'-0"
Side Doors hinged on upper side
12"x16" Door Detail
2
Bottom of Tank to slope 2" as indicated
All Bottom Doors hinged this Side
12"x12" Doors
2" Pipe Connection
3" Pipe Connection Furnish Plug
Side Door-12"x16" Detail

DETAILS OF AMMONIA-LEACHING TANK USED AT KENNECOTT

In the accompanying illustrations are shown drawings of the new leaching tanks and the general arrangement of the apparatus in the enlarged plant.

Based upon the figures of the present 300-ton plant, the cost of treating 800 tons per day by ammonia leaching, assuming a heads assay of 1% carbonate copper and a recovery in the precipitates shipped of 75% of the carbonate copper in the heads, is given below. Of the costs, other than the freight and treatment charges on the precipitates shipped, which need not be considered here, the figures for steam, ammonia, and labor are, in the order given, the most important.

The cost of steam for the operation of an ammonia-leaching process will vary with the grade of material treated, since the steam required for the distillation of the copper-ammonia liquors is practically constant per pound of copper precipitated. On the other hand, the steam necessary for the tailings wash is a factor of the tonnage treated, averaging, say, 100 lb. per ton. Assuming a heads assay of 1% carbonate copper and a recovery in the precipitates of 75%, there



SKETCH SHOWING EXCAVATOR SHAFT AND DRIVING MECHANISM

TABLE V LABOR COSTS OF AMMONIA LEACHING

	No. of Shifts per 24 Hours	Rate per Shift Exclusive of Bonus	Amount per 24 Hours
Foreman and chemist	1	$6.00	$6.00
Shift bosses	3	4.50	13.50
Operators, distillation	3	4.00	12.00
Operators, charging tanks	3	3.75	11.25
Operators, tailings disposal	3	3.75	11.25
Operators, sacking and loading precipitates	3	3.75	11.25
Maintenance	2	4.50	9.00
Firemen (for boilers)	3	4.00	12.00
Roustabouts	3	3.75	11.25
Totals	24		$97.50

or on a basis of 700 tons per 24 hours the cost per ton would be 13.9c.

Miscellaneous

Electrical power, compressed air, lights, etc.	4c. per ton leached
Maintenance—supplies and equipment	9c. per ton leached
Sacking precipitates—expenses other than labor	1½c. per ton leached
Sampling, assaying, experimental, etc.	4c. per ton leached
Miscellaneous	5c. per ton leached

Summary

	Cost per Ton Leached	Cost per Lb. Cu Recovered
Steam	33.6c.	2.24c.
Ammonia	17.0	1.13
Labor	13.9	0.93
Electrical power, etc.	4.0	0.27
Maintenance	9.0	0.60
Assaying, etc.	4.0	0.27
Miscellaneous	5.0	0.33
Totals	86.5c.	5.77c.

would be produced 15 lb. of copper per ton of material treated. With the steam necessary for the distillation amounting to 18 lb. per lb. of copper precipitated, there would be required 270 lb. per ton leached, and with the 100 lb. for the tailings wash, the total steam consumption would be 370 lb. per ton leached. With a net evaporation of 11 lb. of water per lb. of fuel oil, and with oil at $3.25 per bbl. (42 gal.), the cost of steam per ton leached would be 33.6 cents.

The ammonia used at Kennecott is aqua ammonia, or ammonium hydrate, containing 29.2% NH_3 (26° Baumé at 60° F.). This form of ammonia is more convenient to handle and costs less per lb. of NH_3 delivered at Kennecott than does the anhydrous ammonia. The cost per lb. of NH_3, including the return freight on the empty drums, is 34c. With an ammonia loss of 0.5 lb. per ton leached, the cost will be 17 cents.

The costs given in the above tabulation are those estimated for the Kennecott plant when enlarged to have a capacity of 800 tons per day, though to make the costs liberal the labor figures are based on a 700-ton capacity.

Government Operation of Mines

BY FREDERICK F. SHARPLESS*

It is to be hoped that the production of coal and metals for the use of the Government and the public generally may be maintained at such a high level that the occasional suggestion of Government-operated mines may not become a reality or may not have to be seriously considered. With a Government inadequately equipped for handling the multitude of new problems daily presented to it—problems that are national in character and must be solved by it—the additional responsibility of operating a large number of metal and coal mines would be a burden of serious moment.

GOVERNMENT OPERATIONS WILL NOT BE CHEAPER

That the Government, as manager, could operate any better or more cheaply is to be doubted; it certainly could not by placing properties in new and untrained hands. If taken over, the mines would, in most cases, have to be operated by their present forces at an expense which certainly would not be less than without Government intervention. Having fixed the price of metals and coal, having regulated the freight rates to be charged, there remains but one important element for the Government to regulate, that is, the compensation to be paid to labor. It is true that with Government ownership or Government operation it would be in a position to dictate as to the price to be paid for labor, but that it would dictate any terms whereby the cost of production would be reduced is not probable.

Dictation between labor and the Government has always, heretofore, come from the other side. It would probably be no different now. In order to stimulate production it would probably increase the price of labor, and increase correspondingly the price of the commodity to itself and the public. There is a way, however, of avoiding the continual rise in prices and of maintaining production if not stimulating it, a way that is just and is, or can be made, legal, that is, the conscription of labor. Whether it is yet time for it or even time to talk about it is questionable, and yet it is a possibility.

Probably the most important factor endangering the success of our present national undertakings is that portion of the laboring element which is not only refusing to coöperate with the Government but is also absolutely blocking its program. Congress, backed by national demand, quickly passed the selective-draft law, enabling the Government to select all the physically fit men between the ages of 21 and 31, from all classes and walks of life, and to demand that they bear arms, carry our flag to the front and, if necessary, die in the attempt to make that flag the symbol of right and justice.

The best brains of the country have volunteered or been drafted to help in the work. The Government is taking supplies and practically dictating the terms on which they are taken. Money for the expenses of prosecuting the war, or a large portion of it, will be taken from those who have it on conditions determined by Congress. All these are requisitioned, not regardless of the rights and duty of the individual, but with due consideration of all his rights and obligations.

CONSCRIPTED INDUSTRY NEEDED TO BACK ARMY

A successful army will have something more than its trained troops. The latter will be backed not only by brains, money and supplies but also by an army of labor, freely given, it is to be hoped, but forced if necessary. If a canvass of labor were possible, it would doubtless be found that the large majority of workers are in dead earnest about winning the war and ready to help to the limit in office, field or factory; but the spirit of strikes spreading over the country indicates that a considerable percentage of labor is interested in the war only to the extent of securing the maximum wage for a minimum of service.

Such individuals will probably not cease to strike and demand ever-increasing wages and shorter hours, but there is not money enough in the country to buy loyalty to the flag from men of that stripe. We have drafted brains, supplies, money and men when they have not volunteered—labor alone has not been called. This does not mean that labor is slacking, that it is not now doing a big share. There are thousands of men and women, yes millions of them, who are doing their very best. It is not this labor that is referred to, but that relatively small portion of it, earnestly needed by the Government, which says, "Do thus and so, or we quit."

We have drafted men to support the flag, or to die for it, at $1 per day and board. Can we not call the mechanic to do the work for which he is fitted (without the dying) at the same figure or even at normal wages? Certainly justice to the one sent to the front demands support at home, not continued argument respecting rates and hours. Injustice or class legislation cannot be the arguments opposed to the idea.

When a drafted man leaves his family to care for itself and gives up his occupation for some one else to follow, his ardor of going is somewhat dampened when he sees his neighbor, with some slight physical defect going to work as a carpenter's helper at $7 per day or handling a pick and shovel at 50c. per hour when he was never known to be worth more than $1.50 per day. It is with a rather better feeling that the enlisted man sails, while watching the stevedores who have struck, no matter what the cause, while the soldiers' supplies and supply ships lie idly waiting the laborers' pleasure. Is it possible that some of those idlers realize how near their action, their crime, comes to manslaughter? Probably a few of them do; probably the majority do not.

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*Consulting mining and metallurgical engineer, 52 Broadway, New York.

The enlisted man does not want in his company those who are happy to have been rejected, but he has a right to hope for and to expect unlimited support from all those who are unable or afraid to accompany him. Argument is unavailing with such men as are responsible for many of the strikes. They are not many but their influence has been powerful. The American soldier knows that the greater portion of labor is supporting him, he wants to know that all of it is supporting him. He would like to know that it is acting of its own free will, but if there is a lack of free will, he would like to know that it is forced to do its part by the Government in whose care he has placed himself, whose resolutions he is trying to make good, whose war he will win even though it may mean his death.

McIntyre-Porcupine Report

The latest report of the McIntyre-Porcupine Mines, Ltd., of Schumacher, Ont., covers the period of 15 months ending June 30, 1917, for the reason that the date of closing of the fiscal year has been changed from Mar. 31 to a time when the absence of snow facilitates the taking of inventories of supplies.

Of the authorized capital of 4,000,000 shares 3,610,283 are now outstanding with a par value of $1 each. The acquisition of the outstanding minority interests in the McIntyre-Extension and the McIntyre-Jupiter properties involved the issue of 294,000 and 316,298 shares respectively. The fixed assets of the company are now reported as $4,432,249, of which $3,617,254 represents mining properties and $814,995 the buildngs, machinery and equipment. The total assets are placed at $4,851,780 and include some Dominion Government 20-year 5% War Loan bonds and a $100,000 investment in Plenaurum Gold Mines, Ltd., a property adjoining the Jupiter mines. Current liabilities are set down as $87,597, outstanding first mortgage 7% gold bonds $11,000, depreciation and general reserves $400,996, giving with the outstanding stock issue total net liabilities amounting to $4,109,876. There remained on the books on June 30, 1917, a surplus of $741,903, subject to a future slight deduction to provide for the business-profits war tax for 1916-1917.

During the period the ore broken in stopes was 215,240 tons, ore broken in development 21,160 tons, ore hoisted 193,986 tons. Development work amounted to 8454.2 ft. Prior to Apr. 1, 1916, the total footage was 25,676.6 and the bringing of 10,544 ft. of workings of the absorbed properties into the records of the amalgamated company makes a total footage of 44,675 on June 30, 1917. Diamond-drill operations from the underground levels showed interesting results. One hole penetrated 19 ft. of $25.30 ore at 1387 ft. from surface, another penetrated 12½ ft. of $8.20 ore at 1160-ft. depth, and another 7½ ft. of $13.50 ore at a depth of 785 ft. from surface and 60 ft. west of the Plenaurum.

Operating costs are reported as: Exploration $0.0487 per ton; development $0.8085; breaking and stoping $2.1348; crushing and transportation of ore $0.1184; milling $0.8882; repairs to buildings, etc., $0.0512; heating, lighting, water supply, etc., $0.1248; executive expense at head office $0.0649; administrative and general expense at mine office $0.2266; taxes, insurance and workmen's compensation $0.2104; bullion marketing costs $0.0525; and miscellaneous incidental to amalgamation $0.0543; or a total of $4.7833 per ton. The mill treated a total of 195,307 tons of ore (16,286 from subsidiaries previous to amalgamation Jan. 1, 1917) at a cost of $0.887 or 8c. per ton lower than for the preceding period.

The main shaft has been equipped with 2½-ton skips and ore and waste pockets cut out below the 1000-ft. level. Ore passes will carry all the ore from workings on the 600-ft. level to the 1000-ft. level, where it will be hauled to the shaft by electric storage-battery engines. An electric hoist, a 30-drill electric-driven compressor, a 100-ton-per-hour crushing plant, and an 800-ton ore bin were also added to the plant at the main shaft. Various improvements were made at the Jupiter shaft, and new equipment was added to the mill. The total expenditure for additions to plant and equipment was $229,527, which includes $99,040 for additions to the absorbed properties prior to Jan. 1, 1916. After mining and treating ore of a gross value of $1,954,793 during the period the ore reserves have been increased to 443,617 tons with an average value of $11.14 per ton.

Colorado Oil Shale Industry

At various times in the past there have been published in the *Journal* some descriptive articles[1] concerning the oil shale deposits of northwestern Colorado, southwestern Wyoming and northeastern Utah, activity in exploration work being centered near De Beque, Colo., a station on the main line of the Denver & Rio Grande railroad, 417 miles from Denver and 328 miles from Salt Lake City.

During the last year development work in the district has been somewhat active and several companies have been formed for the purpose of exploitation. The American Shale Refining Co., organized by Denver men, is building condensers and furnaces to be installed at De Beque and is expected to reach an output of 6000 bbl. of crude oil per day. A new process, protected by patents, provides for automatic movement of the shale and extraction of the oil in less time than by old methods. Other shale-oil companies incorporated in Denver are the Colorado Carbon Co., Mt. Logan Oil Shale Mining and Refining Co., Glenrock-De Beque Oil and Gas Co., Oil Shale Mining Co., Colorado Shale Products Co., Ute Shale Oil Co., Battlement Oil Shale Co., and the Book Cliff Oil Shales Co. Prominent in the directorate of several of the new shale companies is B. J. Barron, an official of the Midwest Oil Co. and of the Boston-Wyoming Oil Company.

Field examinations and experiments have led to the belief that in Colorado alone there is enough shale to produce 20,000,000,000 bbl. of oil and that 300,000,000 tons of ammonium sulphate can be recovered as a byproduct in the manufacture of the oil. It is further estimated that by ordinary means of refining some 200,000,000 bbl. of gasoline may be extracted from the oil in the Colorado shale.

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[1] Vol. 98, No. 3, p. 133, July 18, 1914; Vol. 99, No. 18, p. 773, May 1, 1915; Vol. 102, No. 21, p. 1011, Dec. 9, 1916.

Production of Electrolytic Antimony From Impure Ores

By WILLIAM A. BURR*

The stringent specifications of buyers as to purity of antimony prohibits the working of many impure ores. After many experiments a profitable method was developed of reducing such ores by grinding to eight mesh and leaching with a solution containing 7% sodium hydrate and 2% sodium chloride. From the solution antimony was precipitated electrically. Steel electrodes and a current density of 8-9 amp. per sq.ft. at 2¼-2½-volts pressure were used. The precipitate contained 99.94% Sb.

SEVERAL years ago I became interested in the mining of antimony ores and, in so doing, not only found myself in direct competition with Chinese and Japanese raw ores and finished products, but also found, on investigating the market, that the stringent specifications adhered to by antimony-ore purchasers in the United States made it difficult to obtain ores sufficiently "pure" to meet their requirements and leave a profit for the miner. These specifications called for stibnite carrying 40% Sb or over and not exceeding 2% combined "impurities." Inasmuch as "impurities," as defined by the ore purchasers, comprised arsenic, copper, lead, zinc, manganese, bismuth and in some cases iron, I found myself confronted with a hard problem.

With a view to marketing the product in competition with foreign producers, I cast about for a practical method of reducing on the ground my somewhat impure ore, which carried in addition to 3% arsenic, various percentages of nearly all the impurities specified. I exhausted the literature of all the authorities on the subject, from Agricola to Dr. Wang, in investigating pyrometallurgical methods, only to find that producing a reasonably pure product, such as could be called "star" antimony, from impure ores was out of the question by any of these methods. At the same time I balked at the usual volatilization or residual losses, amounting usually to from 20 to 25%, which accompany the employment of the old fire methods.

TROUBLES SOLVED BY ELECTROLYTIC PRECIPITATION

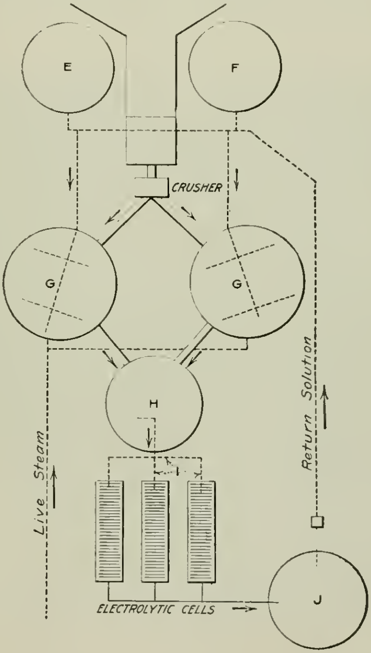
Water concentration was tried but did not give satisfactory results, and I was but little better off with the antimony concentrates than with the original ore. Hydrometallurgy was next turned to but while several efficient solvents were found, I could not discover a precipitant that would give a precipitate that could be readily converted into "star antimony," although many precipitates would have made beautiful pigments.

I finally turned to electrolytic precipitation for a solution of the difficulty and the results of the research recompensed me for the time and effort expended. Electrolytic antimony had been produced on an experimental scale in laboratories in Germany, Sweden and other countries, but no well defined process that approached anything that could be commercialized had been evolved. On undertaking to develop such a process I was confronted by many apparently incompatible results.

I found a dependable solvent that would dissolve the antimony without placing in solution other elements and that would also be precipitated at the current density necessary later to throw down the antimony. This was a 7% solution of sodium hydrate to which was added 4% of sodium sulphide. The sodium sulphide was later eliminated as unnecessary.

This solution fulfilled all requirements. Its efficiency may readily be tested by dissolving three grams of stibnite, crushed to pass through an eight-mesh screen, in a beaker with 10 c.c. of the sodium-hydrate solution at 60° C. Complete dissolution will occur in 17 to 20 min. Antimony may be precipitated from this solution with sodium carbonate. This precipitate, however, had no commercial value. So it still remained to find a method of precipitating the antimony in a commercial form or in one that could be made commercial by remelting and casting.

On this subject absolutely no reliable data, aside from Faraday's law, could be found. Consequently the



FLOW SHEET OF ELECTROLYTIC ANTIMONY PLANT

E, water-storage tank; F, solution-storage tank; G, leaching tank; H, pregnant-solution tank; 1, distributers to cells; J, precipitated-solution sump work was begun with that law. I will not recount here the long series of experiments made in the laboratories of various universities in an effort to determine the proper current-density and voltage, the effect of voltage on precipitate, the proper materials for electrodes, the most advantageous distance between electrodes, and the velocity at which the electrolyte should pass the electrodes, and other important details. I will describe the process of a small plant capable of producing 1000 lb. of electrolytic antimony daily, which with proper manipulation will be chemically pure even when made from so-called impure ores; in such a plant the working tests, on which this article is based, were carried out.

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*Formerly acting superintendent of reduction works, Moose Mountain, Ltd., Sellwood, Ont.

The stibnite ore was crushed to eight-mesh with a No. 2 Limepulver, made by the Jeffrey Manufacturing Co., of Columbus, Ohio, the speed being reduced to 1300 r.p.m. and the grizzlies set with ¼-in. spacings. The hammers were found to be too soft but, had they been made of a good grade of manganese steel, the machine would have been satisfactory and economical for this purpose. As it was, it was necessary to replace the hammers every 24 hours. The crushing was done in the solvent solution. From the pulverizer's discharge the pulp was led away by a launder to two leaching tanks 16 ft. in diameter with 5-ft. staves and an ordinary type-A filter bottom of Douglas fir, furnished by the National Tank and Pipe Co. of Portland, Ore. The filter bottom was covered with one thickness of cocoa matting, on top of which was spread a seamless woolen filter cloth. The entire leaching side of the plant was, in short, the counterpart of the old type McArthur-Forest cyanide plant; any cyanide or lixiviation plant may be readily converted into a plant for the production of electrolytic antimony.

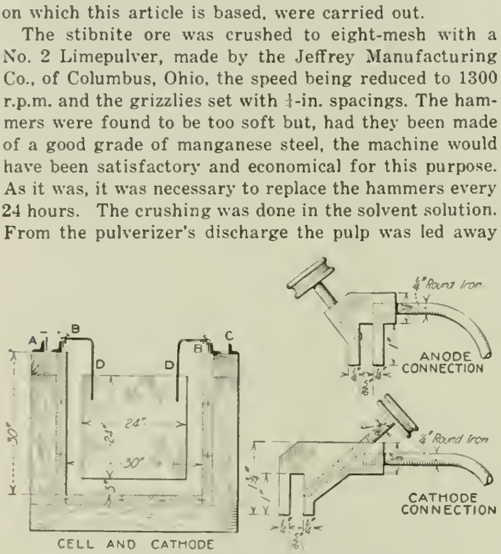


DIAGRAM SHOWING DETAILS OF CELL
A, anode busbar; B, cathode busbar; C, anode dummy bar. Anode connections reach over positive busbars to negative busbar and dummy bar

Live Steam Used in Leaching

When the leaching tank was filled, freshly standardized sodium-hydrate solution was let in through the solution pipes from beneath the filter bottom and allowed to flow upward through the pulp and to overflow through launders, as pregnant solution, into the pregnant-solution tank. Live steam was also introduced beneath the filter bottom in order to maintain a working temperature of 60° C. From the pregnant-solution tank the solution was led, by means of decantation pipes, to the precipitating cells. These were three cells consisting of boxes of 2-in. Douglas fir, measuring 30 in. x 30 in. x 15 ft. inside, having 3 x 3 in. strips, bordering the sides at the top, on which were carried the busbars.

There were three busbars to each cell, the two positive ones being of ¼ x 2-in. copper and the negative one of ¼ x 4-in. copper. A ¼ x 4-in. iron dummy bar, carrying no current, served as support for one side of the anodes, the other side resting on, and taking current from, the negative busbar. The cathodes rested on the positive busbars. The latter were not insulated and were bolted to 1½ x 1½-in. angle irons running along the 3 x 3-in. wooden strips edging the sides of the cell.

Electrodes Made of Mild Sheet Steel

Each cell contained 80 electrodes, consisting of pieces of ordinary mild sheet steel, ⅛ in. thick and 2 ft. square. While the sheet-steel anodes gave satisfactory results, carbon ones would have been better but could not be obtained without considerable delay. Iron would have been better than steel for the cathodes but likewise could not be secured. The electrodes were placed 2 in. apart and the conductivity of the electrolyte was increased by the addition of 2% sodium chloride.

The electric current was supplied by a 5000-amp. variable-voltage direct-current generator, specially built by the Pan-Electric Manufacturing Co. of St. Louis, and was wired to operate between two and four volts. The most successful precipitation was accomplished under a pressure of 2.25 to 2.50 volts. Much of the success was due to the delicacy of control of voltage possible in this generator. A current density ranging from 8 to 9 amp. per sq.ft. of cathode surface was employed. This gave a coarse, crystalline precipitate, easily removable from the cathode by means of a scraper similar to a broad putty knife. The precipitate was allowed to accumulate on the cathodes until a thickness of about ¾ in. had been deposited on both sides, when they were lifted from the busbars and the precipitate scraped off, washed, dried and cast into the usual "star" antimony cake. Its analysis showed 99.94% of antimony.

Low-Grade Antimony Can Be "Starred" in Casting

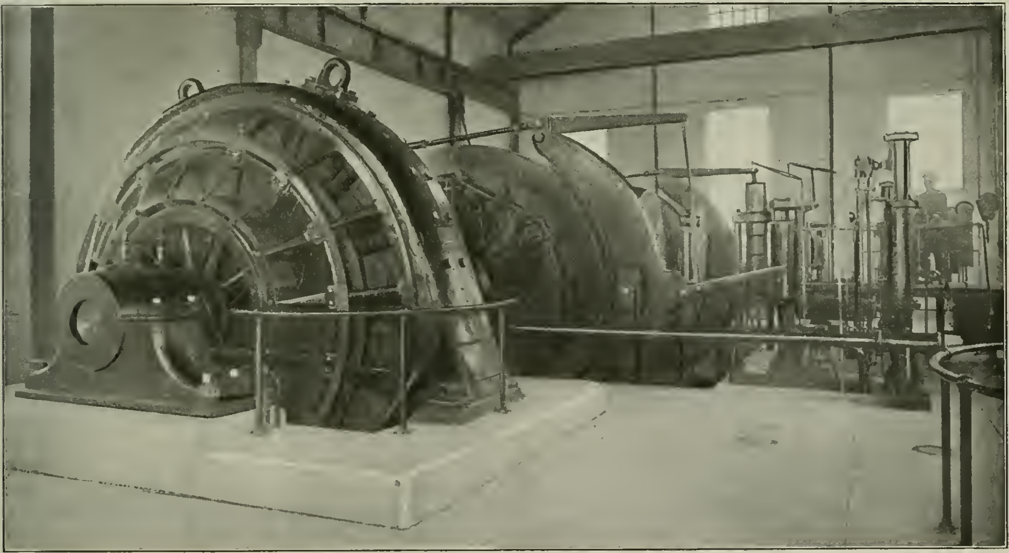
Considerable practice was required in casting the cake in order to produce the "star" on its upper surface. Antimony buyers usually pay more attention to this "star" than to the actual analysis of the metal, not knowing that it is possible to star even a low-grade antimony product. To succeed in this, the iron or brass molds employed must be warm and covered on the inside either with melted rosin or thin slag. The cast must be made under a cover of melted rosin or thin slag, for the cake will not "star" if exposed to the air while molten. The solutions from time to time are cleared of the accumulated sulphur with carbon dioxide, the sump holding the precipitated solution being covered. Sodium hydrate, sodium sulphide and sulphur may be obtained from the precipitated solution as byproducts.

The cost of producing a pound of star antimony in the manner described above was 2.2c., electricity being generated by means of steam with 13,000 B.t.u. coal costing $2.50 per ton. There is a great deal of antimony in the United States, most of which is in low-grade or complex ores such as the process herein described is adapted to treat. If the owners of such properties would turn their attention to the production, on the ground, of alloys such as anti-friction, type and Britannia metals and selling them to the consumer direct, instead of trying to fight the open markets on "star antimony," they would find it, in general, more profitable.

The New Elm Orlu Hoist at Butte, Mont.[*]

Description of a recent Ilgner-Ward Leonard hoist installation at the Elm Orlu Mining Co., Butte, Mont. This installation is one of the two largest of this type in operation in this country. Data on three sets of tests; the first conducted ta analyze a typical day's run, the second to determine efficiency while hoisting under known conditions, the third supplementary to the second test when hoisting from the 1500-ft. level.

DURING the last year and a half, a period to be remembered for its tremendous industrial activity, extraordinary progress was made in the field of mine electrification; and in particular in the electrification of mine hoists of more than average capacity and importance, and for the operation of which the highest type of electrical system was demanded. This progress extended to both the coal-mining and the metal-mining fields. Illustrative of the extent of this progress, it may be said that the number of Ward Leonard and Ilgner-Ward Leonard hoist equipments which will have been put into operation in this country during the two years of 1916 and 1917 will equal the total number operating prior to 1916, and the aggregate horsepower capacity will be 50% greater.



VIEW OF THE ELECTRIC HOIST AT ELM ORLU MINE, BUTTE, MONT.

A recent Ilgner-Ward Leonard hoist installation of considerable interest is that at the mine of the Elm Orlu Mining Co. at Butte, Mont. This equipment has been in regular productive operation since February, having been put into commission to replace an old steam hoist. This type of hoist but recently made its appearance in the Butte district, and the present installations are but forerunners of many electrifications which will undoubtedly be made in the near future.

This equipment is of interest (1) because of its capacity, being one of the two largest of this type in operation in this country, and (2) because of its unusual smoothness of operation, simplicity and ease of control, being so noted throughout the Butte camp. The hoisting equipment is installed in a substantial brick building of one room, the motor-generator set with flywheel, the slip regulator and the switchboard occupying all of one end. A view of the hoist and motor is shown in the illustration. The building is exceptionally well lighted, both by day and by night, and there is a particular absence of congestion. Two 20-ton hand-operated traveling cranes provide adequate capacity for the handling of the heaviest parts.

For the driving of large, high-speed hoists, considerations of accuracy of control and safety of operation suggest the use of equipments operating on the Ward Leonard system. This system, combined with a flywheel for load equalization, commonly known as the Ilgner-Ward Leonard system, is utilized where conditions of power supply make flywheel equalization imperative, as in this instance, the reservation charge being based on the maximum instantaneous demand. For this reason, flywheel capacity was supplied sufficient to equalize completely the maximum duty cycle met in balanced hoisting from the deepest level. The shaft has been sunk to a depth of 1800 ft. and ore is being hoisted regularly from the 1100, 1200, 1300, 1400, 1500 and 1800 levels. Ultimately, the ore will be taken from 3500-ft. depth in the Elm Orlu mine.

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[*] Excerpt from a paper presented by R. S. Sage before the American Institute of Electrical Engineers, June 28, 1917.

The general characteristics of the hoist are as shown in Table I. It is impossible to predict exactly the actual operating schedule in this class of service, but to insure continuity of service, the most important consideration in installations of this kind, the first requisite is that the driving machinery have a safe margin of capacity. A heating guarantee of 40° C. rise for all parts of the electrical equipment was therefore made, for continuous operation, when hoisting the specified hourly tonnage from any level. The estimated limits of demand from the power supply for the various levels were as follows: From 1500-ft. level, 650 kw.; 2400-ft. level, 760 kw.; 3500-ft. level, 865 kw. The estimated overall efficiencies corresponding to the maximum hourly tonnages are: From 1500-ft. level, 46.2%; 2400-ft. level, 48.3%; 3500-ft. level, 47.7%. The hoist is also used for practically all of the hoisting of an unproductive character, such as handling waste, men, timbers and supplies, and the hoisting of ore is done simultaneously with this sort of work. The over-all efficiency at which the ore is hoisted, that is, the ratio of the net work done in lifting a day's output of ore, to the kilowatt-hours of electric energy used per day, is therefore much less than the figures given above. The mine is still in the devolpment stage so that the unproductive work is a large proportion of the total required of the hoist. At present the slip regulator is adjusted so as to limit the demand to 400 kw., as this is sufficient for the present depths and the present manner of hoisting.

TABLE I GENERAL CHARACTERISTICS OF HOIST

Inclination of shaft with horizontal	90 deg
Present maximum lift	1,800 ft.
Ultimate maximum lift	3,500 ft.
Weight of skip and man cage	11,000 lb.
Weight of ore per trip	10,000 lb.
Weight of one rope (3,500 ft.)	12,500 lb.
Maximum speed of skip per minute during hoisting	2,500 ft.
Diameter of cable	1.5 in.
Weight of cable, per foot	3.55 lb.
Diameter of cylindrical, double-clutched drums	10 ft
WR^2 of drums	3,600,000 lb.-ft.^{2}
Maximum hourly tonnage (2,000 lb.) from 3,500-ft. level.	155 tons
Assumed mechanical efficiency	85%

TABLE II. POWER DEMANDS AND TONNAGES FOR DIFFERENT HOSTING DEPTHS

	1,500-Ft. Level	2,400-Ft. Level	3,500-Ft. Level
When Hoisting 100% Maximum Hourly Tonnage:			
Hourly tonnage	267.00	202.00	155.00
Kw.-hr. per ton	2.46	3.74	5.54
When Hoisting 75% of Maximum Hourly Tonnage:			
Hourly tonnage	200.00	152.00	116.00
Kw.-hr. per ton	2.58	3.89	5.75
When Hoisting 50% of Maximum Hourly Tonnage:			
Hourly tonnage	133.00	101.00	77.5
Kw.-hr. per ton	2.83	4.23	6.17
When Hoisting 50% of Maximum Hourly Tonnage:			
Hourly tonnage	67.00	50.5	38.7
Kw.-hr. per ton	3.57	5.07	7.45

STRUCTURAL FEATURES OF HOIST AND MOTOR

The hoist consists of two steel-plate drums 10 ft. in diameter, grooved to hold 1900 ft. of 1.5 in. steel cable per layer. The drums are mounted between three bearings, on a single shaft which has an extreme length of 40 ft. Each drum is provided with an axial-plate-type clutch and a parallel-motion post brake. The diameter of the brake tread is 14 ft. The post brakes are made of structural shapes and steel plate to form a box girder. The brakes are released and the clutches operated by means of oil through cylinders with floating-level control, served by an oil accumulator in connection with a motor-driven triplex oil pump. A 2-hp. motor supplies all the power required for the brake and clutch engines. The weights by which the brakes are set are in the form of cylinders moving vertically in guides formed by part of the brake engine. In addition to the regulation dial-type depth indicators, the drum flanges are extended to provide a surface for spotting marks. The bearings are all of the two-part type provided with gravity-feed lubrication, in addition to oil rings. Sight-feed oil gages are provided for all the bearings.

To the drum shaft is coupled an 1800-hp., 80-r.p.m., 525-volt direct-current motor which is supplied with two bearings, and sole plates. The armature shaft is 14 in. in diameter in the bearings by 11 ft. 5 in. long, and has a forged half-coupling for connection to a corresponding half-coupling on the drum shaft. The armature is 9.5 ft. in diameter, while the outside diameter of the magnet frame is 14 ft. 5 in. The motor has 16 main field poles, the coils being wound for 125-volt excitation, and has commutating poles to insure good commutation at the heavy overloads encountered in the service. The bearings, in addition to being ring-oiled, receive lubrication from the gravity-feed oiling system. The extreme length of the hoist, with motor, is 51 ft. 9 in. The motor receives its power through a set, consisting of a generator driven by an induction motor, and a direct-coupled flywheel and exciter. The generator has a continuous capacity of 1300 kw., at 525 volts, and in order to commutate successfully the heavy currents at the low voltages, it is equipped with commutating poles, and, in addition, a compensating winding is placed in the pole faces of each of the 12 main poles. As in the case of the hoist motor, the main-field excitation is at 125 volts. The induction motor is rated 1150 hp., three phase, 60 cycles, 2200 volts, and has a synchronous speed of 514 r.p.m. It is of the wound-rotor type, with collectors for connection to the automatic slip regulator.

FLYWHEEL, CONSTRUCTED OF STEEL PLATES, WEIGHS 46 TONS AND IS INCLOSED IN HOUSING

The flywheel is built up of rolled-steel plates, 11 ft. 10 in. in diameter, so that the peripheral speed at synchronism is 19,100 ft. per min. The width of face is 20.5 in., making the total weight 92,000 lb. exclusive of shaft. The plates are securely riveted together by steel rivets. The wheel is mounted between two bearings, and coupled to the generator by a Francke type flexible coupling. A special grade of hard babbitt is used in the supporting bearings. Lubrication is afforded both by means of a low-pressure oil pump geared to the shaft supplemented by ring oiling. The geared pump begins to supply the bearings with oil practically as soon as the wheel turns over. The oil reservoir is sunk below the floor line at the end of the flywheel bearing, and contains coils for the circulation of cooling water.

In order to reduce the demand on the power system, when starting the set, a small motor-driven, high-pressure oil pump is provided to supply oil pressure under the bearings, this pump being put into operation only when required for this purpose. With this starting pump in operation, the set and wheel started from rest with 80% of full-load current from the power system. A close-fitting steel plate cover is provided for the wheel above the floor line, the pit in the foundation virtually forming the lower portion of the enclosing casing.

The exciter armature is mounted on an extension of the induction-motor shaft, the field frame being bolted to an extension of the base. The exciter has a continuous rating of 21 kw., at 125 volts. A cast-iron base is provided under the induction motor and generator, and sole plates under the flywheel bearings. The foundation under the various units is of reinforced concrete extending down to the bedrock, insuring stability of alignment.

Electric-Control System

The hoist-motor speed and direction of rotation are controlled by varying the strength and reversing the polarity of the generator field. The field rheostat is provided with a large number of points giving a corresponding large number of speeds in both directions. Between the motor and generator there is inserted an overload circuit breaker and a single-pole line switch. In the design and installation of the entire equipment, careful consideration was given to the matter of safety of operation, with the result that the effects due to carelessness on the part of the operators are obviated and protection to the men and apparatus is provided in almost every emergency.

The arrangement of the control levers is extremely simple, there being but one power lever, a forward movement corresponding to one direction of rotation and a backward movement, the reverse. This lever with the two brake levers, one on either side, completes the lever group. The clutches are operated by a throw, either in or out, of a crank through an arc of 180°. A center-zero direct-current ammeter and voltmeter are mounted in the line of vision with the depth indicators.

TABLE III. RESULTS OF TEST FOR A TYPICAL DAY'S RUN

Duration of test	12	hours
Actual time hoist in motion	3.5	hours
Total number of trips made	280	
Number of skips of ore hoisted	63	
Percentage ore trips of total	22.5%	
Total weight of ore hoisted	252.5	tons
Average weight of ore per skip	4.01	tons
Average lift of ore	1,428	ft.
Net work done on ore—total	272	kw.-hr.
Net work done on ore—per trip	4.32	kw.-hr.
Net work done on ore—per ton	1.08	kw.-hr.
Kw.-hr. energy used during day	1,500	kw.-hr.
Total kw.-hr. energy used, including nonproductive work per ton ore hoisted	5.94	kw.-hr.
Kw.-hr. used while hoist at rest	680	kw.-hr.
Kw.-hr. used while hoisting ore	582	kw.-hr.
Kw.-hr. returned to power system	14.6	kw.-hr.
Over-all efficiency while hoisting ore	46.7%	

The trips with ore were divided among the levels as follows:

Level	No. Trips	Actual Lift
,000 ft.	6	1,068.5 ft.
,100 ft.	3	1,170.0 ft.
,200 ft.	3	1,271.2 ft.
,300 ft.	20	1,372.5 ft.
,400 ft.	7	1,473.5 ft.
,500 ft.	22	1,574.5 ft.
,800 ft.	2	1,915.2 ft.

The weight of ore hoisted was obtained by observing the number of cars dumped into each skip and using an average weight per car obtained from a large number of cars.

A Welch safety device compels slowing down at the proper rate and provides protection against overwinding and overspeeding. As an additional protection, limit witches actuated by the skips themselves are installed n the guides. These switches, as well as the Welch device, cause the direct-current circuit breaker to open, n addition to setting the hoist brakes. In general, any emergency which will cause the direct-current circuit breaker to open will cause the brakes to be applied. The direct-current circuit breaker will open under any of the following emergencies: Extreme direct-current overload, overwind top or bottom, loss of exciter voltage, loss of motor-field excitation, overspeed of hoist, or overspeed of motor-generator set.

The opening of the main line alternating-current, oil circuit breaker will not open the direct-current circuit breaker, nor set the hoist brakes, but the operator is free to continue hoisting as long as the stored energy in the flywheel will permit. The opening of the line switch is indicated in the usual manner by the ringing of a bell. When the direct-current circuit breaker has been opened under any of the above-mentioned emergencies, and an application of the brakes made, the brakes cannot be released until the controller lever has first been returned to the central position. After an over-wind has occured, it is necessary for the hoist operator to throw a small switch before power can again be applied to the motor and motion is possible only in the lowering direction.

Energy Stored in Flywheel

The total energy in the flywheel at 94% synchronous speed is 117,000 hp.-sec., of which approximately 50% is available for operating the hoist in the event the set was disconnected from the power supply, the limitation being the speed at which the direct-current exciter is no longer able to hold up its voltage. If required, a complete trip with a fully loaded skip could be made from a depth of 1500 ft. on the energy of the flywheel, and a load of men could be hoisted from the deepest level. Hoisting "out of balance" can be carried on without causing excessive speed reduction of the set or necessitating a higher limit of demand from the power supply.

The liquid slip regulator used with this equipment is worthy of special mention, as being a decided departure in important details from the heretofore generally accepted design. In the latter, it was necessary to make a water-tight joint between the tile or porcelain vessels and the cooling tank, and also between the tile and the electrodes, clamping rings or draw bolts being used for this purpose. In many instances, this construction in connection with temperature changes resulted in broken tiles, causing much annoyance. In the present design the tiles are simply placed upon a rubber mat on the steel bottom of the tank, the only water-tight joint being that between the lower electrodes and the bottom of the tank. Only enough pressure is applied on the tile by the holding-down bolts to hold it in place, the purpose of the tiles being merely to serve as barriers to prevent leakage between phases. Common sewer tiles are used for the purpose. The value of the input limit is adjusted in the usual manner by varying the number of the counterbalancing weights.

The first set of tests was for the purpose of analyzing a typical day's run under ordinary conditions, as regards its relation to the electrical equipment. In the second tests, measurements were made of the electrical quantities for a few trips to determine, if possible, the efficiency while hoisting under known conditions. The third test was supplementary to the second.

Efficiency Test Under Daily Hoisting Conditions

A log was kept of all the movements of the hoist from 7 a.m. to 7 p.m., recording the time, the nature of all trips, quantity of ore, etc. The only instruments in use were the alternating-current recording wattmeter—30-in. feed per hour—Karlic tachograph and integrating polyphase watt-hour meter. As mentioned in the preceding paragraphs, there are no special, designated periods of the day during which the hoist is used exclusively for the hoisting of ore, but this is carried on simultaneously with the unproductive work, as the conveying of timber, men and supplies. Moreover, the hoisting is of such an intermittent nature that a straight-line input to the motor-generator set is not even approximated, even at the low limit of 400 kw. Storage or bins are under construction, but were not in operation at the time of the tests. The results of the first test are shown in Table III.

The calculated net work done in lifting the ore is subject to some error, inasmuch as during about 25% of the trips timber or men were lowered in counterbalance with the ore. On the other hand, men were hoisted with the ore during about 20% of the trips. During about 50% of the trips with ore, at least one stop was made between the loading level and the dump, there being a maximum number of six such stops. The total kilowatt-hours used was obtained from readings taken on the watt-hour meter at the beginning and end of the test. The energy used during the ore trips was obtained from the record made by the 30-in.-per-hour, curve-drawing wattmeter with the aid of a rolling planimeter. The energy returned to the system was obtained in the same manner. The time during which the hoist stood at rest was taken from the tachograph record.

Efficiency Test Under Rapid Hoisting Conditions

In order to secure as rapid hoisting as possible, there was accumulated at the 1500-ft. level, 30 cars of ore making possible five consecutive trips, as fast as the skips could be loaded. Continuous records were made on the graphic meters of the direct-current voltage and current and of the alternating-current current. A time marker marked every second on all the records, simultaneously. The speed of the motor-generator set was read at frequent intervals and telegraphed to one of the graphic records at the instant of reading, a record of the consecutive readings being kept which was later transferred to the graphic record. The speed of the hoist motor was taken from the tachograph record and the 30-in.-per-hour recording wattmeter supplied a record of the power delivered to the motor-generator set. Conditions of the second test are shown in Table IV.

TABLE IV. TESTS FOR EFFICIENCY UNDER RAPID HOISTING CONDITIONS

(Hoisting Done in Balance)

Duration of test	565	sec
Lift	1,574.5	ft
Number of skips hoisted	5	
Weight of ore hoisted	20.3	tons
Average weight per skip	4.06	tons
Net work done—total	24.1	kw.-hr
Average time per trip	113	sec
Actual running time—total	310	sec
Actual running time—average per trip	62	sec
Time at rest—total	255	sec
Time at rest—average per trip	51	sec
Average time for acceleration	22	sec
Average time for running at full speed	15.5	sec
Average time for retardation	24.5	sec
Average rope speed	1,525	ft. per min
Maximum rope speed	2,580	ft. per min
Average speed of M-G set	486	r.p.m
Hoist motor input (exclusive shunt field)	32.64	kw.-hr
Hoist motor output	28.2	kw.-hr
Mechanical efficiency of hoist	83%	
Energy input to M-G set total	50.5	kw.-hr
Kw.-hr. per ton	2.49	
Over-all efficiency	47.7%	

The energy dissipated in the various parts of the equipment was found to be as given in Table V.

The hoist-motor input was measured directly, and the output was obtained by deducting the losses which were based on factory-test results. The power input to the motor-generator set when running light as measured by the 30-in.-per-hour, curve-drawing wattmeter, and checked by the indicating wattmeter was 80 kw. at 512 r.p.m. For the average speed of the set during the test this was taken at 78 kilowatts.

The segregation of the losses in the set was made from results of tests made in the factory. The running-light input to the set includes bearing, friction and windage for flywheel, generator and induction-motor; induction-motor core loss and running-light copper loss; hoist-motor shunt field (with economy resistance in series); exciter loss with load of motor field. The same total loss in the equipment is obtained by adding to the running-light loss of the set, the increase in losses while under load, these being readily calculated. On this basis, the result is as shown in Table VI. An item not included in this segregation, consisting of approximately 0.25 kw.-hr., used in operating the accumulator oil pump and the brake solenoids, is also included in the running-light input. The total energy accounted for is therefore 50.81 kw.-hr., as against 50.5 shown by the wattmeter.

TABLE V. ENERGY DISSIPATED IN MECHANICAL PARTS

	Kw.-Hr.	Per Cent of Net Work
Losses in mechanical parts of hoist, sheaves, guides, etc	4.1	17.0
Hoist-motor losses	6.25	25.9
Generator losses	5.53	22.9
Induction-motor losses	3.99	16.6
Flywheel losses	4.08	17.0
Slip-regulator losses	2.12	8.8
Exciter losses	0.39	1.6
Total losses	26.46	109.8
Net work done on ore	24.1	
Total energy consumed	50.56 kw.-hr.	
Overall efficiency	47.66%	

TABLE VI. RUNNING-LIGHT INPUT

	Kw.-Hr
Motor shunt field (increase)	0.248
Indicator motor copper loss (increase)	0.223
Exciter loss (increase)	0.060
Generator losses (excluding friction and windage)	3.019
Motor losses (excluding shunt field)	4.440
Regulator losses	2.120
Running-light loss of set	12.250
Friction in mechanical parts of hoist	4.1
Total	26.460

The energy output of the generator, as obtained from the direct-current power curves by the aid of a rolling planimeter was 32.64 kw.-hr., and the input 38.17 kw.-hr. The input to the generator was at the rate of 243 kw., so that during the trips, approximately 27.5 kw.-hr. were required from the flywheel. The average speed reduction of the set during hoisting was 10.6% on the basis of which, the energy given up during the five cycles was 96,500 kw.-sec. or 26.8 kw.-hr., which checks fairly well with the figure given above.

In general, the test results check well with the estimated performance. The friction losses in the hoist, sheaves, rope and guides proved unexpectedly low, but the shaft guides are in good repair, and the cage rides almost as smoothly as a passenger elevator. Also, the hoist drums run true and with no interference with the brake-shoe blocks; the head sheaves and idlers are well lubricated and easy-running.

The efficiency of hoisting exceeded that anticipated, even with the light loads, the load per skip being but 80% of that considered normal. With heavier loads, as when hoisting high-grade copper ore, the efficiency would be further increased. Hoisting was done at slightly less than 50% of the maximum rate for this level and the power consumption was 2.49 kw.-hr. per ton as compared with 2.83 kw.-hr., expected. The tendency should be for the efficiency to increase at the greater depths, the maximum probably being reached at the intermediate levels.

The time for retardation is considerably longer than that used in calculating the duty cycles, and is the result of the rather close setting of the Welch safety device. At present there is no particular reason for rapid hoisting, and the management, being inclined to a policy of safety, requires the slower rate of retardation. A reduction in the retardation period would further tend to a betterment of the efficiency of hoisting. The standby losses are considered particularly low for an equipment of this capacity.

It is believed that by decreasing the loading time so as to obtain a more uniform input to the power set, decreasing the retardation period and bringing the load up to normal, the hoisting efficiency of this outfit will reach 50% at this level. It is believed that the results of these tests give fairly accurate information as to the operating characteristic of the hoist at the Elm Orlu and indicate, in general, the results to be expected of the performance of other Ilgner equipments in similar service.

Supplementary tests of the same nature as those referred to as second test were made when hoisting from the ore pockets subsequently completed at the 1500-ft. level. During this test 12 skips were hoisted from the pockets, the time of loading averaged 27.3 sec., as against 51 sec. during the previous test. The higher overall efficiency obtained, namely 50.2%, is due to the decreased standby loss as a result of the decreased loading time. It will be noted that the total lift was increased 43.5 ft. when hoisting from the pockets, thereby increasing slightly the work done per trip. Table VII shows the conditions pertaining to this test and the results observed therefrom.

TABLE VII. SUPPLEMENTARY TESTS FOR EFFICIENCY

Duration of test	1,081 sec.
Lift	1,618 ft.
Number of skips hoisted	12
Weight of ore hoisted	97,400 lb.
Average weight per skip	4.06 tons
Net work done—total	59.38 kw.-hr.
Average time per trip	90 sec.
Actual running time—total	754 sec.
Actual running time—average per trip	62.8 sec.
Time at rest—total	327 sec.
Time at rest—average per trip	27.3 sec.
Average time for acceleration	21.8 sec.
Average time running at full speed	17.0 sec.
Average time for retardation	24.1 sec.
Average rope speed	1,545 ft. per min.
Maximum rope speed	2,550 ft. per min.
Average speed of M-G set	481 r.p.m
Hoist-motor output	70.7 kw.-hr
Hoist-motor input (exclusive shunt field)	81.5 kw.-hr.
Mechanical efficiency of hoist	81%
Energy input to M-G set—total	118 kw.-hr
Kw.-hr. per ton hoisted	2.425
Overall-efficiency	50.3%

Mine Lien Claims

By A. L. H. Street[*]

As noted by the Oregon supreme court in the late case of Bishop vs. Henry, 165 Pacific Reporter, 237, no valid lien can attach to mining property on account of labor or supplies furnished for its improvement or development, except as such lien may be expressly authorized by statute and except as there may be substantial compliance with such statute in the matter of filing notice, etc. But it is decided that under the Oregon lien law there is no necessity for stating the name of the owner of the mining property against which a lien is asserted, in the statement of lien filed with the county clerk, unless such owner is known to the lien claimant.

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Danger of Oxygen Rescue Apparatus

When oxygen rescue apparatus was first introduced in the United States and made use of in the mines following explosions and fires, there was a wide misconception on the part of many miners and mining men as to the extent to which it might be used, and the limitations of the physical endurance of those who volunteered to wear the apparatus. Many conceive the idea that with an oxygen apparatus a man immediately acquires superhuman strength and endurance. It is not putting it too strongly to state that a number of good men have gone to their death in an effort to satisfy a false belief on the part of spectators that the apparatus had no limitations, and that the wearer knew no limit of physical exertion.

The helmet type of apparatus has received condemnation by many scientific investigators, and the Bureau of Mines has publicly denounced its use for mine or fire-fighting purposes; still there are some who persist in its use, and they are but challenging death. Some helmets may be made to fit tightly temporarily, but the models now in use have large dead spaces, and under enforced breathing admit external air.

It is safe to say that a number of deaths here and in foreign countries have resulted through the wearer breathing his own carbon dioxide, or through leakage of external air into the circulating system of the apparatus. To overcome the re-breathing of air highly charged with carbon dioxide, an efficient absorber is one of the essentials; the apparatus, if of a constant-feed model, should supply an excess of oxygen above the requirements of the wearer; if an intermittent feed, there should be either a constant leakage externally or an auxiliary supply held within a flexible medium under small pressure, which will make the breathing circuit under positive pressure.

The difficulty experienced by designers and manufacturers heretofore has been that the physiological requirements have not been given full consideration. The apparatus has been constructed in a manner which enables the wearer to perform limited physical work. However, it is a source of gratification to report that some manufacturers are now enlarging the absorbers and providing a bypass valve and readjusting the zone of reduced, or negative, pressure.

The Gibbs apparatus, described in U. S. Bureau of Mines technical paper No. 82, is constructed with the sole idea of adapting the apparatus to the limitations of the wearer, whereas some types now in use require the man to adapt his activities to the limitations of the apparatus. This subject has been discussed in a technical paper issued by the Bureau of Mines under the joint authorship of Dr. Yandall Henderson and James W. Paul, the subject of which deals with the status of oxygen-rescue apparatus and the physiological effect on users of such equipment.

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[*] Abstract of an article, "Status of Oxygen Rescue Apparatus and Physiological Effects on Users," by James W. Paul, chief of coal-mining investigations, U. S. Bureau of Mines, Pittsburgh, Penn.; presented at the meeting of the National Safety Council, New York, Sept. 13, 1917.

Eugene Franz Roeber

Dr. E. F. Roeber, editor of *Metallurgical and Chemical Engineering* died at his home in East Orange, N. J., Oct. 17, 1917, after a lingering illness of several months. He had not enjoyed the best of health for a year or more, but it was not until last June that he was compelled to leave his work, to which he never returned. For some time it was hoped that complete relief from care and responsibility, coupled with the best of medical attention, would restore him to health and activity, but he failed steadily and came to an untimely end in the prime of life.

Dr. Roeber was born in Torgau, Saxony, Oct. 7, 1867, and passed his 50th birthday 10 days prior to his death. His excellent education in science and engineering was received at three German universities, Jena, Halle and Berlin. At the last institution he received the degree of doctor of philosophy in 1892. Without waiting to find a field for his abilities in his native country, he came to the United States in 1894. For several years he remained in comparative obscurity and for part of that time, at least, was associated with the book concern of E. Steiger & Co. in New York.

DR. E. F. ROEBER

In 1899 he made the acquaintance of Dr. Carl Hering, of Philadelphia, who engaged him as an assistant. This was his first professional engagement and marked the beginning of a notable career in electrochemistry, which led to his recognition as a leader. His work evidenced characteristic thoroughness, reliability and conscientiousness. These qualities—which he later applied with marked success as a technical editor—first became apparent in his digest of foreign literature for the *Electrical World*.

The early days in Philadelphia witnessed two important undertakings in which Dr. Roeber played a prominent part. It was then that electrochemistry was assuming an aspect of importance in this country, and the time seemed opportune to publish a journalistic exponent for the industry. Accordingly *Electrochemical Industry* was established as a monthly publication in September, 1902, with Dr. Roeber as editor. It was edited at Philadelphia until June, 1903, when the office was removed to New York. Under his guidance the magazine grew in importance and influence, and in January, 1905, it assumed a broader field of activity under the title *Electrochemical and Metallurgical Industry*. In 1906 came the absorption of the *Iron and Steel Magazine*, and in January, 1910, there was a further expansion of the field served by the magazine to include the general realm indicated by the present title, *Metallurgical and Chemical Engineering*. Through all of these logical developments Dr. Roeber remained as editor, directing the policies and enlarging the field of service of the magazine which stands as a fitting tribute to his ability.

The other project, initiated in Philadelphia about the same time, was the organization of the American Electrochemical Society. This developed from the close association of Dr. Roeber with C. J. Reed, Carl Hering and others, and had its inception in the informal gatherings and discussions of that group. Dr. Roeber's enthusiasm and encouragement in the organization and continued support of the society was responsible in large measure for its success and present influence. It must now be gratifying to its members to know that in 1913-14 they honored Dr. Roeber with the presidency.

He had a wide interest in science and engineering and a broad knowledge of both. This, coupled with an unusual ability to express himself in a pleasing literary style, gave his own writings a tone of authority and confidence, and enabled him to choose wisely from the contributions of others. In speech his English was broken, but in writing it was exact and fluent. This was because he early recognized the demand which the editorial profession made upon him, and he applied himself to it with characteristic thoroughness. His services, therefore, were in demand by publication committees and library boards of several technical societies. He was the author of Section 19, on electrochemistry, of the "Standard Handbook for Electrical Engineers" and was also the author of many technical papers presented before various societies. His personality was attractive, and he made many friends through his quiet affable way of becoming interested in their work. The formality of the introduction was soon forgotten. His wide interest in science and engineering were evidenced by membership in the American Electrochemical Society, American Chemical Society, American Institute of Mining Engineers, American Institute of Electrical Engineers, American Institute of Chemical Engineers and Society of Chemical Industry. He was a member also of the Chemists' Club in New York.

The high personal regard in which he was held by his professional friends was evidenced in many ways, but probably with no more kindly and sincere token than the silver loving cup which was presented to him during his presidency of the American Electrochemical Society. This was an appreciation by a large number of friends throughout the country who gladly responded to a proposal made by Dr. L. H. Baekeland. On May 6, 1900, Dr. Roeber married Miss Clara H. Feier, of New York, the ceremony being performed in Hoboken, N. J. He is survived by his widow and three sons, Edward and Bert, aged 11, and Robert aged four.

Plumbago Crucibles

The manufacture of plumbago crucibles has been seriously affected by conditions due to the present war. The disturbances have extended to the users of crucibles, involving increased costs and in some cases reducing output because of the shortage of crucibles of the proper quality. It is believed by M. McNaughton of the Joseph Dixon Crucible Co. that it would be well for the crucible users to be more fully informed as to the details of manufacture that have been disturbed by war conditions, and an article on the subject was prepared for the *Journal* of the American Institute of Metals, referring to the conditions of supply and demand of the essential materials of crucible making.

The important and essential ingredients of plumbago crucibles are the plumbago and the clay which serves to hold the crucible together during manufacture and in use. The supply of plumbago comes largely from the Island of Ceylon and the stock usually carried is a two to four months' supply, with a similar amount contracted for. Shipments by direct steamer usually require from five to eight weeks. In October, 1914, the British government placed an embargo on plumbago exports from Ceylon, lasting more than four months. This cleaned out the reserve stocks of American manufacturers. After the embargo was raised shipments were generally regular enough to meet requirements, except for short periods.

Before the war all the clay for plumbago crucibles was imported almost exclusively from the town of Klingenberg in the western part of Germany. The clay is remarkably pure and uniform, and the deposit large enough to supply all the demands that have been made upon it. Mining and shipping were conducted throughout the year, shipments reaching the United States in from four to six weeks after leaving the mines. Crucible makers usually carried a year's supply in reserve, to secure the advantage of natural drying and to detect and correct such slight variations as might occur in the quality.

Soon after the war began Germany prohibited the shipment of this clay, no doubt foreseeing the demand of the Allies for ammunition and metals, with the consequent increased demand for crucibles. As this demand soon manifested itself, it was seen that a substitute must be found for the German clay. It was necessary to experiment, and customers were informed of the uncertainty regarding the quality of crucibles made from domestic clays. In trying out different mixtures the plan adopted was to make trial lots of six crucibles from each blend of clay. As it takes from two to three months to make and burn crucibles and get results from tests by users, progress is slow. If the first trial is favorable lots of from 50 to 100 are made and sent out to different users. When the results obtained are in practical agreement, the information is of value. But often this is not the case and the test must be repeated.

One great difficulty has been in getting proper reports as to the running of test lots. Many users did not appreciate the importance of getting the information to the maker in an accurate way. The results of early attempts to use domestic clays were distinctly unsatisfactory. While before the war 25 to 30 heats were secured from each crucible, the first use of domestic clays gave only four or five. At present, however, from 15 up to 20 and 25 heats are obtained for an average-size crucible, such as No. 80, used in standard rolling-mill practice. By a process of elimination the clays now in use are comparatively few, and a steady improvement is expected in the quality of crucibles. However, the cost of the domestic clay is more than double that of the German clay.

Increasing Dividends Through Personnel Work*

Accident prevention, sanitation, "welfare" work and other such activities have attracted attention as if they were distinct fields, but many different phases of the single problem of human engineering are closely related. Unsatisfactory housing conditions are an important cause of labor turnover which, in turn, is one of the most important causes of a high accident rate. Accidents cause loss of time and thus interfere with production. Usually the employer must provide medical aid and pay wage compensation. New men must be hired to replace those incapacitated by accident, thus increasing the accident hazard. If many accidents occur in a plant, fear of injury keeps some men away and reduces the efficiency of others. Prevention of illness should receive attention. In one case that was studied the lost time reported as due to illness was four times as great as that due to accidents.

The cost of hiring a man is not merely that of interviewing him, making a medical examination, placing him on the payroll, sending him to his foreman and getting him assigned to work. Other factors are the difference between the standard amount of work and that which he does while getting used to his job; the extra materials spoiled by a new man; the extra supervision required; interference with the work of others; and, not the least, the accidents caused by green men. The cost of training a green man has been computed at from \$25 to \$100 under different conditions. Some companies who keep records find that the ratio between the number of men hired and the actual increase in the working force ranges from 4 : 1 to 15 : 1. In most cases to keep a working force at normal strength the number of new men hired during a year will be equal to or even double the number of the force. Therefore costs run higher than under steadier conditions.

The best method of decreasing labor turnover is to have a capable man in charge of an employment department. His duty will be to get men suited for the jobs. Having secured suitable men, the next step is to make conditions such that they will desire to remain. While discipline in a community is all right in its way, people should be allowed to do what they want to do if there is no valid reason against it. The point is made that companies are now selling employment instead of buying labor; that the mental attitude must be adjusted to conditions; that money spent in serving the convenience and comfort of the workmen will return big dividends.

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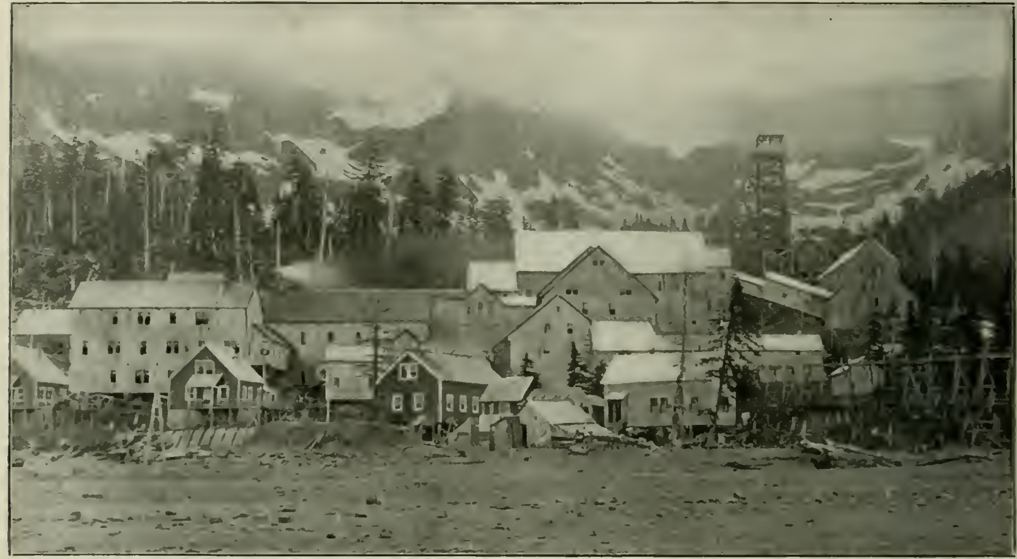
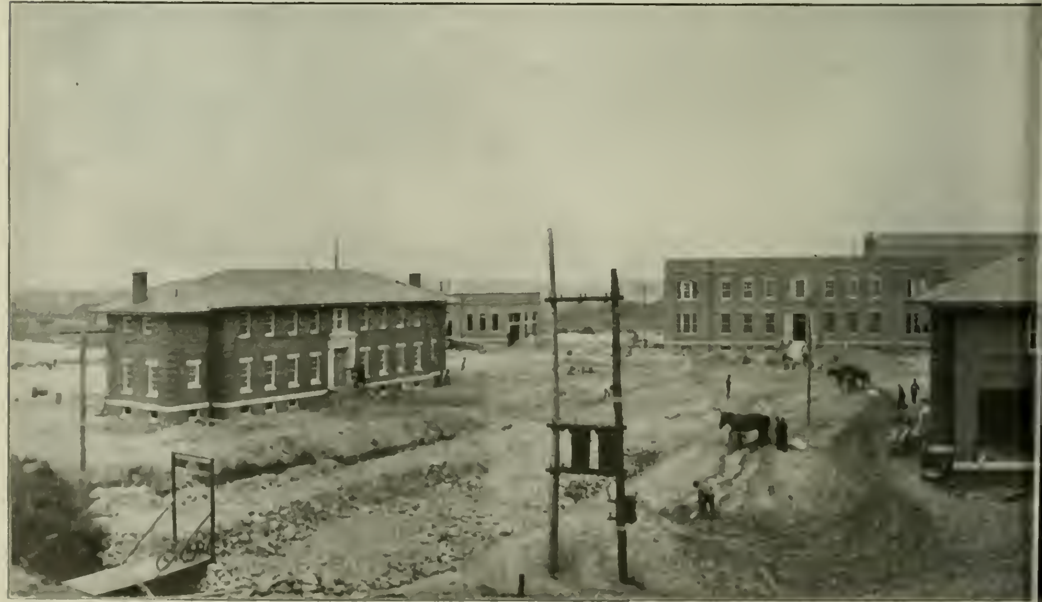
*Abstract of a paper by Thomas T. Read, presented at the St. Louis meeting of the American Institute of Mining Engineers, Oct. 8-13, 1917.

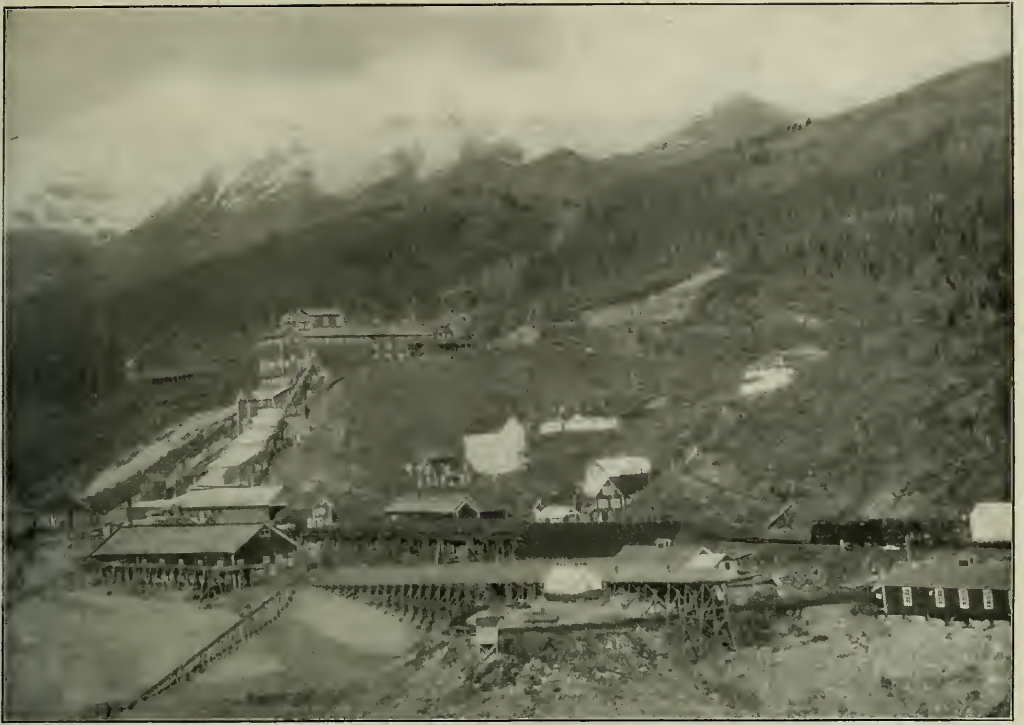
Photographs from the Field



MILL OF THE BEATSON COPPER CO., A KENNECOTT SUBSIDIARY, AT LATOUCHE, ALASKA



THE NEW $5,000,000 REFINERY OF THE INTERNATIONAL NICKEL CO., UN



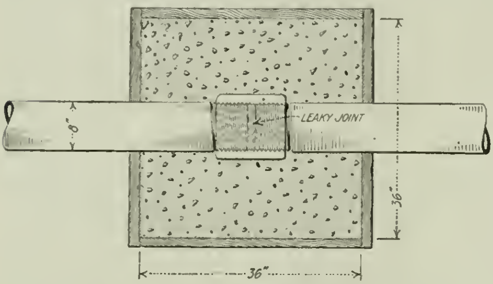
BONANZA MILL OF THE KENNECOTT COPPER CORPORATION AT KENNECOTT, ALASKA

STRUCTION AT PORT COLBORNE, ONT.—PHOTOGRAPH TAKEN SEPT. 29, 1917

Details of Practical Mining

Concreting Leaky Pipe Joints

A joint of screwed pipe of large diameter that could not be successfully tightened caused considerable annoyance and trouble. The installation was such that it could not be relieved of the pressure even for 24 hours to permit a tightening of the joint. To remedy the leakage, forms were put around the troublesome joint and filled with concrete which was well tamped to prevent air pockets or other voids. After drying, the wooden forms were removed and no further trouble was experienced. The concrete used did not contain any gravel or stones larger than [illegible] in. in diameter.



SECTION OF FORM FOR CONCRETING PIPE JOINT

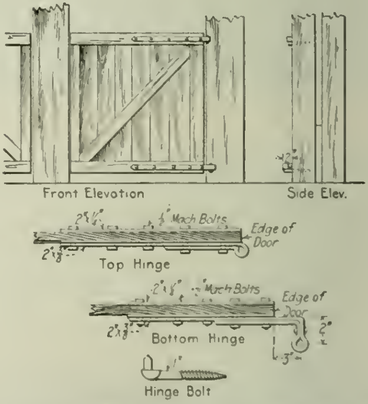
On Buying Machinery*

BY W. F. SCHAPHORST†

Sometimes buyers complain about their machines being inefficient after it is too late. They say that they were 'stung.' I know of a case of this kind in which the machine used was guaranteed to render a certain performance, but from the start it failed to do so. The guarantee was good for one year only. Both the manufacture and user were to blame, I contend, because the machine certainly wasn't 'as represented,' and the buyer was too lenient. The manufacturer insisted that after a time, when the machine was properly 'worn in,' it would come up to the prescribed mark. But it never did, and the owner is still waiting. The year has passed and the guarantee is no longer active. The owner can't hold the manufacturer any more. This does not happen often nowadays, because most reliable manufacturers are willing to make good even after several years, guarantee or no guarantee. The point I want to make is that there is seldom any excuse for buying inefficient machinery of any kind, unless one sets out to buy something cheap. One can hardly expect a cheap product to be efficient. Before buying expensive machinery, though, one has several ways of predetermining whether or not that machinery will be efficient. Manufacturers are generally willing to make tests before the machine leaves the factory, and at these tests the buyer is allowed to have as many representatives as he wishes. After such tests are made to the full satisfaction of experts, there is seldom any chance that the machines will go wrong or fall below guaranteed performance. It often pays to employ competent experts for the selection of machinery. Lastly, if the machine doesn't fulfill the guarantee, don't be afraid to ask the manufacturer to make good. Present-day manufacturers are anxious to make good, because they know that any case of poor or unsatisfactory performance means a 'black eye' for the manufacturer.

Self-Closing Door for Mine Shaft

Kinks that are not always new are sometimes nevertheless good, says H. J. Brown, in *Coal Age*. Some time ago an institute bulletin published pictures of a self-closing shaft gate. They didn't look right, but gates hung in accordance with the accompanying illustration are square with the world.



THE HINGES AND THE DOOR THEY SUPPORT

While doing some consulting work for a certain company it became necessary to replace the shaft "bars," for reasons of safety, with something that would stay closed. I gave the boss carpenter the necessary instructions, only to be met with a blank stare. They do not use gates much hereabouts.

I had to make sketches. The blacksmith did his part, and the boss carpenter, against his better judgment, hung them—and with them his convictions that they wouldn't work.

The gate hangers here shown are only the old hinges that suported the gates we used to swing on when we were kids, but the gates hang straight and stay shut.

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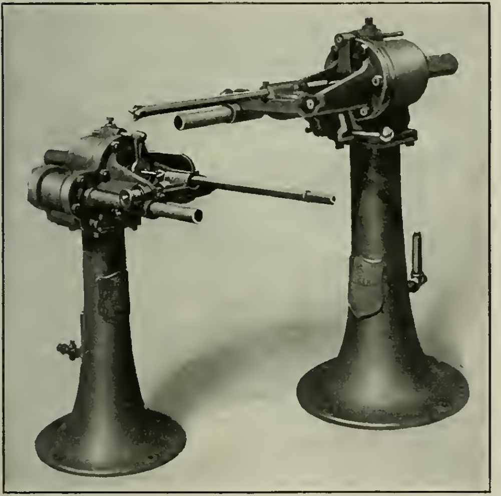
*Copyright by W. F. Schaphorst, 1916

†Engineer, Woolworth Building, New York

Mining and Metallurgical Machinery

Machine for Punching Out Bits and Shanks of Hollow Drills

The modern hammer drill, using hollow-drill steel and air or water to expel the cuttings from the drill hole, is employed in practically all rock-drilling operations today. Keeping the hole in the drill steel properly opened is important for the reason that plugged steels wholly or partly prevent proper functioning of the drill, speed of operation is retarded, water tubes are bent or broken, and time is lost in tinkering, or the drilling gang is idle while someone makes a trip to the shop after more steel or water tubes.



LEYNER SHANK AND BIT PUNCH

To relieve this condition, the Ingersoll-Rand Co. has developed and is placing on the market, as an auxiliary to the Leyner sharpener, a new device—the Leyner shank and bit punch.

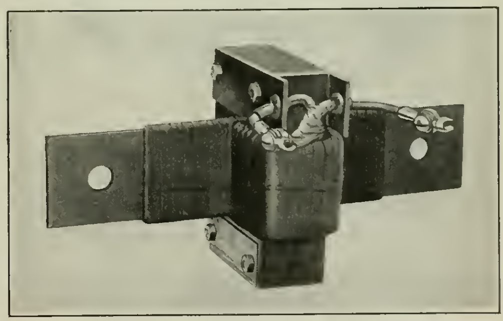
This machine is compact and simple in construction. It consists of a cast-iron pedestal, at the top of which are bolted the clamping and punching cylinders and apparatus. The drill steel is clamped by two jaws brought together by the movement of a pinion, which is operated by the clamping cylinder through the medium of a rack on the extended piston rod. The heat-treated steel punching pin is attached to the piston of a punch-operating cylinder in such a manner that it may be removed readily should occasion require. The front head of the punch cylinder is provided with a clearance space around the punching pin so that on the extreme reverse stroke air is exhausted against the heated pin, effectually cooling it. The maximum stroke of the punch is 6 in. An adjustable stop for the drill steel is provided so as to regulate the distance to which it is desired to have the pin penetrate. The standard punching pin is $\frac{5}{16}$ in. in diameter for a distance of 2 in. from the end and $\frac{3}{8}$ in. for the remainder of its length.

The operation of the machine is controlled by a single lever moving in a T-slot. A downward movement clamps the steel and a further side movement operates the punch. The operation of the control lever locks the clamp jaws before the punch can be brought into action. In like manner the punching device must be in neutral position before the clamp jaws can be opened. This safety feature prevents action of the punch before the steel is firmly clamped and in perfect alignment. All the movable parts of the machine are protected from dirt, grit and damage by tight-fitting covers which also assure safety in operation. The Leyner shank and bit punch occupies a floor space of 22 x 44 in. and weighs 400 lb. Planking is the only foundation required.

Cheaper Electrical Protection

Suppose something—a short-circuit for instance—should take place on the power line, and the machines in the generating station should happen to be unprotected. Serious damage would almost certainly result.

But, of course, this rarely happens, for protection is usually adequate. Circuits are safeguarded automatically by electrically operated devices which, opening under unusual stress, cut off the circuit at a sign of danger.



TRIPPING TRANSFORMER FOR PROTECTING ELECTRICAL CIRCUITS

As a rule, these automatic devices receive the power which causes them to open the circuit from "current transformers," which change the current from a large to a small quantity and keep the dangerous "voltage" away from the automatic devices. The transformers also assist measuring instruments in their duties as indicators and recorders of the current or power of the line. When thus used, the "transformers" must possess high accuracy and hence are quite expensive.

Today, if measuring and recording are unnecessary, as is true in many cases, a small "tripping transformer" (see illustration) designed recently by the General

Electric Co., of Schenectady, N. Y., may be used in connection with the automatic device.

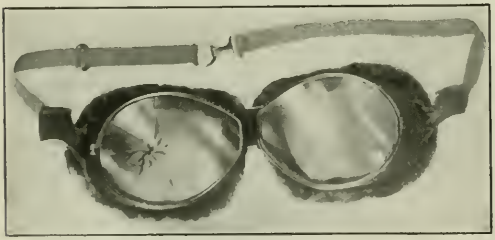
This eliminates the higher priced, more accurate transformer, and since the new device is accurate enough for tripping purposes, it offers a similar advantage; that is, it results in a simpler, cheaper and safer arrangement.

Although small and inexpensive, the new "invention" offers a convenient and satisfactory method of safeguarding valuable apparatus.

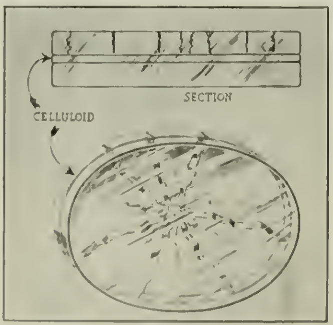
"Resistal" Safety Lenses for Goggles

Mining men who advocate the safety-first idea will be interested in a new "crystal" that has been developed for use in goggles and masks worn by workmen who are exposed to the constant hazard of flying chips or specks, dust, gas, or excessive heat and light which jeopardize their eyesight. The feature of the crystal is its remarkable resistance to breakage, its strength being such that it will stand up even under a hammer blow, while even on cracking there is no accompanying shower of glass chips and splinters to harm the eye of the wearer.

"Resistal" is the trade name of the glass which has been developed by the Strong Kennard and Nutt Co. of Cleveland, Ohio, and is used in the manufacture of these goggles. The construction is made plain by the accompanying sketch. It comprises two layers of perfect optical glass, which may be either flat or curved, with a layer of celluloid interposed, the whole being welded—not cemented—into a solid mass. The result is a crystal for which is claimed every virtue of the ordinary glass with none of its dangers or drawbacks, having all of the strength and safety features of the celluloid goggle but, unlike celluloid, being unscratchable, rigid and fireproof. Neither is it affected by water, heat or cold, and the celluloid layer provides a heat-insulating medium which prevents "clouding up" due to moisture condensation.



One lens cracked, but inner surface intact



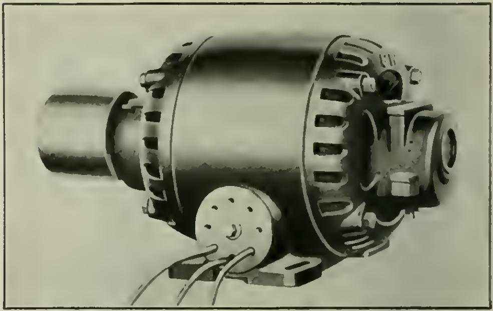
Enlarged view and section of broken lens, showing safety feature

"RESISTAL" SAFETY LENSES IN USE

As a testimonial of their worth is advanced the fact that "resistal" goggles have been adopted for the needs of the Aviation Corps, U. S. Army, while from the same quarter the makers have received orders for a large number of crystals for military gas-mask purposes. The fact that the glass remains perfectly gas- and water-tight, even when badly cracked, makes it particularly adapted for use in the latter application.

Crocker-Wheeler Induction Motors

The illustration shows a new type of squirrel-cage induction motor recently placed on the market by the Crocker-Wheeler Co., Ampere, N. J., and known as the C-W Form P. These motors range in size from $\frac{1}{2}$ to 3 hp. and are designed for constant-speed operation on 60-cycle, polyphase circuits. Among the features claimed for the machines are good starting torque, high power factor and good ventilation.



SQUIRREL-CAGE INDUCTION MOTOR

The stator housing is of cast iron and is cylindrical in form. The stator core is made up of sheet-steel laminations, riveted and bolted together. Windings are placed in insulated slots and treated with a moisture and acid-fume proof varnish. The rotor is also built up from steel laminations. Bearings are of bronze, with oil grooves so located as to distribute a film of oil regardless of the direction of belt pull. Motor feet are cast integral with the frame and are slotted to permit adjustment for belt tension.

Legal Status of Mining Machinery

On bankruptcy of a company engaged in placer mining in Alaska, it was established that an oil-burning combustion engine and other apparatus which were readily removable from the mine and which had been sold to the company under a contract reserving title in the seller until payment therefor, a condition which had not been met, could be reclaimed by the seller, not being subject to claim by the trustee in bankruptcy as part of the real-estate assets vesting in such trustee. This point was decided by the United States circuit court of appeals in bankruptcy proceedings against the Seward Dredging Co. (242 Federal Reporter, 225).

Events and Economics of the War

The second Liberty Loan was oversubscribed, the total reported to date being considerably over $5,000,000,000. A plot for a second Sinn Fein rebellion, backed by Germans and scheduled to take place in Ireland about Easter, has been exposed in this country. Chairman Scott of the War Industries Board has resigned and the Aircraft Production Board has been reorganized. The British embassy at Washington has released to the Swedish ambassador the pouches seized at Halifax. Steps to curtail non-essential production have been undertaken by the Government. The price of soft coal at the mines, as fixed by the Government, has been raised 45c. per ton by the President.

A great Teuton drive into northern Italy has won initial successes from Cadorna, over 100,000 Italians and 700 guns being captured with the towns of Gorizia, Cividale and Udine; the Italians are retreating within their own borders, intending to stand at the Tagliamento River; a credit of $230,000,000 has been given Italy by the United States. The Germans have shortened their lines on the Riga front by falling back. In France, more ground at Soissons and Ypres has been gained by Haig and Petain. At Berlin, von Hertling has succeeded Michaelis as chancellor. Brazil has declared war upon Germany.

Better Control of Munitions Needed

The resignation of Frank A. Scott from the War Industries Board has served to bring to a head the matter of reorganizing the munitions administration, according to the *Times*. A general expectation exists in Washington circles that in consequence of the situation a Department of Munitions will be created at the instance of President Wilson, with a Secretary having a seat in the Cabinet. All the civilians who have been helping the Government to bring about intensive production of munitions have urged the President to do this, and it is understood that Secretary Baker favors it also. One opinion is that the President may create such a department without delay and ask Congress, when it reassembles in December, to give legal authority for the organization.

The War Industries Board, of which Mr. Scott was head, is an unofficial body and supposed to work under the direction of the Council of National Defense. As a matter of fact, it is the all-powerful section of the Council and does practically all the administrative work with which the Council is intrusted. As it has no statutory standing it must depend on the Secretaries of War and the Navy to carry out its advice. The Board has, nevertheless, been uneasy under its lack of authority to meet directly the pressing needs of the nation. It has been hampered by lack of authority.

It is asserted that establishment of new munitions plants and the extension of present plants have been impossible to the degree desired by the Board, because it was unable to guarantee to munitions manufacturers that the Government would take care of their output. The feeling is that with the creation of a Department of Munitions by statutory authority much of the present embarrassment will be eliminated. The head of the department would be able to act without being hampered by the necessity of making all his actions *ad referendum*. Whether the Ordnance Department of the Army, which has come in for criticism, would be placed under the new department is a matter to be settled later, but the probability is that it would retain its position as a branch of the military establishment. This would leave to the Department of Munitions the production of munitions and their shipment, while the Ordnance Department would attend to ordnance supplies in the field.

State Fuel Administrators Confer

A conference of state fuel administrators appointed since the meeting on Oct. 2 was held in Washington on Oct. 26. The subjects discussed were: State organization methods, retail prices, methods of obtaining emergency coal supplies, methods of improving transportation, and conservation of fuel supplies. To the list of state fuel administrators previously published should be added the following names: For Pennsylvania, William Potter, Philadelphia; California, Albert E. Schwabacher, San Francisco; Arizona, Will L. Clark, Flagstaff; Minnesota, Judge John F. McGee, Minneapolis; North Dakota, I. P. Baker, Bismarck; Louisiana, John G. O'Kelley, New Orleans; Oregon, Fred J. Holmes, La Grande; Mississippi, C. L. Towns, Minter City; New York, Albert H. Wiggin, New York; Illinois, John E. Williams, Streator; Ohio, Homer H. Johnson, Cleveland; Michigan, William K. Prudden, Lansing; Indiana, Evans Woolen, Indianapolis; Colorado, William J. Galligan, Denver; New Mexico, former Governor William C. McDonald, Carrizozo; South Carolina, B. B. Gossett, Anderson.

Government Advances Price of Coal

An increase of 45c. a ton in the price of bituminous coal at virtually all mines in the country, effective from Oct. 29, has been granted by President Wilson. The new price will absorb wage raises recently agreed upon between operators and miners in the central competitive and other fields. The order provides that the increase shall not apply in case of existing contracts providing for an increase in price to cover any raise in miners' wages. Neither will it apply in districts where miners and operators fail to agree upon a miners' penalty provision satisfactory to the Fuel Administration.

Coal operators have been informed that 10% of the anthracite and bituminous coal output of the nation will be requisitioned by the Fuel Administration to meet the wide-spread shortage. The administration it is understood, will direct operators to set aside the prescribed percentage of their production to await orders. This free coal will be diverted into the districts where it is most needed. If an operator's output is wholly under contract, it appears that he will have to "shave" the contracts in order to set aside the required amount. The first step in this direction has actually been taken. On Oct. 29, the entire output of the coal fields of Ohio, western Pennsylvania and Michigan was ordered sent into the sections of Ohio and Michigan needing it most. During the same 24-hour period the priority order for shipment of bituminous coal to Lake points was suspended by order of the priority director of the War Industries Board.

John P. White, president of the United Mine Workers of America, has resigned to take up work as adviser to Dr. Garfield on labor problems. A. S. Learoyd, of New York, former Lackawanna general freight agent, has been appointed on the staff of the Fuel Administration to take charge of the distribution of anthracite coal. For the position of head of the Administration's transportation department, G. N. Snider, of New York, formerly coal traffic manager of the New York Central R.R., has been selected.

Curtailing Non Essential Production

The Government took steps on Oct. 27 to restrict enterprises not essential to the conduct of the war by forbidding the use of open-top freight cars on and after Nov. 1 for transportation of materials other than coal for roads and highways, theater construction and manufacture of pleasure vehicles, furniture and musical instruments, etc. Such cars are to be set apart for the exclusive use of the coal, metallurgical, sugar and fertilizer industries according to the new order, known as priority order No. 2. This is the first move on the part of the Government to curtail non-essential production. Regarding such a policy two courses have been generally discussed in Washington. Under one the War Industries Board would enter into voluntary agreements with specific manufacturers of non-essentials to reduce their output gradually. Under the other the President would issue a general request to manufacturers, and rely on their patriotism to follow the suggestion. The power behind both plans would be the Government's authority to hold up coal shipments to recalcitrant producers and to control transportation through the priority director of the War Industries Board.

Japan Would Control Chinese Iron

The Japanese are exerting every effort, officially and unofficially, to close the Chinese arms-monopoly contract, involving the control of the Nankin iron deposits, the employment of Japanese military advisers and a director of the new arsenal at Nankin. The Japanese say that they are extending credit and not making a loan and consequently, are not violating the Six Powers' exclusive rights to make political loans.

However, this view is not shared by the French and the English, and a large section of the Chinese press, as well as the diplomatic circle, which universally denounces the deal as a revival of the most objectionable features in Japan's demands—known as "Group V"—presented to China in May, 1915. The main provisions of those demands concerned the appointment of Japanese military and political advisers for China and related to Japanese supervision over the manufacture or purchase by China of munitions of war. Minister Reinsch has advised the Foreign Office that China invariably took the position that it would hold the remainder of the iron deposits for national use whenever Americans sought development rights, and that consequently the United States now would insist that consideration be given American interests in the Chinese iron industry. The ministers of several other countries have taken the same position.

Industrial Research in Great Britain

Such progress has been made in industrial research during the last year in Great Britain that a department has been created by the government for the work and a million pounds sterling voted for its encouragement. Many trades are seeking to establish research organizations among which are the coal-mining industry and the Scottish shale-oil and steel industries. The Privy Council, however, considers that many important fields cannot be covered by such associations.

Research into fuel is one of these, and a fuel-research board has been established, which intends, with the help of coal owners, to collect specimens typical of the coal seams of the various mining districts, and to examine and classify them. It is intended to investigate the nature and origin of the various types of coal and the behavior of their constituents under the action of heat and other agents, beginning with the well defined types of coal as they occur in commerce. The board has already published a report covering the resources and production of iron and other metalliferous ores, tungsten, the zinc industry, the smelting and refining of copper, and the qualities of copper and copper alloys.

Waterways Commission to be Named

Plans for greater utilization of navigable rivers to relieve railroads of the strain imposed by the war will soon be entrusted to a waterways commission of seven members to be named by President Wilson. This commission will be asked to give special consideration to encouraging transportation of heavy freight by barges on the principal waterways, to relieving harbor congestion at seaboard terminals, and to developing waterpower quickly for war purposes. At least one of the commissioners must be an army engineer, according to the Rivers and Harbors Act; one must be an expert civilian hydraulic engineer, and the others may be selected from either civil life or the public service.

To Speed Ship Building

For the purpose of discussing the labor question and to evolve a plan of attracting men to shipyards which are said to need about 300,000 more workmen, steel shipbuilders were called to meet in Washington on Oct. 29 to confer with representatives of the Fleet Corporation, Department of Labor, Navy Department and the American Federation of Labor. The Government's steel ship-building program needs speeding up as it is now 20 ships behind schedule. A second shake-up in the Emergency Fleet Corporation has been forecast from present conditions. The Corporation recently announced that one million tons of new ships would be afloat by Mar. 1 next, but, nevertheless, it is said that the construction is far less than war needs require. Amendment of the shipping law also is quite probable, so that there will not be two boards, as at present. One board is constructing ships, the other operates them. But where the first hesitates the other is powerless. That appears to be the difficulty today.

Scott Quits War Industries Board

Frank A. Scott, chairman of the War Industries Board of the Council of National Defense, delivered his resignation to Secretary of War Baker on Oct. 26. The reason advanced by Mr. Scott for his resignation was ill health. In his letter he referred to the "recurrence of a serious physical difficulty." Secretary Baker, as chairman of the Council of National Defense, accepted the resignation and designated Judge Robert S. Lovett, vice chairman of the War Industries Board, to assume the direction of the situation temporarily.

New Air Board Selected

Naval and military members of the Aircraft Board, about to be reorganized under a law giving it legal status, were announced on Oct. 26 by Secretaries Daniels and Baker. President Wilson is to name a civilian as chairman and two other civilian members. All of the service representatives appointed so far except Lieut. Commander Arthur K. Atkins of the Navy are members of the present board. They are: Navy—Rear Admiral Taylor and Capt. H. E. Irwin. Army—Maj. Gen. George O. Squier, Col. E. A. Deeds, and Col. R. L. Montgomery. Brig. Gen. Benjamin D. Foulers, Col. Raynal C. Bolling and Col. S. D. Waldon will be dropped, but will continue their services in connection with airplane production.

Restrictions on Press Defined

As interpreted by the Postmaster General, Albert S. Burleson, the Espionage and Trading-with-the-Enemy Acts make it unlawful for any person, firm, corporation, or association to mail, transport or carry, or otherwise publish or distribute, during the war, printed or other matter of the following kinds:

(1) Advocating or urging treason, insurrection, or forcible resistance to any law of the United States.

(2) Conveying false reports or false statements intended to interfere with the operation or success of the military or naval forces of the United States, or to promote the success of its enemies.

(3) Intended to cause insubordination, disloyalty, mutiny, or refusal of duty in the military or naval forces of the United States.

(4) Intended to obstruct the recruiting or enlistment service of the United States, to the injury of the services of the United States.

(5) The circulation or publication of which involves the violation of any of the numerous other criminal provisions of the Espionage act, but which are not of special interest to publishers.

(6) Printed in a foreign language containing any news item, editorial, or other printed matter respecting the Government of the United States, or of any nation engaged in the present war, its policies, international relations, the state or conduct of war, or any matter relating thereto, unless the publisher or distributer thereof, on or before offering the same for mailing, or in any manner distributing it to the public, has filed with the postmaster at the place of publication a true complete translation of the article.

(7) Referred to in the preceding paragraph for which publishers have been granted a permit to circulate, free of restrictions named therein, but which does not bear at the head thereof in the English language the fact that such a permit has been granted.

Lake Boats for Ocean Trade

To make the large tonnage on the Great Lakes available for use on the ocean during the four or five months that navigation is closed on the lakes, the United States Shipping Board may urge to the Canadian Government the advisability of rushing to completion the enlargement of the Welland Canal. The 800-ft. locks contemplated in the Canadian plans will permit the diversion of the great bulk of lake tonnage to the coastwise trade and in some cases to the transatlantic trade, according to officials of the board. They will also make possible the utilization of the immense shipbuilding facilities on the lakes which are sufficient for the construction of 140 ships per year at present and can be greatly increased, and will obviate the necessity of cutting such ships in two in order to get them to the ocean. The board is now bringing about 40 ships from the lakes, of which 24 must be cut in this fashion.

Eighteen Pounds of Metal Used in Equipment of Infantryman

A table showing that more than 18 lb. of metal enters into the composition of articles required for the equipment of each infantryman has been prepared by the Ordnance Bureau of the War Department. The metal equipment carried by each infantry soldier weighs 294.65 oz., consisting of 153 oz. iron and steel, 12.35 oz. tin, 62.7 oz. brass, 24.2 oz. aluminum, 36.4 oz. of metal in bullets consisting of lead, tin and cupro-nickel, and 6 oz. of other metal. An additional weight of 114.7 oz. is added by equipment of cotton, wool, leather and wood. The Ordnance Bureau, therefore, supplies each soldier with approximately 25 lb. of equipment, this being exclusive of that supplied by the quartermaster corps.

Chile Releases Nitrates

Nitrates reserved for German account have been released by the Chilean government and are now available for the munition purposes of the American and Allied Governments. Credits lodged with the German banks in payment have been transferred to an American bank in New York, so that the money as well as the nitrate can be used. The large demand has forced the price to more than $3.65 per quintal. As nitrate forms three-quarters of the exports of Chile, there has thus been effected a rise in Chilean exchange.

American Federation of Labor, through its executive council, has declined to participate in an international conference of workmen and Socialists of all countries, suggested by the executive committee of the Russian Workmen's and Soldiers' Delegates' Council.

Industrial News from Washington

By Paul Wooton, Special Correspondent

To Rehabilitate the Defense Council

Shorn of a portion of its effectiveness by Sec. 3 of the Food Control Act, the Council of National Defense has become more and more the target for criticism. Plans are being considered which will rehabilitate it and it is believed that it will not be long before the Council is again an important factor in the Government's war activities. Even as it is, it is carrying forward important work. Many of its committees are as active now as ever. The raw materials section under Bernard M. Baruch; the committee on chemicals, under Dr. William H. Nichols; the Aircraft-Production Board, of which Howard E. Coffin is chairman; the lumber committee and the committee on oil, headed by R. H. Downman and A. C. Bedford respectively, are continuing their work with unslackened energy.

In the rapid march of events, many have lost sight of the accomplishments of the Council of National Defense. Among them are the creation of the War Industries Board to act as a clearing house for the war-industry needs of the Government; under this board are handled vital war matters, having to do with raw materials, finished products and priority. It was this board which arranged for fixing the price of copper and steel with the producers. The procurement of vast quantities of raw materials for the use of the military and naval forces at prices greatly below the current market quotations was made possible by the coöperation of industrial leaders. The Defense Council is also responsible for the completion of an inventory of American manufacturing plants setting forth the aid they can extend toward carrying out the military plans of the nation; for the saving of millions of dollars by the coördination of purchases through the agency of the general munitions board; for the elimination of middlemen in the purchase of many of the supplies for the War and Navy Departments; and for the development of the Liberty motor and other aid in establishing an American aviation service, and standardizing the heavy-duty war truck. The enlistment of reserve-engineer regiments to aid in rehabilitating the railroads of France was also due to the Council's work.

Examining Manganese Properties in Virginia

An outcome of the work of the war minerals committee, composed of a representative of the American Institute of Mining Engineers, the United States Geological Survey, the United States Bureau of Mines and of the state geological surveys, is an examination of Virginia manganese properties to be made by four prominent mining engineers, namely, Philip N. Moore, F. Lynwood Garrison, Prof. Robert H. Richards and Allen H. Rogers. These men are now in Virginia and will follow a program arranged by Dr. Thomas L. Watson, the state geologist, in coöperation with the manganese miners of the state. Mining and milling methods that will improve production will be considered as will the problem offered by the inadequate water supply at most of the mines during certain seasons of the year.

Export of Cyanide to Mexico

Users of cyanide in Mexico will have to form an organization to undertake the fair distribution of that chemical before supplies may be exported to any extent. In spite of the secrecy with which the War Trade Board shrouds itself, it is possible to predict this with a fair degree of certainty.

Representatives of several mining companies operating in Mexico have been trying for several weeks to get a ruling on this question. All applications for licenses have been refused by the Board with the result that the Mexican operators are in a bad way, many of them having been forced to close down. The thousands of workmen thus made idle are not disposed to take the hardship kindly. They have been accustomed to taking the law in their own hands during recent years and at many properties are threatening trouble if wages are interrupted.

It is regarded as probable that the War Trade Board has delayed action on this matter pending an investigation of the domestic situation and that it has found that, although there is reason for the conservation of cyanide, enough will be forthcoming for the actual needs of the domestic mining industry and still leave some for Mexican use.

New Mining Law Drafted by Mexico

Mexico's new mining law has been drafted and is now being scanned critically by a special commission, according to the semiofficial news bureau, which is maintained in Washington by the Mexican Government. As soon as the commission has completed its work on the tentative draft, it will be submitted to the Chamber of Deputies. From the same source it is learned that Mexican authorities are taking energetic steps to prevent the clandestine removal of kelp from Mexican waters. The activities of those supplying the seaweed to the potash-recovery plants are alleged to have extended far along the coast of Baja California.

Export of Tin Plate Restricted

With regard to licensing exports of tin plate, the War Trade Board makes the following announcement:

> (1) That no licenses will be granted for the exportation of tin plate for use for any other purpose than as food containers, except on satisfactory evidence that the plate will be used in such a way as to contribute to the military needs of the nations at war with Germany and her allies; (2) that, as to applications for license to export tin plate to be used as food containers, preference will be given to those cases in which satisfactory evidence is presented that the food to be packed will be for the use of the nations at war with Germany and her allies.

Editorials

Recruiting a Mining Regiment

WE HAVE received from Maj. O. B. Perry of the Engineer Officers' Reserve Corps (formerly general manager of the Yukon Gold Co.) the following dispatch, dated at Washington, D. C., Oct. 31, 1917:

> We are today mailing to mine managers throughout the country an appeal for aid in securing volunteers for mining service in France. Our letter contains the following announcement:
>
> "The Engineer Corps of the United States Army has been authorized to raise by voluntary enlistment a special mining regiment to consist of six companies of 250 men each and to be known as the 27th Engineers National Army. The regiment is now being recruited. The first company has been formed and is in training at Camp Meade, Md. This regiment is to be made up entirely of picked men from the various mining sections of the country. All trades and occupations in and around a mine will be represented and each company will have a sufficient number of men skilled in each trade to enable it to operate as a unit. The work to be done is purely military in character and what is known as first-line work consists of the preparation of underground shelters for the fighting troops and the placing of explosive mines. This work requires a high degree of skill in rapid tunneling construction and involves the handling of all sorts of material from clay and chalk to hard rock. In addition to the regular engineer equipment each company will be provided with special tools such as tunneling and boring machines, drills, compressors, hoists, lighting sets, etc. While most of the work of the 27th Engineers will be underground mining, the regiment will be trained to fight as well as to mine. The commanding officer will be a regular-army engineer officer, the remaining officers of the regiment being largely drawn from the mining engineers who have volunteered their services and who have been given the necessary military training at the officers' training camps. The 27th Engineers offers a great opportunity for the miners of this country to show their skill and courage. Any experienced mining man who wants first-line service in France is urged to enlist at once."

We urge upon mine managers their hearty coöperation in recruiting this mining regiment which will be the special representative of the mining industry at the front in France.

The Second Liberty Loan

THE second Liberty Loan has been floated successfully, the maximum amount being oversubscribed. The number of individual subscriptions surpasses expectations. Every industry and class is represented. Any doubts concerning America's sincerity, unity and efficiency, both among those directing Governmental affairs and individuals comprising the nation are thus removed. As for the future, it may be safely assumed from this vigorous demonstration that the country will shoulder her responsibilities.

The mining industry did its share nobly as shown by the subscription lists, which we should like to publish, though it is impractical because of their present incompleteness. Not only the financial interests directing the production of mines but also the miners have loyally contributed. Butte, a striking example, recently torn by labor strikes, infested with agents of the German propaganda and charged with disloyalty by some unduly excited pessimists, has responded so as to leave no doubt regarding the patriotism of this mining center. As in Butte, so throughout the country. Thus, not only has the Allied cause gained by the intrinsic value of the loan itself for necessary munitions, but deeper is its significance, in the showing of national unity and firm purpose of maintaining democracy.

Labor Troubles Ended

THE labor troubles in the metal mining industry, which upset conditions so seriously last summer, now appear to be ended, but it will be a long time before the rate of copper production of last May will be regained, especially in Montana and the other northern districts. The working population everywhere has been reduced by the draft into the army. This, of course, affected all districts equally. During the period of idleness, many men went out prospecting and hunting, from which they have not yet returned but they may be expected to come back with the advent of cold weather. However, there is a migratory working force that moves to Montana in the spring, and back to Arizona in the fall. We think it is doubtful if the copper production of the United States will rise much above 80 to 85% of the rate of 1916, except in those districts where the mining is done in openpits, and a lower grade of labor than underground miners is used.

In lead and zinc mining there must be now a surplus of men owing to the curtailment of production. It would be an excellent thing if such men could be diverted to copper mining, but the nation does not possess the machinery for accomplishing any such transfer. We are now deprived, moreover, of the incentive of increasing prices and increasing wages. The marvelous strides in production that occurred in our industries previous to the middle of 1917, are ascribable to the free play of natural conditions. We are, of course, going to pay a penalty for interfering therewith. Nobody ever interferes with nature without suffering some disagreeable consequences.

Valuation of Mines

THE allowance that the Federal Tax Law permits for depletion of mines, as a deduction from gross income, is based on a valuation of the mine and embodies the indispensable factor of life of the mine, as any such valuation must do. The cases of mines possessing delimited orebodies, such as the porphyry copper mines, are capable of comparatively easy computation, although even in those cases the result cannot in the nature of things be anything more than a rough approximation. In the cases of mines possessing veins or orebodies that descend vertically to great depths, which cannot practically be delimited, the life of the mine is highly uncertain. The proprietors of such mines are confronted by two horns of dilemma. If they reckon a short life, they will obtain a large immediate deduction for depreciation; but, if they figure on the basis of five years, let us say, and at the end of that time the mine proves to be as productive as ever, with no end in sight, the proprietor will have used up his allowance for depletion, and will, moreover, be exposed to the risk of changes in legislation that will make taxation even more onerous than it is now. But, anyway, there must be a valuation of the mine. We prophesy that there is going to be in the near future more work for mining engineers who have made a specialty of mine valuation than there has ever been in previous history.

The Jump in Silver

SINCE the high point of silver prices was reached in September the quotations have been gradually declining, almost every day showing a falling off, until a level was reached of 41⅞d. in London and 82½c. in New York. This was low compared to the September rise, but still a high point relatively to those of the last two years. Several causes combined to bring down the quotations. Among them may be mentioned the absence of larger European purchasers for coinage; a decreased demand from India caused by Government embargoes; an absence of buying from China; and the failure of the reported sale of a large amount in Mexican pesos to the United States. To these may be added the larger supplies which were drawn out of reserves by the high prices; these furnished the market with quite as much as it was prepared to take, or even more.

On Oct. 30, however, there was a sudden turn, a jump upward amounting to 3d. in London or 6c. in New York, a greater change than has been experienced in one day for a long time. This carried the current price to 90⅜c. in New York, which is still below the September level, though high in comparison with the earlier months. There has been a general feeling that the fall had been greater than was warranted by the underlying conditions of the market, and that some advance was to be expected soon, but so sharp a turn was hardly looked for. Here again a combination of causes is to be noted. Deliveries have been rather slow, a number of orders have been received, more licenses have been issued for imports into India, and there are reports that Australia has been unable to meet the current demands for China. Besides these there is something speculative in the sharp turn, which has doubtless embarrassed some London and New York operators who were not able to make deliveries as promptly as they were required. The fact that there have been no dealings in futures for some time past doubtless helped to emphasize the sharpness of the turn.

As to the future, coinage demands are sure to continue large and the requirements from the Far East will remain steady if they do not increase. There is no increase in production apparent anywhere. The Mexican surplus is not likely to come on the market suddenly, since it is not large in amount and its existence is well known and discounted. Trading may be slow and to some extent delayed by the current embargoes in various quarters. The indications, however, point to continued high prices, even if there is no further advance.

The Tax Law

THE more the new tax law is examined and studied, especially as to the war profits section, the more confused, indefinite, and inequitable does it appear to be. Even the Commissioner of Internal Revenue and his assistants, upon whom devolves the interpretation of the law, admit their own inability to unravel the meaning of some paragraphs and concede the unfairness of the provisions of other paragraphs that are reasonably clear. There is talk of appointing an advisory board of experts—chosen from among business men—in the Bureau of Internal Revenue to analyze the law and give advice to the Government in the drawing up of the regulations necessary to make it effective, but it is recognized that not even such a board can help in matters where the language of the law is clear and admittedly unfair.

The major difficulty appears to be in the inadequate definition of capital, a percentage of which determines the tax that any corporation must pay. Corporations are not allowed to reckon as capital their investments in the stocks of other corporations, although in fact the largest part of their capital may be employed in that way. But over and above everything looms the principle that concerns of small capitalization are taxed out of all proportion to concerns of large capitalization that are doing the same business and earning the same net income. Many of these corporations, like railways and banks, have not enjoyed any war profits at all. On the contrary, the economic position of the railways, especially the Eastern roads, has become rather desperate. Manifestly, a revision of the war-tax law will be necessary when Congress reassembles in December. It is to be hoped that then the stupid Congressmen, who have so little knowledge of business affairs, but who played so great a part in enacting the present law, like Mr. Kitchin, of North Carolina, can be relegated to the background. The exhibition of their incompetence that we are now having ought to be sufficient.

Controlling the Distribution of Explosives

IT IS most necessary at this time to regulate the distribution of explosives lest any fall into the hands of those who are only too ready to use them for hindering the progress of the war. The Explosives Act was passed to make such control possible and the Federal Bureau of Mines is now endeavoring to draw up the details of administering it. But the task, which never looked easy, is proving more difficult than at first anticipated. So widespread has the use of explosives become, not only in mining and allied industries, but in agriculture, that it is apparent that many men, who might otherwise be productively employed, will be needed to enforce the provisions of the Act.

It is in the preparation for licensing all persons who handle explosives that the Bureau is finding its greatest task. Experienced men in the industries concerned have been asked to aid in the work and a large number of clerks working day and night is employed. The state inspectors to be named by the President, as provided in the Act, have not been appointed, with the result that the entire matter must be handled from Washington by an organization but temporarily effected. The chief problem confronting the Bureau is the selection of a licensor for every county throughout the land. The county clerks are being chosen for the work for the most part, except where the size of the county or the extensiveness of mining operations therein make necessary the appointment of deputies and other officials. The complexity of the problem is further emphasized by the fact that the distribution of ingredients of explosives as well as explosives themselves must be controlled. It will therefore be necessary to license manufacturers and retailers of drugs and chemicals though to what extent no decision has been reached. Thus it is seen that the work confronting the Bureau of Mines in administering this important act has already assumed large proportions.

The possibility of Government operation of mines is discussed on another page in this issue and brings forcibly to mind the close parallel with Great Britain that our affairs have followed since we entered the war. Strikes for higher wages were among the first evidences of the failure of industry generally to recognize the great jump in the cost of living. We marveled at the time that the British miners and other workmen could be so unpatriotic as to strike, and later we found the same difficulties, with slight variations, reducing the output of our copper mines and then of the shipyards. Labor in the mines and the essential industries will probably determine the outcome of the war. Great Britain and France have both found it necessary to establish practical conscription of industry. While an unpleasant prospect, it looks very much as if this country may be forced to the same course.

In our editorial last week on "War Taxes on Mining Companies," we fell into error in saying that "the Kennecott Copper Co., on the other hand, which owns a large interest in Utah, will get the benefit of its investment in Utah on the basis of something like $110 per share." We overlooked that the new tax law prevents corporations from including in their capital their investments in other corporations.

BY THE WAY

Two new minerals are reported from California. They have been christened "crestmoreite" and "riversideite," presumably named from the locality in which they were found. According to the press dispatch, crestmoreite is a hydrous basic orthosilicate containing small amounts of other oxides in place of silica; riversideite a hydrous lime sulphate.

The creation of a multiplicity of bureaus, supposedly to facilitate the dispatch of official Governmental business and other people's business recalls an old Colorado anecdote. A tenderfoot had been appointed station agent and general factotum at the terminus of a small and unimportant branch railroad, served by an accommodation train once per day or once per week—we forget which. Some prospector had shipped to that point a "Rocky Mountain canary." After the train departed the agent sized things up as well as he could, heaved a sigh, and then laboriously reported over the wire: "Short, one bureau; over, one donkey."

After setting the automatic shift-boss indicator at the entrance to the stope, Jerry and Bill, both zealous students of mining by the short-cut route, sat down for a smoke and a friendly discussion of lesson paper 27. "Sure an' there must be big money in thim rare earths," said Jerry. "I seen in the super's minin' paper where the guv'mint in Injia is all worked up over a dayposit some av thim fellies diskivered *in situ*." Bill, not to be outdone in any display of erudition, spat contemptuously down the chute. "India, hell. Situ is a Japanese island."

Why prospects are not sold is explained by the following communication received by one of the large mining companies from an Arkansas "mine" owner: "We have a twelve (12) acre pocket of very rich ore, running heavy with gold, starting at a depth of seven (7) feet on the surface, and the deeper we go the richer it runs in gold and other valuable metals, and when we got to a depth of 370 ft. we went through a very rich bed of 30 to 40 ft. of pure, free gold and platinum, running about ⅔ gold and ⅓ platinum, and very little rock. We are now open for a business proposition with you, and would contract with you for many hundreds of thousands of tons of this ore. We could send you samples, but do not feel it necessary, for your representative can see for himself the richness of this ore." Thousands of such letters are received each year by the leading mining operators. After Nov. 2, the answers will require 3c. postage.

The early history of well-known mines becomes shrouded with inaccuracies as time goes by and the original locators disappear. The discovery of the Santa Gertrudis mine in Mexico by a Cornish engineer is reported in the London *Financial Times.* While presiding at the annual meeting of the Grenville United Mines in Camborne, Thomas Negus remarked that he had seen in the *Cornish Post* a report dealing with the Santa Gertrudis mine and added: "There are not many here who know that mine, or the facts I am about to record. It was in the year 1867, when I was one day surveying, that I found the Santa Gertrudis lodes and their continuation. I made notes, and within a day or two saw the late Capt. William Stoneham, who, with myself, took up a piece of the ground and commenced work. We worked on for a little time until we were offered a place 150 miles in the interior of the country, and we left this bonanza to go to another bonanza, which did not prove to be as good as the first would have been had we stuck to it. The Santa Gertrudis mine has yielded thousands of pounds sterling in profits since I left the country. I only wish I had remained there and kept my interest in the property, but we cannot foresee these things, and when we think we are making a move in the right direction, and do it for the best, the reverse often happens." Sticking by a property in Mexico is not such a pleasant task, today, even for a Britisher with a government that stands squarely behind him.

Harry J. Cantwell

By H. A. Wheeler

The mining industry of Missouri lost one of its most active workers and boldest pioneers through the untimely death of Harry J. Cantwell, of St. Louis, last August, at the age of 59. Although trained as a lawyer, in which profession he was exceptionally capable, his tastes and interests were mainly devoted to mining. The frontier or development stage of the industry appealed strongly to his bold foresight and optimistic temperament, which coupled with excellent judgment, resulted in opening up successfully a much larger number of properties than usually befalls the pioneer. The very successful Central, the Columbia and the Catherine lead companies were promoted by him when but little was known of the now famous disseminated lead belt of Southeastern Missouri and when few had confidence in its low-grade ores.

Mr. Cantwell's first undertaking was the development of the area that became the property of the Central Lead Co., of which he was president for a number of years. Upon termination of his connection with that company, he acted for the St. Louis Smelting and Refining Co. in acquiring lands that it developed, the company now being one of the largest producers of the district. He next organized the Columbia Lead Co., also in the Flat River district, and became its president, and about the same time organized and conducted the Catherine Lead Co. in the neighborhood of Mine la Motte. He later became interested in mines in the vicinity of Palmer, in Washington County. He always had a firm conviction that some day the disseminated lead deposits of St. Francois County would be traced westward into Washington County.

As usually happens to the pioneer, his followers and successors reaped very much greater financial rewards than Mr. Cantwell, but he never complained of his meager returns and he was always ready to put his indomitable energy into any new mining proposition that would stand critical analysis. While his mining training was derived in the "University of Hard Knocks," he always had his propositions checked up by able experts before he invited his numerous friends to join him in new enterprises that his high integrity attracted. He promptly recognized the unusual merits of the new Miami zinc district in Oklahoma, and was in the midst of several highly promising deals when he was suddenly stricken about a year ago with paralysis, from which he never recovered. It is said of him that during 1916 he interested more capital in the Miami field than did any other one man.

The term "promoter" is not apt to invite confidence in the board rooms of bank directors and some silk-stocking business men avoid contact with this type of business pioneer; but the financial world would be thrice blessed if it had many H. J. Cantwells, while the mining industry would expand and justly thrive were there more such able, energetic, high-minded promoters. For he was a pioneer, operator and promoter through whose efforts the wealth of this country and the output of lead and zinc has been greatly increased.

Although bristling with energy and action, his charming personality, his wealth of good stories and anecdotes and his breadth in matters of general interest endeared him to a wide circle of admiring friends who will hold his memory dear as a real man—a broad-gaged, whole-souled, energetic optimist who more than made two blades grow where one blade had a struggling existence.

Mining Conditions in Mexico

R. T. Bayliss, chairman of El Oro and a number of other important mining companies in Mexico, and long a close student and keen observer of conditions in that country, reviewed in his annual report the conditions that confront mining companies in their attempt to operate in Mexico at this time. Part of his speech at the meeting of the Buena Tierra Mining Co. in London, on Sept. 18, is reproduced below:

"I regret extremely that I cannot at the moment give you any forecast as to when operations may be resumed. The advices we receive from our general manager and from our consulting engineer do not encourage us to expect any resumption of work during the current year, and it is most difficult at the moment to put a period to the conditions that prevail. Looking at the position of Mexico generally, there is no doubt that during the last 12 months conditions have improved—that is to say, there has been almost a complete cessation of active fighting. From another point of view, however, they cannot be said to be much better. The new constitution, which was adopted in May this year and which is ultra-democratic in character, and the decrees which it confirms, and others which have been put in operation since its passage, make the operation of any mining company extremely difficult. Very wide powers have been granted to labor and to committees of labor practically to adjust the rate of wages and otherwise to penalize the employer.

Buena Tierra Taxes Quintupled

"Onerous taxation has been imposed on the gross output of mining companies throughout the Republic, and in the case of low-grade mines this taxation is so heavy that it will practically absorb all the profits of the undertakings. In the case of this company, the tax paid on the output of the year 1912, which was the nearest approach we ever had to a full year's work, would on the present scale have amounted in that year to $25,830 instead of $5869 which we then paid. The constitution further provides that only Mexicans by birth or by naturalization and Mexican companies shall have the right to acquire possession of land, mines and so forth; but inasmuch as a limited company like this cannot naturalize itself, it is permitted that the state may grant the same right to foreigners and foreign companies, providing they are willing to consider themselves as Mexican citizens with respect to such properties and consequently undertake not to invoke the protection of their governments in any matters relating thereto under the penalty of forfeiting the properties they hold. We are advised that the British Foreign Office will not permit us to make any such renunciation, and I need hardly tell you that we would not dream of doing so under any conditions even if this prohibition did not already exist.

"When I say, however, that the position in Mexico has somewhat improved during the last 12 months I must except the State of Chihuahua and two or three other northern states of the Republic. The conditions in Chihuahua itself are worse than they have ever been, for there is no semblance of any government therein, democratic or otherwise. While there has not been any serious fighting round the City of Chihuahua during the year, there have been constant raids both of the Carranza forces and those under General Villa. Sometimes one side has been successful and sometimes the other. This, of course, completely destroys the possibility of any transportation facilities; and until one side or the other obtains permanent dominion over this district I am very much afraid we must expect the present conditions to prevail. I think it may be truly said of the Buena Tierra company that it has encountered the worst of bad luck ever since its incorporation. The revolution commenced within a few months of that date, and in consequence we have never yet had one completed or uninterrupted year's operation.

"It has always seemed a tragedy to me that a country like Mexico, so rich in mineral and otherwise so prolific, should have fallen on such evil days. It may be that it is nearing the point of recovery. I trust this may be so, but I doubt very much whether that recovery will be hastened by placing its population, over 80% of which is totally uneducated and illiterate, under what appears in the recent constitution to be a form of rampant socialistic democracy."

At the annual meeting of the El Oro Mining and Railway Co., on Oct. 4, in London, the directors reported that the audited accounts for the year ended June 30, 1916, had only recently been received and that the accounts to the end of June last were not expected to be available before the end of this year. Continuing, the directors' report says: "As stated in the last annual report, the management was compelled, much against its own judgment and the inclination of the directors, to re-start milling operations on Oct. 20, 1916, under threats of confiscation of the property and other penalties if this course was not adopted. The reduction works have since been kept in operation with more or less satisfactory results. Owing, however, to the present high cost of operation, mainly due to the enforced payment of excessive wages to the workmen and to the provisions of the constitution recently enacted, the company at present is not making any appreciable profits. The directors desire to impress upon shareholders the impossibility of laying detailed information with regard to the operations at the mine before them at this juncture. At the moment the operation of mining properties in Mexico has reached a crisis at which the industry must either terminate or be conducted under less onerous conditions."

Scant Profit in Black Sands

Investigation of the black sands in the Northwest (presumably Oregon, Washington and northern California) by the United States Bureau of Mines has led to the conclusion that the exploitation of them offers no promising commercial possibilities. While gold and platinum in limited quantities are found in them, the deposits do not seem sufficiently rich and extensive to justify development. It is admitted that isolated instances may be found where the sands may be worked profitably.

October Mining Dividends

Dividends disbursed in October, 1917, by 48 United States mining and metallurgical companies making public reports amounted to $9,778,910, as compared with $13,728,122 paid by 45 companies in October, 1916. Holding companies paid $348,139, the same as a year ago. Canadian and Central American companies paid $1,287,137 as compared with $1,769,761 in October, 1916.

The decrease in the disbursements by United States companies from the amount for the corresponding month last year, was a little less than $4,000,000; this is partly accounted for by the New Jersey Zinc Co. payment last year of an "extra" amounting to $3,500,000, no similar item appearing in this year's list. It should also be noted that there have been decreases in the dividend rates of such companies as Osceola, Isle Royale and North Butte, which are affected by unfavorable labor conditions, price-fixing and prospective war taxes.

United States Mining and Metallurgical Companies	Situation	Per Share	Total
Ahmeek, c	Mich.	$4 00	$800,000
Allouez, c	Mich.	3 00	300,000
Am. Smelters, pfd. A	U. S.-Mex.	1 50	175,257
Am. Smelters, pfd. B	U. S.-Mex.	1 25	375,000
Arizona Commercial c	Ariz.	.50	132,500
Arizona Copper, "A" Pref	Ariz.	.06	9,600
Big Creek Leasing	Ida.	.50	2,500
Bingham Mines, c	Utah	50	75,000
Blockhouse, z	Wis.	1 00	20,000
Butte Bullwhacker, c	Mont.	01	10,000
Caledonia, l. s	Ida.	03	78,150
Cerro Gordo, l. z	Calif.	05	50,000
Champion, c	Mich.	6 40	640,000
Continental Zinc	Mo.	1.00	22,000
Cresson, g. s	Colo.	10	122,000
Daly	Utah	.10	15,000
Derry Ranch Gold Dredging	Colo.	5 00	5,000
Douglas	Ida.	.01	8,525
Dragon Cons.	Utah	.01	18,750
Empire Copper	Ida.	.05	50,000
Golden Cycle, g	Colo.	.03	45,000
Hecla, l. s	Ida.	.15	150,000
Homestake, g	S. D.	65	163,254
Inspiration, c.	Ariz.	2 00	2,363,934
Iron Blossom, s., l. g	Utah	05	50,000
Isle Royale, c.	Mich.	1 00	150,000
Judge Min. and Smelt., s. l. z.	Utah	.25	120,000
Mammoth, g. s. l. c.	Utah	.10	40,000
New Idria, q.	Calif.	.50	50,000
North Butte, c.	Mont.	25	107,500
Osceola, c	Mich.	2 00	192,300
Portland, g	Colo.	.03	90,000
Prince Cons., l. s	Utah	.05	50,000
Richmond, l. s	Ida.	02	16,800
Shattuck Arizona, c.	Ariz.	1.25	437,500
Silver King Coalition, s., l. z.	Utah	15	187,500
Silver King Con., l. s	Utah	.15	103,287
Tintic Standard, s. l.	Utah	.02	23,350
Tonopah Belmont, g. s.	Nev.	.12½	187,504
Tonopah Min., s	Nev.	.15	150,000
United Copper	Wash.	.01	10,000
United Eastern, g	Ariz.	05	68,150
U. S. Smelting, com	U. S.-Mex.	1 25	438,894
U. S. Smelting, pfd	U. S.-Mex.	87½	425,555
United Verde, c.	Ariz	1 50	450.000
Utah Apex, c.	Utah	.50	264,100
Vindicator, g.	Colo.	03	45,000
Wellington Mines, g	Colo.	.10	100,000
Wolverine, c	Mich.	6 00	360,000
Yellow Pine, z. l	Nev.	.03	30,000

Canadian and Central American Companies	Situation	Per Share	Total
Cons. Min. & Sm. Co., c. z	B. C.	$0 62½	$260,445
La Rose, s	Ont.	.05	74,931
McKinley-Darragh-Savage, s.	Ont.	.03	67,431
N. Y. & Hond. Rosario	C. A.	50	100,000
Nipissing, s	Ont.	.50	600,000
North Am. Magnesite	Que.	5 00	9,330
Standard Silver Lead	B. C.	.05	100,000
Temiskaming, s	Ont.	.03	75,000

Holding Companies	Situation	Per Share	Total
California Explor.	Calif.	$0 12	$28,139
St. Mary's Min. Land, c	Mich.	2 00	320,000

The Continental Zinc Co. and New York & Honduras Rosario designated their payments as distribution of capital and "payment from amortization fund," respectively. Utah Apex paid 50c. a share, one-half of which was designated as distribution of capital.

The totals for the first ten months of the year are as follows: Mining and metallurgical companies, $179,201,367; holding companies, $4,979,361; Canadian, Central American and Mexican mines, $16,381,857.

Personals

Victor Rakowsky, of Joplin, Mo., is in New York for a few weeks.

A. W. Allen has left New York for Denver and expects to be away for several weeks.

A. W. Newberry will be at the Engineers' Training Camp, Vancouver, Wash., until Dec 1

C. A. Burdick, of New York, has returned from the South, where he has been engaged in manganese examinations for two weeks.

Lee Wilcox, chief engineer for the Republic Iron and Steel Co, with headquarters at Gilbert, Minn., has been transferred to the Duluth office of the company.

Charles F. Jackson, formerly chief engineer for the Arthur Iron Mining Co., at Hibbing, Minn., has accepted a position with M A. Hanna Co., at Cleveland, Ohio.

George Readman, director of the Arizona Copper Co., Ltd., of Edinburgh, Scotland, has been elected chairman of the board in place of Lord Salvesen, who recently retired.

Harry W. Newton has joined the staff of Falkenburg & Laucks, chemists and metallurgists of Seattle, Wash. He will have charge of the ore-testing department of the company.

C. W. Lawr, who has recently been in Butte, Mont., experimenting with the briquetting of manganese concentrates for the Butte & Detroit Copper and Zinc Mining Co., has returned to Esqueda, Sonora, Mexico.

F. Jenkin, assistant general manager of the El Oro Mining and Railway Co., Ltd., of London, operating mines at El Oro, Mex., has resigned his position. He has been with the company since its formation in 1899.

Carml A. Thompson, of Duluth, has been appointed general manager of the Lake Superior iron-ore properties of the Tod-Stambaugh Co., of Cleveland. Mr. Thompson has been general manager of the Great Northern Ore Properties for over four years.

Theodore Pilger, mining engineer and geologist of the Butte & Superior Mining Co., is returning from an extended trip through Alaska, where he has been examining properties in the Willow Creek district as well as coal properties at Matanuska and Chickaloon, along the new Government railway.

Philip Laurence Foster, of the London Exploration Co., has resigned as a director of the Greene-Cananea Copper Co., having been appointed a captain in the Signal Corps of the United States Army. His place has been filled by the election of **Robert M. Raymond**, who represents the same interests

Dr. Louis D. Ricketts has been appointed to take charge of mining and other operations of the Calumet & Arizona Mining Co. during the absence of General Manager **John C. Greenway**, who has joined the colors. Mr Greenway recently handed in his resignation which was not accepted, indefinite leave of absence being granted him instead to enable him to go to France with the United States Army.

James J. Martin is general manager of the Chiksan Mining Co., of Yokohama, Japan, which is engaged in gold lode and placer mining at Chiksan, Korea. The members of the mine staff are J. S Bradford, general superintendent; H A Stewart, superintendent Sajunkohl mine, W L Farnham, superintendent Moonsukohl mine; J. M. Truby, superintendent Yangdei mill. H. A DeWitt, superintendent cyanide plant, assayer and surveyor; C Harbottle, master mechanic; C W DeWitt, Sajunkohl mine foreman; W B Thorsen, Sajunkohl underground foreman; A L Holiway, night foreman Yangdei mill, J M Scott, store accountant, M Kudzehara, superintendent agriculture and transportation; C. M. Truby, auditor.

Obituary

William Matson, a pioneer in the development of the oil fields in California, died in San Francisco on Oct 11 He built the first independent pipe line from the California fields to the ocean

Leo von Rosenburg was found drowned in the East River at Brooklyn, N. Y., Oct 15. He had been missing only two days and there was nothing to indicate whether his drowning was caused by accident, foul play or suicide. He was 57 years old, was born in Austria and educated there, with a short course at Freiberg. He came to this country when a young man and his first work here was in the engineering department of the Lehigh Valley R.R. Co., which was then building its extension from Easton to Perth Amboy He was a draftsman of exceptional attainments and afterward prepared, under the supervision of chief engineer Sayre, a monograph on the Musconetcong tunnel, which was very finely illustrated. Later he went to California and engaged in mining engineering. He practiced also for some years in Colorado, Montana and Missouri. In recent years he spent much time in New Mexico and Arizona. His last residence was in Flushing, N. Y., and he maintained an office in New York.

Societies

American Institute of Mining Engineers—The organization of a Tulsa section has been authorized and by-laws are being drafted It has not as yet been determined whether the membership will be recruited solely from the oil industry or will be made to include representatives of the zinc and lead districts also.

American Institute of Electrical Engineers, Denver section, held its first regular meeting of the season on Oct. 20, at the Denver Athletic Club. A paper was presented by R. D. George, state geologist, on the "Oil Possibilities of the Rocky Mountain Region," which was of special interest to the mining men present. The various favorable oil formations in the state were discussed, and special attention was called to the great opportunities existing in the infant shale-oil industry in Colorado. The electrical engineers were concerned in the possibility of developing a demand for new electrical equipment.

New York Sections of the American Chemical Society, the American Electrochemical Society and the Society of Chemical Industry held a joint meeting in New York on Oct. 19. Prior to the meeting honorary membership in the Chemists' Club was conferred upon Major Victor Grignard, professor of chemistry in the faculty of science of the University of Nancy, France. The following papers were presented: "Some Problems in Filtration," W. L. Jordan, Los Angeles, Calif.; "The Pigments of the Tomb of Perneb," Maximilian Toch, New York; "Technical Applications of Nephelometry," P. A. Kober, Albany, N. Y.; "Titanium and Its Industrial Applications," A. J. Rossi, Niagara Falls, N. Y

United Engineering Society's Engineering Council met on Oct. 11 in the rooms of the American Society of Mechanical Engineers, Engineering Societies Bldg., New York. The rules committee submitted a draft of rules for the admission of other societies to the Council and progress was made in their consideration The Council at present is composed of 24 members, five being appointed by each of the four founder societies and four by the United Engineering Society. The founder societies are the American Society of Civil Engineers, American Society of Mechanical Engineers, American Institute of Mining Engineers and the American Institute of Electrical Engineers. The committee on public affairs reported on a number of requests that the Council support pending or proposed legislation. Remedial laws intended to promote hydro-electric development were favored and the Council voted to offer its coöperation to the United States Chamber of Commerce which is interesting itself in this matter A movement to coördinate, unify and strengthen the work of various engineering committees coöperating with the Federal authorities at Washington was favorably considered. H. W. Buck and Charles Whiting Baker were appointed Council conferees.

Industrial News

Merrill Metallurgical Co., of San Francisco, has been apointed Pacific Coast representative of the Jonathan Bartley Crucible Co., of Trenton, New Jersey.

Asbestos Protected Metal Co. of Pittsburgh, Penn., announces the opening of a sales office in the Union Central Building, Cincinnati, under the direction of J. C. Lathrop.

Walter A. Zelnicker Supply Co. has recently secured the services of W. H Bramman, who is acting in the capacity of assistant to the president Mr Bramman was formerly connected with the American Carbon & Battery Company

New Patents

United States patent specifications listed below may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

Annealing Furnace for Metals. Richard Masters, Dudley, England. (U. S. No. 1,241,750; Oct. 2, 1917.)

Automatic Sampler. Seward E. Cogswell, Central City, Neb. (U. S. No. 1,241,196; Sept. 25, 1917.)

Belt-Shifting Device. George A. Sexton, Fitchburg, Mass. (U. S. No. 1,241,036; Sept. 25, 1917.)

Blasting Device. Ernest Hutton, Wayland, Ky. (U. S. No. 1,241,386; Sept. 25, 1917.)

Cyanamid—Process of Making Calcium or Other Metal Cyanamid. James Henry Reid, Newark, N. J. (U. S. No. 1,241,020; Sept. 25, 1917.)

Car-Dumping Apparatus. George H. Mueller, Columbus, Ohio, assignor to the Jeffrey Manufacturing Co., Columbus, Ohio. (U. S. No. 1,240,867; Sept. 25, 1917.)

Case-Hardening Material and Process of Making Same. Alfred O. Blaich, Chicago, Ill., assignor to Alfred O. Blaich Company, Chicago, Ill. (U. S. No. 1,241,909; Oct. 2, 1917.)

Chute—Loading and Unloading Chute. Clarence Peterson, Elm Springs, S. D. (U. S. No. 1,241,436; Sept. 25, 1917.)

Classifier. Joseph S. Bartley, Denver, Colo. (U. S. No. 1,240,923; Sept. 25, 1917.)

Compressor. Stephen G. Skinner, Wilmette, Ill. (U. S. No. 1,240,892; Sept. 25, 1917.)

Crucible Furnace. George Keith, London, England, assignor of one-half to James Keith, London, England. (U. S. No. 1,241,397; Sept. 25, 1917.)

Crucible. John C. Henderson, Washington, D. C., assignor to Driver Harris Co., Harrison, N. J. (U. S. No. 1,241,971; Oct. 2, 1917.)

Earth-Boring Machine. John F. Sauerman, Little Rock, Ark., assignor of forty-eight one-hundredths to Ben D. Schaad, Little Rock, Ark. (U. S. No. 1,241,665; Oct. 2, 1917.)

Electrolytic Apparatus. Herbert R. Hanley, Winthrop, Calif., assignor to Bully Hill Copper Mining and Smelting Co. (U. S. No. 1,241,967; Oct. 2, 1917.)

Electric Furnaces, Regulating Apparatus for. Wilfred Sykes, Pittsburgh, Penn., assignor to Westinghouse Electric and Manufacturing Co. (U. S. No. 1,241,574; Oct. 2, 1917.)

Fuel, Process for Manufacturing. John Miller, Seattle, Wash., assignor of one-fourth to Nels Krantz and one-fourth to Hansene Krantz, King county, Wash. (U. S. No. 1,241,648; Oct. 2, 1917.)

Gold-Washing Machine. Jospeh A. Furtado, Half Moon Bay, Calif. (U. S. No. 1,241,954; Oct. 2, 1917.)

Grinding-Mill. Edward F. McCool, Victor, Colo., assignor to The McCool Manufacturing and Trading Co., Victor, Colo. (U. S. No. 1,241,749; Oct. 2, 1917.)

Ingot and Ingot-Mold. Emil Gathmann Baltimore, Md. (U. S. No. 1,241,618; Oct 2, 1917.)

Metal-Heating Furnace. Zenas Beldor Leonard, Cleveland, Ohio. (U. S. No. 1,241,526; Oct. 2, 1917.)

Phosphoric Acid — Apparatus for th Manufacture of Phosphoric Acid and Compounds of the Same. William H. Waggamann, Harry Brynn, and Cary R. Wagner Washington, D. C. (U. S. No. 1,241,791 Oct. 2, 1917.)

Pump—John L. Latta, Hickory, N. C (U. S. No 1,237,530; Aug. 21, 1917.)

Silicon — Process of Securing Element from Their Compounds. Victor M. Weaver Harrisburg, Penn., assignor to Weaver Company, a Corporation of Wisconsin. (U No. 1,241,796; Oct 2, 1917.)

Welding-Electrode and Process of Welding. Percy A E. Armstrong, New Yor N. Y., assignor to Walter L. Clark and Arthur H Adams, a Copartnership under th name of The Quasi-Arc Company, Ne York, N. Y. (U. S. No. 1,241,899; Oct 1917.)

Zinc-Extraction Process. Herbert Hanley, Winthrop, Calif., assignor to Bul Hill Copper Mining and Smelting Co. (U No. 1,241,966; Oct. 2, 1917.)

Editorial Correspondence

SAN FRANCISCO—OCT. 27

I. W W.'s in Mother Lode Region are few and the mines have been fairly well rid of them. The miners are well paid and well treated throughout the state. It is only the ignorant foreigners that listen to agitators of the I. W. W. clan and they are gradually being disabused of the idea that the mines will soon belong to the I. W. W. A member of that organization at the Fremont mine accosted Samuel Robbins, bookkeeper, for funds to aid striking miners in Arizona. He gave his name as Louis Persoi and said he had been soliciting money from the miners. Upon being accused of being unfriendly to the U. S. Government, Persoi responded with "To hell with the Government." His derogatory remarks precipitated a fight with the result that Persoi was shortly lodged in jail. There is little disturbance in the Mother Lode region, minor outbreaks of this kind being the only ones occurring since the mines closed down last autumn.

Hetch Hetchy Tunneling may develop some of the lower orebodies of the Mother Lode region in Tuolumne County, if the tentative plan said to be under consideration by the City and County of San Francisco shall be carried out. It is reported that City Engineer O'Shaughnessy proposes to abandon all plans for carrying the water along the surface, either by canal or pipe through the higher elevations that intervene between Hetch Hetchy and the San Joaquin Valley. No definite figures are available, but an approximate estimate may be made as to the depth which would be reached by such a bore through the hills along the proposed line. The mines are situated at various elevations from 1500 to 3000 ft. above sea level, or a probable average of 2000 ft., so that such a tunnel would cut away below the mines of ordinary depth. Most of the mines are shallow, a few hundred feet in depth. Rights-of-way are said to have been secured and provision made in the deeds for exploring the tunnel by the owners of the mining claims during the progress of construction. There are about 400 of these rights-of-way, which means that there will be a large amount of prospecting and exploring if the plan is carried out. It may mean the development of great orebodies at the depth of the tunnel, or it may prove that the plane of the tunnel will be on the line of the barren zones that have been encountered in mines that have reached a depth approaching the level of the sea. At any rate the development will be interesting from a geological point of view and the mine owners will profit by the knowledge.

BUTTE—Oct. 27

Raid on Union Headquarters of the "Metal Mine Workers" at Anaconda was made on the afternoon of Oct. 24, resulting in the arrest of J. S. Robertson, president, and of F. H. McDonald, W. J. Anglum and James Canfield. The arrests are supposed to be in line with others made recently by the Federal authorities in this section. The men will be held pending the arrival of a Federal agent. They were charged with interfering with and hampering the production of copper in the district.

Anaconda Operating at 78% Capacity is reported by officials of the company and figures of other mine managers show that all the mines of the district are being operated at over 70% of normal capacity, the Anaconda company having the highest percentage. A statement also shows that the company is shipping to the smeltery at Anaconda 10,000 to 11,000 tons of ore per day. It is stated that 15 shafts are now in operation, but 13 are still idle for want of men. Those still shut down are the Alice, Lexington, Buffalo, Bell, Diamond, Rarus, Tramway, Berkeley, Belmont, Neversweat, St. Lawrence, East Colusa and Silver Bow. Not in the history of Butte mining has labor been so scarce as at present. Even operators of small properties, where working conditions are always good and jobs desirable, have no applicants for employment, and for the first time such employers are compelled to "hustle" for men, instead of the miners "rustling" for jobs. The striking miners, not without a sense of humor and irony, suggest the establishment of a "rustling card" system for employers.

Twenty Million Dollars Loss has been incurred by mining companies and the miners through the strikes that have existed in the Butte district for more than four months, and have cut the production of copper, silver, gold and zinc from 50 to 70%. While conditions are slowly righting themselves, they still are a long way from approaching normal. There will always be many people, who will be of the opinion that, viewed from either the side of the mining companies or the miners, the long-continued trouble has been senseless and useless. The grievances of the miners were long known to everybody before a strike was thought of, and it might have been averted had the requests of the miners been anticipated and granted in the measure that they were conceded after they had been on a strike for a month or more. The next great mistake, always apparent, was made by the authorities—Federal, state and local—in permitting the influx of the vicious, traitorous I. W. W.'s, and allowing them practically free tongues for months in their advocacy of violence, sedition and destruction of property. After these had done all the damage they could and one of their number was lynched, the Federal Government made its long-delayed raid, and that was the end of the I. W. W. influence among the strikers. The great mistake on the part of the miners was in permitting the few vicious I. W. W. and pro-German agents to use them, and advise them to demand the earth and all the fullness thereof. The mine managers refused to deal with the strikers or receive their committees, and so bitterness grew and it still continues, with the end not in sight.

Plan to Prevent Strikes and lockouts of labor during the period of the war is proposed by the Anaconda interests and the Employers' Association of Montana and will be presented to the Federal investigating board when it visits Montana. The plan has already been submitted to President Wilson, Secretary of Labor Wilson and the governor of Montana. It is in effect a compulsory-arbitration scheme, a plan that worked successfully in Montana, including Butte, until the occurrence of the present labor troubles in this city, when both employers and workingmen became so bitter toward each other that negotiations for peace would not be considered. The proposal of the employers' association, of which the Anaconda company is the most important member and chief controlling factor, is the establishment of a national board of arbitration, with local arbitration boards throughout the United States, laying the foundation for an order by the President prohibiting strikes or lockouts from a certain date until the termination of the war, and compelling the submission of all labor disputes for that period. It is suggested that the national board be composed of seven members, three to be selected by Samuel Gompers, one by the Government and three by the employers associations, local boards to be agreed on by the employers and employees, with all matters referred to the national board when local boards cannot reach an agreement. It is proposed that employers support their own members on the board and that labor unions provide for the support of their representatives, while the national board members shall be under salary from the Government. The powers of the boards shall cease on the termination of the war.

DENVER—Oct. 26

Mine Taxation is giving the metal miners considerable cause for complaint at this time. The producers claim that the Government officials who devise methods of taxation are placing an unwarranted burden on the industry, which is producing the metals that are most needed by the Government. Men who control large mining operations and substantial amounts of capital available for investment in mine development and equipment are acting with reserve and extreme caution. Some take a decidedly gloomy view of the situation and say that instead of increasing their operations, as they would like to do, they will be forced to curtail, that they can actually make money by shutting down and waiting until after the war is over and the ill-advised taxation has been removed. It should be apparent to anyone but an incompetent bureaucrat that placing any unnecessary and unfair penalty upon the production of the metals which the Government needs most at this time is suggestive of killing the goose that lays the golden egg, although in this case the egg may sometimes be made of lead or zinc or copper.

SALT LAKE CITY—Oct. 27

Fire Destroys Potash Plant belonging to Minerals Products Corporation at Alunite, six miles west of Marysvale, in Piute County, on the evening of Oct. 25. The fire originated in the coal dryer, and was proceeded by an explosion. The main mill building in which was installed a part of the calciner, the digesters, evaporators and the sacking and loading department for the potassium sulphate, was completely burned. The loss, according to company officials, is placed at about $250,000, which may be reduced $50,000 by salvage of the calciner, digesters and possibly the evaporators. Two stokers, who were working at the coal dryer and rear end of the calciner at the time of the explosion were severly burned. During last May and June there were seven fires of mysterious origin and the company built a fence around the entire plant. This plant was the first successfully operated potash mill in the United States.

WALLACE, IDAHO—Oct. 26

Suit Against Bunker Hill & Sullivan by the American Smelting and Refining Co. in the Federal court was to have been heard in Portland on Oct. 18, but was postponed by agreement to a future date. The plaintiff had asked for an order to restrain Bunker Hill & Sullivan from smelting the ores from the Bunker Hill & Sullivan mine and to force compliance with the contract held by plaintiff under which the defendant is required to ship all ore containing between 30 and 75% lead to the plaintiff's smelting plants, and also ore containing less than 30% and more than 75% under certain stipulated conditions. In the meantime, the Bunker Hill & Sullivan company has filed its answer to the complaint. It consists of supporting affidavits by F. W. Bradley, president of the Bunker Hill & Sullivan company, Stanly A. Easton, general manager, and Myron A. Folsom, chief counsel. The answer reviews the smelting situation in the Cœur d'Alene district and gives in considerable detail the circumstances under which the now famous contract between the contending companies was entered into, alleging violation of the spirit of the contract on various occasions for the purpose of depriving the defendant of the benefit of competition in the sale of its product. On account of these wrongful methods by the smelting company the defendant alleges it has suffered a loss and injury between June 1, 1915, and the date of filing the complaint, in excess of $3,000,000 and demands damages in that sum. The answer prays that the complaint be either dismissed, or that the court determine and adjudge the following: (1) That the rates and terms which defendant should have received since June 1, 1915, are the full New York price for 90% of the lead contained in all the ore shipped, with freight and treatment charge of not exceeding $15 per ton; (2) that plaintiff be first required to do equity by accounting for and paying the amount which defendant has been wrongfully deprived of by plaintiff, which sum, defendant alleges amounts to three million dollars; (3) that plaintiff has no right in the future to any of the defendant's product which may contain 75% in lead or more, or any of defendant's product which may contain 30% lead or less; (4) that by reason of plaintiff's refusal to accept at its smelting plant at Tacoma, Wash., sufficient of defendant's product to yield 37 tons of metallic lead per day, that hereafter defendant may dispose of that amount of its product containing between 30% and 75% in lead, in such manner as it sees fit; (5) that for the present and until conditions of contract and the amendments thereof are changed, the defendant shall not be required to ship any of its product containing between 30% and 75% in lead to said plaintiff, except upon condition that plaintiff pay to the defendant the full New York price for 90% of the lead contents of such shipments, and upon the further condition that defendant shall not be required to pay in excess of $15 per ton for freight and treatment; (6) fix, determine and adjudge from time to time until the year 1930, upon the application of either party hereto, what better rates and terms the said defendant company shall be entitled to under clause 12 or any other portion of said contract, and that upon such determination this court further determine that defendant shall not be required to ship thereafter until plaintiff shall have complied with such finding; (7) that the court grant such further relief as may seem proper, including costs. In his affidavit Mr Bradley reviews his negotiations with the smelting company, and states that in 1912 he discovered that the smelting company was arranging its contracts so that they would expire on or before June 1, 1915, the date for revision of the Bunker Hill contract on a basis of the rates given the majority of the ores of the district. It was then that the Bunker Hill company decided to build its own smeltery, and contracts were awarded in the latter part of that year

JOPLIN—Oct. 27

Wages at Sheet-Ground Mines of this district are not to be cut, despite the fact that the average basis price for blende indicates a cut of 25c. per day per man. Operators of the sheet-ground mines met today at Webb City and after a thorough discussion of the matter, decided to recommend that the schedule of wages, based on the average monthly basis price of blende —a schedule which has been adhered to for over two years in this field with mutual satisfaction to the operators and miners— be violated during November to the extent of keeping wages where they are. The decision to make this recommendation was not unanimous, but was concurred in by the majority of the operators. At the same time they passed and ordered published a resolution in which they cite the fact that the cost of mining has advanced almost 100% in the last two years, while the price of ore in recent months has been dropping steadily. Since the middle of August, lead ore has dropped $70 a ton, and zinc ore $12 a ton. At the same time it is appreciated that the miners are up against an increased cost of living, and it is out of consideration for this fact that the cut in wages will not be made in November. The announcement was made without any threats of a strike in case the cut was made, but it is realized by mining men that the miners cannot live at much less than the prevailing wages. The meeting of operators also considered the proposition of a general shutdown of mines and decided that this was a matter for individual mine owners and operators to decide. A large percentage of the sheet-ground mines are already shut down, and this week for the first time in several years, the shipments of the Webb City-Carterville camp dropped below one million pounds of blende The Oklahoma camp continues with heavy shipments, but the cut in the price of lead is going to affect that camp materially, as their production proportionately is much greater in lead than the Webb City camp.

TORONTO—Oct. 26

Royalties on Flotation Patents or Dominion control of the patents continues to be agitated by the "Northern Miner," a Cobalt newspaper, which in its campaign for obtaining easier conditions for Cobalt flotation operators, telegraphs as follows: "Hon. Frank Cochrane, who was Minister of Lands, Forests and Mines in Ontario before entering the cabinet of the Dominion government, stated at a 'Win the War' convention in Cobalt on Oct. 24, regarding the patents in flotation held by Minerals Separation North American Corporation in Canada: 'It will be my business to see Sir Robert Borden on the question with a view to bringing them to their senses, and for the benefit of the mining community try to get him to cancel their patents.' He informed the meeting that if, after a thorough investigation it were found that control was not vested in German alien enemies, it would be the duty of the government to see that the royalty imposed was so reasonable that it would in no way embarrass the industry, or retard the developments and production of Canada's metals. In this connection, he suggested that the government would appreciate the advice from mining operators in Canada, as to what in their estimation would be considered a fair and reasonable royalty"

EL PASO—Oct. 27

Chihuahua Properties of the American Smelting and Refining Co. are expected to be partially reopened soon. The company has brought in a shipment of coke preparatory to commencing smelting operations. Under present conditions, the American companies operating in Mexico are doing so under the arrangement made some weeks ago by the Federal Reserve Board to provide the necessary gold for the companies to meet the Carranza demands. Luis Cabrera, a delegate from Mexico, is in the United States, it is understood, for the purpose of getting food for Mexico, and the question of the gold embargo is held up pending the settlement of the former matter.

The Mining News

ARIZONA

Gila County

LAVELL GOLD (Hayden)—Mine situated few miles north of Burns siding purchased by George B. Leighton, president of the Lavell company and eastern men. St. John Smith, treasurer and J. M. Boutwell, consulting engineer. Shipping to El Paso.

Mohave County

UNION BASIN MINING CO. (Golconda) —Mill destroyed by fire Small force retained John W Wanvig, manager.

NEW TENNESSEE MINING CO. (Chloride)—Shaft down 280 ft. Molybdenite showing below 265-ft. level. G. J. Ridenour, superintendent.

MERRIMAC (Chloride)—Installed new compressor and engine Sinking started Oct 15 in new shaft, 60 ft deep J P. Ryan, superintendent.

NEW MOHAWK MINING CO. (Chloride) —Struck oreshoot west of shaft. Heavier hoist being installed, present moved to shaft No. 3. J J Robertson, manager.

Pima County

WAKEFIELD (Tucson) — Charles P. Reiniger of Mile Wide Copper Co., purchased Wakefield-Belmer group of 19 claims in San Xavier district.

Pinal County

U S. VANADIUM (Kelvin) — Milling equipment arriving.

TROY ARIZONA (Kelvin) — Climax shaft sunk 130 ft. At 500-ft. level will explore laterally.

GILA DEVELOPMENT (Kelvin)—About 500-ft development done on the first level, much of it in ore.

SILVER KING (Superior) — Shaft unwatered, timbering and repairing nearly completed Electric-lighting plant installed. Three miles of wagon road built to connect railroad siding Finding ore in new drifts from upper workings

Yavapai County

DUNDEE ARIZONA (Jerome)—Water difficulty seems to be overcome. Working three shifts in shaft making about 2½ ft daily

UNITED VERDE COPPER (Jerome)— Ex-Sen W A Clark and son, C W Clark, general manager, present at property for two weeks, reported making arrangements for increasing output, reopening Equator mine and purchasing adjoining property.

NEW YORK VERDE (Jerome)—Organized as successor to Victor Copper Co., with W. W. Lewis, general manager. Latter claims three south end claims of property were to be delivered to him. Suit will be tried in Superior court at Prescott.

CALUMET & JEROME (Jerome)—Sinking winze on 600-ft. level; driving 1-3 drift westward from No 1 crosscut; winze reported showing chalcopyrite. Will drift eastward under the 2-R and westward when winze is down 150 ft., while connecting shaft by crosscut and raise.

CALIFORNIA

Butte County

EL ORO DREDGING (San Francisco)— Reported to be drilling the Menzel Ranch, north of Redding Been operating in Oroville field, Butte County, for years.

Calaveras County

SALVADOR (Mokelumne Hill)—Frank Lagomarsino, superintendent, reports new ore developed. Preparing to start mill.

PACIFIC GOLD MINING AND MILLING CO. (Mokelumne Hill)—Permitted to sell 99,500 shares at 50c., for development; also to issue 500 shares to incorporators and 900,000 shares to Max Muller for lode claims and mill sites. Equipped with electric-power plant, ball mill, machinery and surface buildings. Option on Early Bird included.

Fresno County

COALINGA SYNDICATE OIL CO. (San Francisco)—Permitted to issue 2,199,993 shares for 225 acres in Coalinga district; 2,098,169 shares in escrow with M B Harris of Fresno, and 110,824 shares in escrow with Bank of California, at San Francisco, to be delivered upon satisfaction of mortgage.

Inyo County

STANDARD (Bishop)—Marcy mill being put in tungsten plant will bring capacity to 200 tons a day. Expected to mill with less sliming Tunnel in two new claims at 200 ft. from surface croppings, being advanced. Present figures estimate possible blocking out of 70,000 tons of ore between tunnel planes and croppings. Wages increased to $3 50 per day for common labor, $4 for hand miners and $4 60 for millmen. Increase in accord with advance in tungsten prices. No labor troubles so far

Kern County

UNION OIL CO. (Bakersfield)—Electrical storm caused firing of 37,000-bbl. oil tank at refinery five miles north of town. Nine other tanks in danger, but change in wind and heavy rain confined fire.

BUTTE (Randsburg)—New 10-stamp mill being improved. Additional plates installed and provision made for cleaning settling tanks New ore disclosed requires increased capacity and full 24-hour run per day. F. K. Seaman, in charge of mill, and Mr. Taylor, superintendent.

Nevada County

ALLISON RANCH (Grass Valley) — Centrifugal pump, 500-gal. capacity installed on 500-ft. level. Remaining 600 ft of shaft and several hundred feet of drifts will be unwatered before developing

WASHINGTON ASBESTOS CO. (Washington)—Repairing old Fairview mill completed Extensive deposit of asbestos reported. Development by San Francisco and Oakland men.

Plumas County

DINSMORE (Quincy)—Reported R. E. Edgar and associates will sink shaft on gravel deposit recently drilled.

CRESCENT (Crescent Mills)—Reported shaft will be sunk 200 ft. deeper on vein. Recently equipped with hoist, pumps and other machinery and 400-ft. shaft unwatered.

Shasta County

SHASTA KING (Coram)—Owned by Thomas W. Lawson interests, being reopened. Shipping to Mammoth smeltery

AFTERTHOUGHT (Ingot) — Flotation plant reported to be satisfactory in trial run, after some changes. Development continues; 100 men employed.

BULLY HILL (Winthrop)—Rising Star shaft repaired and developing lower levels; silver-gold ore carrying copper being shipped to Mammoth smeltery at Kennett.

Trinity County

JENNINGS GULCH MINING AND MILLING CO. (San Francisco)—Permitted to issue 5000 shares to David Gove and Robert S. Norris for assignment of lease to placer claims; also to sell W C and M T Dohrman 5000 shares. Situated in Jennings Gulch district.

Tehama County

TEDOC MINING CO. (Red Bluff)—Completed 11-mile road from chrome mines on Tedoc Mountain to connection with Red

Bluff-Eureka stage road, 40 miles distant from Red Bluff. First load of chrome hauled on Jeffrey-quad motor truck, 51 miles. W. A. T. Agard, superintendent of mines, states company contracted for early shipment of 4000 tons.

Tuolumne County

CONFIDENCE (Sonora) — Installing 100-ton roller mill. Ore disclosed in 800-ft. level. Was good producer.

ELLEN WINTON (Tuolumne) — Mill and improvements destroyed by forest fire. Also large amount of grain, hay and timber, burning over 15-sq.mi. area.

Yuba County

DIBBLE (Smartsville)—Copper ore reported being shipped to Mammoth smeltery. Nevada men may option property.

COLORADO

Clear Creek County

WINDSOR CASTLE (Idaho Springs)—Worked by lessees.

JOSEPHINE (Georgetown) — Shipping high-grade lead ore.

RULER (Georgetown) —Operated by Onondago Mining Co. through Capital tunnel; shipping to Jackson mill, Idaho Springs.

LAKE (Idaho Springs)—Lessees operating mine. Hoist and air lines installed; shipping milling-grade ore to custom mills. Subleasing dump and No. 1 tunnel.

Chaffee County

PARAMOUNT REDUCTION CO. (St. Elmo)—Impounded tailings from stamp mill below St. Elmo, will be retreated in new mill; incline, tramway and bins built. Flora Belle and other ore will be treated.

Gilpin County

HOMER (Central City)—Shaft being sunk another lift. Shipping.

LITTLE MELVIN (Central City)—Bond and lease taken; will be reopened.

PITTSBURG (Central City)—Shipping good-grade gold-copper ore from this Russel Gulch mine.

HAMPTON (Central City) — Situated near Russel Gulch; producer of ore carrying gold, silver, lead and copper.

GILPIN-EUREKA (Central City)—Operating 10-stamp mill; shipping ore also produced. Shaft 1000 ft. deep. E. L. Clark, manager.

ESMERALDA (Silverton) — Sold at trustee's sale to Louis Rosenfield, holder of bonds. Situated in Minnie Gulch; former producer.

RED MOUNTAIN MINES shipping to Silver Lake custom mill and Durango smeltery are Guston, Congress, St. Paul and Koehler Tunnel. Latter operated by Summit Copper Mining and Milling Co.

Gunnison County

FAIRVIEW (Gunnison)—Still driving tunnel.

Lake County

DERRY RANCH GOLD DREDGING (Leadville)—Has just paid its eighth dividend, making a total of 100%* to date. Gold produced up to Oct. 1 has amounted to $278,301. Ground averages 28c. per yd.; this is second year of operation; life estimated at five years.

Ouray County

OPHIR (Ouray)—Being developed by local men.

GUSTON (Red Mountain) — Shipping from dump; may be reopened through Joker tunnel.

ROOSEVELT BASIN, near top of range above Sneffles, has had several strikes during summer; will develop until heavy snow falls.

Park County

SHELBY (Alma)—Situated on Mt. Loveland, being reopened by lessees. Shipping lead-zinc ore from old dumps.

San Juan County

BELCHER (Silverton)—Lessees shipping lead-silver ore.

GOLD KING EXTENSION (Silverton) —Tunnel being driven by contract.

DETROIT-COLORADO (Silverton)—Being reopened. J. H. Slattery, in charge.

San Miguel County

CONCENTRATES SHIPMENTS in September from Telluride: Tomboy, 55 cars; Black Bear, 33; Smuggler-Union, 32; Liberty Bell, 11; Carruthers Lease, 1 car; total, 132 cars.

JAPAN FLORA (Telluride) — Lessees working dumps.

ALTA (Telluride)—Kelly 40-hp. truck installed for hauling between Telluride and mine.

SMUGGLER-UNION (Telluride)—Additional equipment being installed at Blue Lake pumping plant.

TOMBOY (Telluride)—Returns for September show mill operated 28 days, crushing 12,000 tons, yielding $24,000 in bullion. Concentrates shipped amounted to $71,400 and expenses $66,200. Profit, $29,900.

LEWIS MINING AND LEASING CO. (Telluride)—Company of local men to reopen Lewis mine, in Blue Lake Basin. Flotation process to be installed. H. C. McClain, superintendent of Liberty Bell, will be manager.

Summit County

WARRIOR'S MARK (Montezuma)—Option secured, and will be operated soon.

JESSIE (Breckenridge) — Milling ore from development work; considerable tonnage being blocked out.

WELLINGTON (Breckenridge) — New vein opened in crosscut from 6th level at depth of 1000 ft.; drifting under way. Mill overhauled, and operating full capacity. Shipping crude ore and concentrates.

Teller County

SEMI-MONTHLY PAY DAY now operative with most of big mines of Cripple Creek district.

QUEEN BESS (Cripple Creek)—Shipments made recently.

DIG GOLD MINING CO. (Cripple Creek) —Electric hoist and compressor installed. Shaft will be sunk 250 ft. deeper.

ECLIPSE (Cripple Creek)—Building incline surface tramway to "low line" switch, where loading will be done since removal of narrow-gage railroad.

PORTLAND (Cripple Creek)—Independence mill treating 1300 to 1400 tons daily, mostly dump ore; all units operating and treating more than expected capacity; recently received first custom ore. Ore from Portland lessees and Stratton's Mining and Development Co. will be treated hereafter. Portland mill treating about 600 tons daily.

MICHIGAN

Copper

QUINCY (Hancock)—Averaging almost 4000 tons daily from 11th to 77th level.

MASS (Mass)—Gaining in men. Costs higher this year but below 21c.

HANCOCK (Hancock)—September production, 350,000 lb. comparing with 334,000 in August.

CALUMET & HECLA (Calumet)—Flotation machines will be built at Minerals Separation's San Francisco plant.

MAYFLOWER-OLD COLONY (Houghton)—Started sinking new shaft with hand drilling below concrete collar, Oct. 9.

MOHAWK (Mohawk)—May reach rock output of 50,000 tons in October. Rock averages 19 lb. copper per ton.

ALLOUEZ (Allouez)—Will show increase in output for 1917. Daily average now 2100 tons of rock, averaging 18 lb. per ton.

SENECA (Calumet)—Contracted with Smith & Sparks for 200-ft. spur to Keeweenaw Central railroad. Constructing powerhouse-machinery foundations.

FRANKLIN (Demmon)—Repairs to old shaft hoist completed. Output of rock for September was 23,000 tons, compared with 27,000 in August. Old shaft has full crew, but more men could be worked at No. 2. Latest report indicates that No. 2 shaft is cleaned out nearly to bottom at 17th level. More men coming in; averaging 1000 tons daily.

AHMEEK (Ahmeek)—Shipped in September, 96,000 tons comparing with 109,000 in August. Decrease because of less working days. Mill treated 300 tons Allouez rock daily, being overflow from Lake No. 2 and Centennial-Allouez mills.

SOUTH LAKE (Houghton)—Produced in September 3500 tons of rock, carrying good copper contents, being 1500 less than August output. Rock sent to Franklin mill at Point Mills. Shipping since Oct. 1 to Winona mill, saving railway haulage. Rock now averages 17 lb. per ton.

MICHIGAN (Rockland)—Over 400 ft. in Ogimah lode on sixth level; drift from crosscut on fourth level disclosing good contents. Butler lode on second and seventh showing fair grades in drift. Sinking to eighth level. Grading for 600-ft. extension of railroad completed and when track is laid, motor-truck haul will be only 1000 ft.

COPPER RANGE (Painesdale)—These mines continue normal production of about 3600 tons daily. In September, sent to mill more than 100,000 tons, averaging 30 lb. Champion mine produced in September 60,000 tons of rock; Baltic, 26,000 tons; Trimountain, 16,000. The company will build 25 double houses more at Champion and 12 at Trimountain, also concrete stack at both the Champion and Trimountain properties for compressor plant.

MINNESOTA

Mesabi Range

STATE ORE ROYALTIES on ore shipped from State lands for quarter just ended will amount to over $460,000, of which $100,000 will be invested in Liberty Loan bonds.

NEWPORT MINING CO. (Grand Rapids) —Has five drills checking properties recently leased near here.

KINNEY (Buhl)—Closed down after shipping throughout season. Steam-shovels working most of summer.

PHILBIN (Hibbing)—Finished shipping and started stockpiling. Operated by Republic Iron and Steel Co.

HAROLD (Carson Lake)—M. A. Hanna Co. preparing to reopen after one year shutdown.

UNION (Virginia)—Incline shaft, down pit side for hoisting remaining ore, built during last season. Operated by Republic Iron and Steel Co.

SELLERS (Hibbing) — Marion steam shovel Co. setting up 300-ton shovel for Oliver Iron Mining Co. in this pit. This is second shovel of this class purchased by company.

WASHOE (Coleraine)—Contract given to A. Guthrie & Co., of St. Paul, for removal of overburden from property north of Walker pit; leased to Pickands, Mather Co. by Northwestern Improvement Co. (Northern Pacific Ry.)

MISSOURI

Joplin District

MIAMI-ADA (Quapaw, Okla.)—Drilling tract southeast of city with good results.

CONSUMERS (Joplin)—Shut down three weeks to rebuild mill hopper. Will start operating Oct. 29.

HUGH McINDOE, until recently mayor of Joplin, has purchased fee north of Waco Mining Co. mill, at Waco.

LITTLE BILL (Joplin)—New mill ready by Nov. 15 on tract west of Chitwood. Disseminated formation at 185 ft.

ARNOLD & BARRY (Quapaw, Okla.)—Will build small mill on Red Feather lease, just north of Quapaw. Shaft down 80 ft.; mining at 60 ft.

OAK ORCHARD (Joplin)—Sold lease on Cox land north of city to Universal Lead and Zinc Co.; will try deep drilling for first time.

BESSIE LEE (Joplin) — Developing shallow lead property, two miles southeast of Duenweg on Byrd land. Drilling shows sheet-ground formation below 20 ft.

WACO MINING (Joplin)—Making 125 tons weekly at Waco camp; operating mill one shift. Heavy water flow keeps operations above 130 ft. Frank Danglade, Webb City, manager.

ADAMS-HICKS (Joplin)—Taken additional 30-acre lease at Jackson hollow and have 925-ft. incline tram to connect new shaft with mill. Gas-engine power entirely.

MALCONA (Joplin)—Mill shaft completed; making 30 tons concentrates weekly, with only one mill shift and ground partly opened. Recovery is 10%. W. R. Davis, Joplin, manager.

PICHER MINING CO. (Joplin)—Subleased on Golden Rod Co.'s tract, south of Picher, Okla., and will move Twin-Cities mill from Carterville to new site. Former stockholders in Twin-Cities, and some Joplin and Wentworth investors interested.

NEW DINERO (Lincolnville, Okla.)—Recently installed James slime tables and enlarged settling tank to recover more from fines. Operating at 89 ft. Pomona pump, handling water successfully. C. W. Gould, Miami, vice president and manager.

JAYHAWK (Miami, Okla.)—Planning construction two mills soon, one on tract north of Lincolnville and other on lease near state line, north of Sequoaah mine, mile east of Picher, Okla. Shafts started on each; in ore at Lincolnville. W. N. Hays, Miami, Okla., president.

MONTANA

Deer Lodge County

PYRENEES MINE in Georgetown district, owned by Clark interests and Clinton H. Moore of Butte, being reopened by Butte leasers under management of J. Clarke Johnstone. Large producer in past when ore was treated on plates until sulphides were reached, preventing profitable treatment.

Granite County

PHILIPSBURG MINING (Philipsburg) —Constructing 300-ton washing plant for low-grade manganese ores.

Jefferson County

MT. WASHINGTON (Wickes)—One car daily, lead-silver ore sent to smeltery.

CRYSTAL (Basin) — Teams hauling ore from Cataract to railroad at Basin, seven miles distant. Developed by tunnel.

Fergus County

PACIFIC DREDGING CO. (Coffee Creek)—New set of bucket lips received for bucket line of this dredge under reconstruction. Dredge removed four miles from Morrison Gulch because of heavy boulders and will be in operation shortly.

BARNES KING (Kendall) — Statement for September production shows: North Moccasin, ore treated, 2476 tons, assaying about $9.10 per ton, bullion produced, $22,204; Gloster and Shannon, in Lewis and Clark County, ore treated, 4676 tons, bullion produced, $76,570. Shannon ore assayed, $19.40 per ton; Gloster ore, $11.28 per ton.

Lewis and Clark County

CARBONATE HILL (Helena)—Will resume operations in 300-ft. shaft, Oct. 20.

ROCK ROSE (Helena)—Contact lead at 300-ft. level. Galena ore.

THOMAS CRUSE DEVELOPMENT CO. (Helena)—East 500-ft. drift running into larger orebody.

HELENA (Helena)—Shipped 16 cars of silver-lead ore to East Helena smeltery from 300-ft. level.

ECONOMY (Helena)—Electric power to pump out 300-ft. shaft. Crosscutting at present.

CRUSE CONSOLIDATED (Helena)—North 150-ft. drift in copper-silver ore. New 10-drill compressor ordered, and shaft to be sunk to 250-ft. level.

STEMWINDER MINE (Helena)—Shaft down 100 ft. Silver ore, 2½ ft. wide. Drifts at 100-ft. level.

AMALGAMATED MINES CO. (Helena) New corporation owns mines in Lump Gulch, has Free Coinage under bond, and possesses other claims in Nevada. Will pump out 350-ft. shaft.

Madison County

METALLIC (Virginia City)—Five tons of high-grade ore recently shipped from this Barton Gulch mine to mill in Williams Gulch. Shipment of 15 tons lower-grade ore will be made this week to Anaconda smeltery.

Silver Bow County

EAST BUTTE (Butte)—Production for September was 2,203,300 lb. copper, comparing with 1,676,360 lb. in the previous month having resumed smelting operations after 1½ months' shutdown.

GEORGE (Butte)—Present high price of silver caused William Cassidy, of Butte, to reopen this old mine west of Butte. Two cars silver ore ready for shipment. New locations being made in vicinity.

ANACONDA (Butte)—Mines now operating nearly normal capacity; miners working on Oct. 19, 7847 out of a normal of 10,000; on Oct. 18, 11,000 tons hoisted. Several hundred of company's men were drafted into army, and large number enlisted, which makes the total now at work seem as good as could be expected.

TUOLUMNE MINING COMPANY (Butte)—Developing east-side properties, including Main Range and Colusa-Leonard Extension. Leonard vein owned by Anaconda company on west passes through Tuolumne properties, being known as the Spread-Delight in the Main Range property. Has width of 132 ft. on 700-ft. level, shows good copper and silver assays. Additions to surface plants cost $60,000 preparatory to sinking shaft 400 ft. deeper. Shipping from old property on Anaconda hill. Sinking shaft to 1000 ft.

NEVADA

Nye County

TONOPAH ORE PRODUCTION for week ended Oct. 20 amounted to 9311 tons, valued at $163,467, comparing with 8982 tons the previous week. Producers were: Tonopah Belmont, 2429 tons; Tonopah Mining, 2350 tons; Tonopah Extension, 2380 tons; Jim Butler, 500 tons; West End, 1063 tons; MacNamara, 315 tons; Montana, 116 tons; Rescue, 132 tons; North Star, 56 tons.

MANHATTAN DEXTER MINING (Manhattan)—Juhl-Fogle lease completed 200-ton test in War Eagle mill. Results not available now. Hibbert-Cantwell lease obtained good returns from amalgamation on recent shipment.

UNION AMALGAMATED MINING (Manhattan)—North crosscut on fissure advanced total of 61 ft.; No. 11, north crosscut, east, total of 47 ft.; south crosscut, 61 ft. Development shows two orebodies have come together at 600-ft. level. Swanson oreshoot yet to be proved. Earl shaft, now at depth of 350 ft., will be straightened and enlarged to double compartment with manway. Will connect shaft bottom with 600-ft. level by raise. Intend to remove mill to Litigation Hill, near Earl shaft, and may discard stamps for ball mill.

WHITE CAPS (Manhattan)—East orebody opened from fourth and fifth levels; proved longer on fifth level than above; considerable more width proved on fourth level than expected. East fault cuts off orebody in level above; will not strike fault on fifth level for 120 ft. further. East drift driven 35 ft. on fourth level; preparing to start stoping operations.

OREGON

Jackson County

GALLS CREEK MINING AND DEVELOPMENT (Gold Hill)—American Exploration Co., of Grants Pass, optioned this placer mine, three miles south of here. Ground being exploited by small crew of men. Consists of 200 acres with valuable water rights. Has been mined successfully since 1851. J. Mattison, manager.

BARRON (Ashland)—This gold mine, situated nine miles east of here, sold to H. J. Sallee. Vein is 16 ft. wide, carrying gold, silver and antimony. Workings consist of 750-ft. drift at 200-ft. depth and winze 50 ft. deeper. Carload of tools and machinery arrived. Employing 25 men cleaning out old works. Ore from former operations, ready for shipment, will be hauled to Mistletoe station, thence to Shasta County smelteries. John Kemple, manager.

SOUTH DAKOTA

Lawrence County

SILVER QUEEN (Galena)—Shipped 10 cars of lead-silver ore from dump to smeltery.

DEADWOOD LEAD AND ZINC (Deadwood)—Plan to erect 10-stamp mill. Excavation completed; road being built. Sulphide ore carrying lead, silver, zinc and copper.

Pennington County

DAKOTA CONTINENTAL (Hill City)—Diamond drilling started. Mining suspended awaiting results. Shaft over 200 ft. deep.

UTAH

Beaver County

PALOMA (Milford)—Strike on 900-ft. level reported holding out well. Small amount of ore being mined on 700-ft. also.

CREOLE COPPER (Milford)—Will be operated for company account soon. Stated enough ore opened for shipments of 10 to 15 cars monthly. Owns five patented claims; practically debt free. Shipped 80 cars in 1916 when under lease. J. A. Pederson, president.

Juab County

TINTIC MILLING (Silver City)—Shipping car of bullion, yielding about $30,000 per car, monthly from Dragon Consolidated, Iron Blossom and Colorado ores.

DRAGON CONSOLIDATED (Silver City)—Fluxing iron ores is most of output, with little high-grade ore. September shipments, 184 cars; August, 254; July, 145; total for first six months, 1917, 876 cars.

TINTIC STANDARD (Eureka)—Cash payment of $12,000 for new property recently made. New shaft connected with old workings, at present producing most of output; ventilation improved. Drifted on 1560-ft. level, 400 ft. from new shaft; short distance further a second raise will be made to connect with stope in old workings; has opened considerable ore, allowing increase in output.

CHIEF CONSOLIDATED (Eureka)—Expect electric pumping plant in operation in about three months, also large concrete reservoirs constructed on 1800-, 1200-, and 600-ft. levels.

PLUTUS (Eureka)—This adjoining property acquired by Chief being opened by latter. Cleaning out and repairing Plutus 400-ft. shaft to be widened later, and sunk further.

IRON BLOSSOM (Silver City)—Prospecting showed no new orebodies, but indications reported encouraging. Shipments during September, 75 cars; August, 88; total for first six months 1917, 761 cars.

SOUTH STANDARD (Eureka)—New company to be formed, known as South Standard, to take over United Tintic's and South Standard's ground. E. J. Raddatz, of Tintic Standard, president.

Salt Lake County

EMMA CONSOLIDATED (Alta)—Diamond drilling for old Emma orebodies continues. Most of ore from between 200- and 300-ft. levels. Daily output said to be 60 to 70 tons.

UTAH METAL AND TUNNEL (Bingham)—Mill increased to 450 tons. High-grade and milling ores stated to be increasing. Smelter contract will take output for five years at average price for week preceding delivery of ore.

AMERICAN SMELTING AND REFINING (Murray)—Building stack to be 450-ft. high and 20-ft. inside diameter at top; perforated radial blocks being used, with acid-proof lining to full height, and terra cotta cap.

Utah County

SOUTH PARK (American Fork)—Strike reported in tunnel, widening with depth.

BELLEROPHON (American Fork)—Leased to American Exploration Co.; caved shaft, being retimbered, sunk 30 ft. in fissure in quartzite showing good ore.

PACIFIC (American Fork)—Capacity 200 to 250 tons. Estimate tonnage on dumps will keep mill operating for some time, before drawing on mine. Leased to Fissures Exploration, which has built mill.

Tooele County

WOODMAN MINING (Gold Hill)—Main tunnel at 120-ft. depth in low-grade copper ore carrying gold and silver for 72 ft. Shipping.

SEMINOLE COPPER (Gold Hill)—Stated will build mill to treat molybdenum and tungsten ores available on property. Will also develop showings of lead-silver and copper-gold ore.

WASHINGTON

Pend Oreille County

LEAD AND ZINC CO. (Metaline Falls)—Shipping eight to 10 carloads per month. Increasing capacity to 12 to 15 carloads.

WISCONSIN

DAHL (Cuba City)—Tom Baldwin and the company unwatered property.

OLIVER (Shullsburg)—Leased land of John Lyne and O'Toole estate, two miles south of Shullsburg.

IDA BLENDE (Benton)—W. Eller and others organized company to reopen this old producer at Benton.

CANADA

Ontario

KELSO (Porcupine)—Contracted for diamond drilling property.

ALEXANDRA (Cobalt)—Purchased by the Mining Corporation of Canada.

ANKERITE (Porcupine) — Contracted for sinking three-compartment shaft, 500 ft.

ADANAC (Cobalt)—Calcite vein containing argentite, ruby, and native silver, cut.

WRIGHT HARGRAVES (Kirkland) Lake)—Shafts down 300 ft.; drifting to connect them.

WALDMAN (Cobalt) — Situated on Gillies Limit acquired by Mining Corporation of Canada and development resumed.

MINAKER - KIRKLAND (Kirkland Lake)—Main vein cut at 40-ft. level shows up well. Small mill will be installed.

BUFFALO (Cobalt)—Paying 25c. a share in cash and reducing capital liability by issue of new stock having par of 75c instead of $1.

McKINLEY-DARRAGH (Cobalt)—About 40 ft. of drifting on 400-ft. level of Cobalt Lake fault vein shows low-grade orebody 6-ft. width.

TRENTON OIL AND GAS CO. (Toronto)—Secured oil leases near Campbellville; begun drilling. H. H. Stubble, in charge.

TECK-HUGHES (Kirkland Lake) — Winze down from 400-ft. level reached a 600-ft depth. Station being cut; crosscut will be run to connect with main shaft.

LA ROSE MINES, LTD. (Cobalt, Ont.) —Estimated reserves are $4,943,000 compared with $854,836 on Mar. 31, 1915. Operating expenses were $1.78; ore averaged $9.82; extraction over 95%.

CONIAGAS (Cobalt)—Report for year ended Oct. 31 shows mine produced 1,250,000 oz. silver, a decrease from previous years owing to less high-grade ore. Coniagas Reduction Co. had difficulty in obtaining supplies which restricted operations. About $70,000 spent on Ankerite and Maidens-McDonald claims at Porcupine and contracted for sinking shaft on Ankerite. Will not pay dividend Nov. 1.

MEXICO

ESPERANZA (El Oro, Mex.)—Ore milled in August amounted to 11,325 tons, at estimated net profit of $25,507

The Market Report

SILVER AND STERLING EXCHANGE

Oct.	Sterling Exchange	Silver New York, Cents	Silver London, Pence	Oct.	Sterling Exchange	Silver New York, Cents	Silver London, Pence
25	4.7515	82½	41⅞	29	4 7515	84¾	43
26	4 7515	83¼	42¼	30	4 7515	90⅛	46
27	4.7515	83¼	42¼	31	4.7515	90⅛	45¾

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

DAILY PRICES OF METALS IN NEW YORK

Oct.	Copper Electrolytic	Tin Spot.	Lead N. Y.	Lead St. L.	Zinc St. L.
25	*23½	62	5½	5 25 @5.42½	7½ @7¾
26	*23½	63	5.40 @5.50	5.37½ @5 42½	7½ @7¾
27	*23½	64	5.45 @5.50	5.42½ @5.50	7⅜ @7⅝
29	*23½	65	5.45 @5.75	5 42½ @5.50	7⅜ @7½
30	*23½	66	5.50 @5.75	5.42½ @5.62½	7¼ @7⅜
31	*23½	66¼	5 50 @6.00	5.42½ 5.82½	7⅛ @7¼

* Price fixed by agreement between American :opper producers and the U. S. Government, accordng to official statement for publication on Friday, ;eptember 21, 1917.

The above quotations (except as to copper, the rice for which has been fixed by agreement between American copper producers and the U. S. Govern- nent, wherein there is no free market)are our ppraisal of the average of the major markets based enerally on sales as made and reported by producers nd agencies, and represent to the best of our judg- nent the prevailing values of the metals for the leliveries constituting the major markets, reduced to asis of New York, cash, except where St. Louis is he normal basing point.

The quotations for electrolytic copper are for cakes, ogots and wirebars.

We quote electrolytic cathodes at 0.05 to 0.10c. elow the price of wirebars, cakes and ingots.

Quotations for spelter are for ordinary Prime Vestern brands. We quote New York price at 17c. er 100 lb. above St. Louis.

Some current freight rates on metals per 100 lb. re: St. Louis-New York 17c.; St. Louis-Chicago, .3c.· St. Louis-Pittsburgh, 13.1 cents.

LONDON

Oct.	Copper Standard Spot	Copper Standard 3 Mos.	Copper Electrolytic	Tin Spot	Tin 3 Mos.	Lead Spot	Zinc Spot
25	110	110	125	247½	247½	30½	54
26	110	110	125	247¾	247¾	30½	54
27							
29	110	110	125	250½	251	30½	54
30	110	110	125	256¼	256¼	30½	54
31	110	110	125	257¾	257¾	30½	54

The above table gives the closing quotations on ondon Metal Exchange. All prices are in pounds erling per ton of 2,240 lb. For convenience in mparison of London prices, in pounds sterling per 240 lb., with American prices in cents per pound e following approximate ratios are given, reckoning change at $4.75½. £30½ = 6 474c.; £54 = 11 462c.; 120 = 25.473c.; £137 = 29.082c.; £240 = 50.946c. ariations, £1 = 0.212277c.

Metal Markets

NEW YORK—Oct. 31

The most noteworthy feature of the etal markets this week was the advance the price of lead on very large transac- ons, the cut to 5½c. having stimulated iying. Zinc continued dull and stagnant, is market still being under the incubus accumulating stocks. Tin experienced sharp advance in a small market owing scarcity of supplies. Of copper noth- g need be said.

Copper — The copper business is going along very smoothly in the hands of the copper producers' committee. Deliveries to the U. S. Government and to the Allies are being made right along, but it is well known that their orders have not yet attained the maximum. In the meanwhile deliveries of copper on old contracts with domestic consumers are being made, but October ends without completion of the full percentage being delivered that producers owed to them, for the simple reason that there was insufficient copper. New business with domestic consumers has been booked only when they could show that it was absolutely needed, and it then was accepted only to the extent that it could be supplied.

The production of the refineries in October was far short of the average monthly rate in 1916, but it was probably larger than in September (although statistical returns for that month were not made) and an increase in November is confidently expected.

The smoothness with which the copper business is proceeding is due largely to the generous coöperation of manufacturers, who are abstaining from demanding what they do not immediately need, who have reduced the stocks in their yards, and who have arranged to conduct their business with a smaller quantity of copper in semi-finished forms in circulation through their works. Copper manufacturers are drifting to larger business with the Government and less for domestic industry. It is inevitable that the Government will soon be using vast quantities of copper and it is only a question of a short time when its plans will have been formulated and will be revealed.

Copper Sheets have been cut 1c. and are quoted at 35c. per lb. for hot rolled, and 1c higher for cold rolled. Wire has also been reduced, being quoted at 30c. per lb., f.o.b. mill.

Tin—This market advanced sharply from day to day on small transactions, the business is Straits tin being probably not more than 5 to 10 tons per day. However, the supplies were so scarce that even that small demand had an important effect on the market. Banka tin also is scarce and at the close is quoted at 64@65c., while Chinese No. 1 is quoted at 62½@63½c.

Lead — At the very beginning of the week, the market having got its breath following the surprise of the cut by the A. S. & R. Co. to 5½c., large buying developed. Sales reported to us amounted to 15,000 tons and we conjecture that the total business of the week must have been close to 20,000 tons. In this excited market buying and selling was more or less at sixes and sevens, especially at first, when there were some transactions of considerable volume at below 5½c., but by Monday the market found itself and on that day there were large transactions at 5.45c. @ 5.50c. in the morning, and 5¾c. was realized in the afternoon. On Wednesday 6c. was realized for a round lot, December delivery, but the A. S. & R. C. continued to sell at 5½c. for shipment within 30 days.

The transactions of the week included a considerable tonnage for export, France and Canada being the most important foreign buyers. As for the domestic market, a characteristic was the widespread inquiries and large volume of small sales, indicating that distributers were replenishing depleted stocks.

Zinc—This market declined from day to day on relatively small business. Everybody seemed to want to sell, but relatively few caught the business. Others cut prices to what they thought were low figures, but steadily found that someone else was offering lower. Business of the week included one or two small lots for export to France. The explanation of the situation in spelter is perfectly simple. Buyers are conspicuous by their absence, stocks continue to accumulate, and the producers on whose hands they are accumulating prefer to get money rather than to keep spelter. Spelter class A. or high-grade, is quoted at 11½@12½c. Class B, or intermediate, at 10½c.

Zinc Sheets—Price of zinc sheets has not been changed Market is still at $19 per 100 lb. f.o.b Peru, Ill., less 8% discount.

Aluminum—This market continues dull with small transactions taking place at 37@38c. per lb. for No. 1 ingots at New York.

Antimony—Reports of this market vary, some houses having done a moderate business, while others did none at all. In the latter class were the Chinese and Japanese houses, which declare themselves out of the market at the present level of prices. The tone of the market is somewhat softer, and we quote spot at 14@14¼c., and futures, at 13@13½c., c.i.f. in bond.

Bismuth—Unchanged at $3.50 per pound.

Cadmium—This metal is quoted at $1.40 @1.60 per pound.

Nickel—Steady at 50c. per lb., premium of 5c. per lb. for electrolytic.

Quicksilver—Stocks continue light and the tone of the market firm without any change in quotation of $100@102. San Francisco reports, by telegraph, $100, strong.

Gold, Silver and Platinum

Silver—This market has been very erratic. After touching 41⅞d. in London and 82½c. in New York, it gathered strength, making violent bounds from 84¾c. to 90⅝c. in New York and is quoted today at 45¾d. in London and 90⅛c. in New York.

Proposed agreement between U. S. and Mexican governments regarding export of gold and silver has not been ratified by Mexican government.

Mexican dollars at New York: Oct. 25, 62¼c.; 26, 63c.; 27, 63c.; 29, 65c.; 30, 69c.; 31, 69c.

Platinum—Active at $103@105.

Palladium—Active at $120@125.

Zinc and Lead Ore Markets

Joplin, Mo., Oct. 27—Blende, per ton, high, $72,60; basis 60% Zn, premium ore, $72.50@75; medium to low, $67.50@60; low, $55; calamine, per ton, 40% Zn, $35; average selling price, all grades of zinc, $56.62 per ton.

Lead, high, $64.10: basis 80% Pb, $60; average selling price, all grades of lead, $59.66 per ton.

Shipments the week: Blende, 8016 tons; calamine, 1005 tons; lead, 550 tons. Value, all ores the week, $543,620.

One purchasing company continues to pay $72.50 to $75 base for ore. Aside from this the highest base is $67.50, with the bulk of ore selling from $65 to $60 base. Ores grading under 55% Zn receive a $55 base, with slimes grading around 50% on a $50 base.

The electric power situation has improved, but coal deliveries are so uncertain that several mills have operated only part time.

Platteville, Wis., Oct. 27—Blende, basis 60% Zn, $65 base for premium grade down to $58 base for medium grade. Lead ore, basis 80% Pb, $60 per ton offered, but no sales are reported and producers are not disposed to sell. Shipments reported for the week are 3342 tons of zinc ore, 75 tons of lead ore, and 528 tons of sulphur ore. For the year to date the figures are: 120,268 tons of zinc ore, 6276 tons of lead ore, and 23,599 tons of sulphur ore. Shipped during the week to separating plants, 3690 tons of zinc ore.

Other Ores

Manganese Ore — Unchanged at $1 per unit for metallurgical ore on the basis of 48% manganese.

Molybdenum Ore—Unchanged at $2.20 per lb. on the basis of 90% molybdenum sulphide.

Pyrites—Spanish lump quoted at 15c. per unit, on basis of 10s. ocean freight, buyer to pay war risk. Ocean rates remain at 35s. for Northern, 40s. for Southern and 42s. 6d. for Gulf ports.

Tungsten Ore—We quote high-grade (70%) unchanged at $23@25. Slightly lower grades are quoted at $20@23. For anything except the highest grades it seemed to be difficult to get the prices that were asked.

Exports of wolframite from Tavoy, Burma, in the month of June were 202 tons 10 cwt., as against 104 tons 17 cwt. in June of last year.

Iron Trade Review

PITTSBURGH—Oct. 30

During the last week a rumor has been circulating widely that the War Industries Board had decided to hold in abeyance its intention to set prices upon the steel products left out in the announcements of Sept. 24 and Oct. 11. The explanation accompanying the rumor is that an understanding had been reached whereby the industry would itself regulate prices for the remaining products. In some quarters the rumor is credited but in most quarters it is still believed that eventually the Board will set prices for tubular goods, wire products and sheets at least, if not for a number of other and relatively minor products as well

At this writing a meeting of the sheet manufacturers is in session at Pittsburgh, apparently for the purpose of crystallizing sentiment in favor of adopting the sheet prices that the War Industries Board indicated several weeks ago it would countenance, these prices being considerably lower than those first submitted by the mills. To-morrow representatives of the sheet industry are to meet the War Industries Board at Washington, and an official announcement may follow.

A striking feature in the market is the rapid decline of sheets in the open market in the last fortnight. At the top of the sheet advance it was practically impossible to buy blue annealed or black sheets at 8c., while 9c. was paid in many instances. When the basis prices for pig iron and steel were set on Sept. 24, the sheet market was not under 8c. Ten days ago sheets could be bought at fractions under 8c., while last week offerings became numerous at 6c. and this week there are occasional offerings at 5.50c. or a trifle less, with no quotations above 6c. The first price the sheet manufacturers considered for submission to the Government was 6.50c., so that the market has taken the case in its own hands.

The American Steel and Wire Co. has advanced its prices $2 a ton on plain wire and $6 a ton on nails and barb wire, making plain wire 3.25c. and wire nails $3.50. In some quarters this was interpreted as a suggestion to independents to reduce to $3.50 from their $4 price, but the independents show no disposition to do so and thus the wire trade shows no ability to adjust its prices.

The opinion has now become almost unanimous that if there is any readjustment in prices Jan. 1, as Government statements have suggested is possible, the revision will be downward, and in some quarters it is believed it will occur, starting with a reduction in pig iron from $33 to $30.

Trading in steel products is quite limited, being confined chiefly to material required for Government account. There is little pressure to buy, as consumers generally are well covered for the near-by future and neither buyers nor sellers are disposed to do business for late deliveries.

Production of pig iron, and in consequence of steel, continues to be restricted at 10% or more below capacity, almost wholly on account of the shortage in coke October, usually a record month, has shown practically no improvement.

Pig Iron—The trade still awaits formal statement at Washington as to differentials, if any, between districts, as well as differentials between grades Meanwhile business is being conducted with considerable freedom on a tentative basis. As a rule producers are refusing to sell except to regular customers as there are suspicions that consumers having iron due them at higher prices are disposed to go elsewhere and seek iron at the Government prices We quote the market at the set level of $33, valley, for foundry and basic and at the tentative price of $36 30 for bessemer, prices delivered Pittsburgh being 95c higher

Ferroalloys

Ferromanganese—With demand limited, and the possibility that the Government may undertake to set ferromanganese at a relatively low price, the market has been declining and is quotable at about $275 for prompt domestic and $250 for first half domestic Imported remains nominally at $325

Coke

Connellsville—Production remains at substantially the same rate as formerly, and materially under the requirements, particularly of the furnaces having their own ovens Offerings in the open market have increased only slightly The Government has not yet announced a differential for foundry coke and we quote coke in general at the fixed price of $6 a net ton at ovens.

STOCK QUOTATIONS

N. Y. EXCH.†	Oct 30
Alaska Gold M	3
Alaska Juneau	3
Am.Sm & Ref ,com	91
Am. Sm. & Ref , pf	102
Am. Sm. Sec , pf , A	94
Am. Sm. Sec., pf B	‡93
Am. Zinc	14
Am. Zinc, pf	40
Anaconda	61
Batopilas Min	1
Bethlehem Steel	79
Bethlehem Steel, pf	91
Butte & Superior	19
Cerro de Pasco.	31
Chile Cop	15
Chino	42
Colo Fuel & Iron	36
Crucible Steel.	62
Dome Mines	7
Federal M. & S	15
Federal M & S , pf	36
Great Nor , ore ctf	27
Greene Cananea	39
Gulf States Steel	93
Homestake	‡95
Inspiration Con	43
International Nickel	26
Kennecott	32
Lackawanna Steel	77
Miami Copper	30
Nat'l Lead, com.	44
National Lead, pf	101
Nev. Consol	18
Ontario Min	4
Quicksilver	1
Quicksilver, pf	1
Ray Con	22
Republic I.&S.,com.,	75
Republic I & S., pf	98
Sloss-Sheffield	39
Tennessee C. & C.	12
U S Steel, com	102
U. S. Steel, pf	113
Utah Copper.	80
Va. Iron C. & C	56

N. Y. CURB†	Oct 30
Big Ledge.	1
Butte & N Y	1
Butte C. & Z	8
Butte Detroit	[illegible]
Caledonia	52
Calumet & Jerome.	1
Can Cop. Corpn	1
Carlisle	‡3
Cashboy	‡ 05
Con. Ariz. Sm	1
Con. Coppermines	8
Con. Nev.-Utah	‡ 08
Emma Con.	[illegible]
First Nat. Cop	2
Goldfield Con	40
Goldfield Merger	‡ 04
Greenmonster.	[illegible]
Hecla Min	5
Howe Sound	‡4
Jerome Verde	1
Kerr Lake	4
Louisiana	[illegible]
Magma	38
Majestic	35
McKinley-Dar-Sa	60
Milford	1 10
Mohican	‡ 25
Mother Lode	33
N. Y. & Hond	‡13
Nipissing Mines	8
Ohio Cop	‡1
Ray Hercules	‡3
Richmond	56
Rochester Mines	38
St Joseph Lead	15
Standard S. L.	[illegible]
Stewart	28
Success	13
Tonopah	5
Tonopah Ex	2
Tribullion	09
Troy Arizona	15
United Cop	50
United Verde Ext	33
United Zinc	2
Utica Mines	15
Yukon Gold	1

SAN FRAN.*	Oct 30
Alta	02
Andes	10
Best & Belcher	02
Bullion	01
Caledonia	07
Challenge Con	05
Confidence	06
Con Virginia	09
Gould & Curry	‡ 01
Hale & Norcross	03
Jacket-Cr Pt	03
Mexican	11
Occidental	60
Ophir	12
Overman	04
Savage	03
Seg Belcher	‡ 02
Sierra Nevada	11
Union Con	95
Utah Con	01
Belmont	3 75
Jim Butler	76
MacNamara	28
Midway	09
Mont -Tonopah	‡ 15
North Star	06
Rescue Eula	14
West End Con.	70
Atlanta	10
Booth	05
Comb Frac	03
D'field Daisy	‡ 02
Florence.	13
Jumbo Extension	18
Kewanas	08
Nevada Hills	03
Nevada Packard	21
Round Mountain	23
Silver Pick	11
White Caps	06
Big Jim	‡ 50
United Eastern	3 65

BOSTON EXCH.*	Oct 30
Adventure	1
Ahmeek	89
Algomah	25
Allouez	55
Ariz. Com., ctfs	9
Arnold	25
Bonanza	21
Butte-Balaklava	40
Calumet & Ariz	66
Calumet & Hecla	455
Centennial	14
Copper Range	46
Daly West	1
Davis-Daly	3
East Butte	9
Franklin	‡4
Granby	71
Hancock	9
Hedley	‡16
Helvetia	25
Indiana	1
Isle Royale	25
Keweenaw	1
Lake	6
La Salle	3
Mason Valley	4
Mass	5
Mayflower	1
Michigan	1
Mohawk	66
New Arcadian	2
New Idria	12
North Butte	13
North Lake	60
Ojibway.	1
Old Dominion	38
Osceola	60
Quincy	67
St. Mary's M. L	57
Santa Fe	75
Seneca	7
Shannon	5
Shattuck-Ariz.	20
So. Lake.	2
So. Utah	13
Superior	5
Superior & Bost.	3
Trinity	4
Tuolumne	1
U. S. Smelting	48
U. S. Smelt'g, pf	47
Utah Apex	2
Utah Con	12
Utah Metal.	3
Victoria.	2
Winona	‡2
Wolverine	35
Wyandot...	.50

BOSTON CURB*	Oct. 30
Alaska Mines Corp	25
Bingham Mines	10
Boston Ely	55
Boston & Mont	58
Butte & Lon'n Dev	12
Calaveras	2
Calumet-Corbin	‡ 01
Chief Con	2
Cortez	10
Crown Reserve.	24
Crystal Cop	52
Eagle & Blue Bell	2
Gila Copper	17
Houghton Copper	70
Intermountain	1
Iron Cap, Com	14
Iron Cap Cop , pf.	14
Mexican Metals	31
Mines of America	1
Mojave Tungsten	37
Nat Zinc & Lead	30
Nevada-Douglas	1
New Baltic	1
New Cornelia	15
Oneco	42
Pacific Mines	35
Rex Cons	10

SALT LAKE*	Oct 29
Bannack	26
Big Four	01
Cardiff	4 50
Colorado Mining	12
Daly	1 50
Daly-Judge	8 25
Empire Copper	1 27
Gold Chain	18
Grand Central	65
Iron Blossom	60
Lower Mammoth.	03
May Day	01
Moscow	11
Prince Con	91
Rico Wellington	13
Silver-King Coal'n	2 90
Silver King Con	3 75
Sioux Con	04
So Hecla	94
Tintic Standard	1 45
Uncle Sam	01
Wilbert	21
Yankee	08

TORONTO*	Oct 29
Adanac	15
Bailey	05
Beaver Con	34
Chambers Ferland	12
Coniagas	3 40
Hargraves	08
La Rose	37
Peterson Lake	10
Temiskaming	28
Wettlaufer-Lor	07
Davidson	30
Dome Exten	11
Dome Lake	16
Hollinger	4 80
McIntyre	1 37
Newray	45
Porcu Crown	32
Teck-Hughes	40
Vipond	22
West Dome	.17

STOCK QUOTATIONS—Continued

COLO. SPRINGS	Oct 30
Cresson Con.	5 00
Doctor Jack Pot	.03
Elkton Con....	.03
El Paso	15
Gold Sovereign.	02
Golden Cycle.	1 84
Granite.......	‡ 40
Isabella	.08
Mary McKinney	.06
Portland	1 10
United Gold M	16
Vindicator	25

LONDON	Oct. 15
Alaska Mexican	‡£0 5s 0d
Alaska Tre'dwell	‡ 1 0 0
Burma Corp.	4 0 7
Cam & Motor	0 12 0
Camp Bird	0 9 0
El Oro........	0 10 6
Esperanza..	0 9 0
Mexican Mines	5 17 6
Nechi, pfd..	0 13 0
Oroville	0 18 0
Santa Gert'dis.	0 15 0
Tomboy.	0 18 6

* Bid prices † Closing prices ‡ Last Quotations.

MONTHLY AVERAGE PRICES OF METALS

Silver	New York			London		
	1915	1916	1917	1915	1916	1917
Jan	48 855	56 775	75 630	22 731	26 960	36 682
Feb	48 477	56.755	77 585	22 753	26 975	37 742
Mar	50 241	57.935	73 861	23.708	27.597	36 410
April	50 250	64 415	73 875	23 709	30 662	36 963
May	49 915	74 269	74 745	23.570	35.477	37 940
June	49 034	65 024	76 971	23 267	31 060	39 065
July	47 519	62.940	79 010	22.597	30 000	40 110
Aug	47 163	66.083	85 407	22.780	31 498	43 418
Sept	48 680	68 515	100 740	23 591	32 584	50 920
Oct.	49 385	67 855		23 925	32 361	
Nov	51 714	71.604		25.094	34 192	
Dec	54 971	75 765	.	26.373	36 410	.....
Year	49 684	65 661	.	23 675	31 315	..

New York quotations cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Copper	New York		London			
	Electrolytic		Standard		Electrolytic	
	1916	1917	1916	1917	1916	1917
Jan..	24 008	28.673	88.083	131 921	116 167	142 895
Feb	26 440	31 750	102 667	137 895	133 167	148 100
Mar	26 310	31 481	107 714	136 750	136 000	151 000
April	27 895	27 935	124 319	133 842	137 389	147 158
May.	28 625	28 788	135 457	130 000	152 522	142.000
June.	26 601	29 962	112 432	130 000	137 455	142.000
July	23 865	26 620	95 119	128 409	125 500	140 409
Aug	26 120	25 380	110 283	122 391	126 304	137.000
Sept	26 855	25 073	113 905	117.500	134 071	135 250
Oct.	27 193		122 750	..	142 523	
Nov.	30 625		134 659	.	155 432	
Dec	31 890		145 316	.	162 842	.
Year	27 202		116 059	..	138 281	..

Tin	New York		London	
	1916	1917	1916	1917
January	41 825	44 175	175 548	185 813
February	42 717	51 420	181 107	198 974
March	50 741	54 388	193 609	207 443
April	51 230	55 910	199 736	220 171
May	49 125	63 173	196 511	245 114
June	42 231	62 053	179 466	242 083
July	38 510	62 570	168 357	242 181
August	38 565	62 681	169 870	243 978
September	38 830	61 542	171 345	244 038
October	41 241		179 307	
November	44 109		186 932	
December	42 635		183 368	.
Av year	43 480	.	182 096	

Lead	New York		St. Louis		London	
	1916	1917	1916	1917	1916	1917
January	5 921	7 626	5 826	7 530	31 167	30 500
February	6 246	8 636	6 164	8 595	31 988	30 500
March	7 136	9 199	7 375	9 120	34 440	30 500
April	7 630	9 288	7 655	9 158	34 368	30 500
May	7 463	10 207	7 332	10 202	32 967	30 500
June	6 936	11 171	6 749	11 123	31 011	30 500
July	6 352	10 710	6 185	10.644	28 137	30 500
August	6 244	10 594	6 088	10 518	29 734	30 500
September	6 810	8 680	6 699	8 611	30 788	30 500
October	7 000		6 898		30 716	
November	7 042		6 945		30 500	
December	7 513		7 405		30 500	.
Year	6 853		6 777		31 359	

Spelter	New York		St Louis		London	
	1916	1917	1916	1917	1916	1917
Jan	16 915	9 619	16 745	9 449	89 810	48 329
Feb	18 420	10 045	18 260	9 875	97 762	47 000
Mar	16 846	10 300	16 676	10 130	95 048	47 000
April	16 695	9 459	16 525	9 289	99 056	54 832
May	14 276	9 362	14 106	9 192	94 217	54 000
June	11 752	9 371	11 582	9 201	68.591	54 000
July	8 925	8 643	8 755	8 473	50 750	54 000
Aug	8 730	8 360	8 560	8 190	51 587	54 000
Sept	8 990	8 136	8 820	7 966	52 095	54 000
Oct	9 829		9 659		54 159	
Nov	11 592		11 422		56 023	
Dec	10 665		10 495		55 842	
Year	12 804		12 634		72 071	..

New York and St Louis quotations, cents per pound, London, pounds sterling per long ton

Pig Iron, Pitts	Bessemer‡		Basic‡		No 2 Foundry	
	1916	1917	1916	1917	1916	1917
January	$21 60	$35 95	$18 78	$30 95	$19 70	$30 95
February	21 16	36 37	18 93	30 95	19 51	30 95
March	21 81	37 37	19 20	33 49	19 45	38 91
April	21 65	42 23	18 95	38 90	19 45	40 06
May	21 78	46 94	19 11	42 84	19 58	43 60
June	21 95	54 22	18 95	50 05	19 34	50 14
July	21 95	57 45	18 95	53 80	19 20	53 95
August	21 95	54 17	18 95	50 37	19 22	53 95
September	22 88	46 40	19 59	42 24	19 63	48 58
October	24 61		21 28		21 51	
November	30 07		28 18		26 58	
December	35 16		30 95		30 79	.
Year	$23 88		$20 98	..	$21 16	.

‡ As reported by W P Snyder & Co.

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Reconstruction of Hydraulic-Power Canal for Ecuador Gold Mine

BY PAUL C. SCHRAPS*

The reconstruction of a section of the hydraulic-power canal, spillway, penstock and closed conduits, without interruption to the operation of the existing power plant; an outline of operating conditions in Ecuador and a well segregated cost sheet are described in considerable detail.

IN CONNECTION with the construction of the South American Development Co.'s new cyanide plant in the Zaruma district of Ecuador, it became necessary to reconstruct part of the hydraulic-power canal, spillway and conduits at Portovelo. This company operates a gold mine in southern Ecuador, in the foothills of the Andes, about two days' ride from the coast. The town adjacent to the mine is called Portovelo. Zaruma, the head of the Canton of Zaruma, which includes Portovelo, lies a few miles distant.

LOCAL CONDITIONS AFFECTING OPERATIONS

A brief description of some of the difficulties attending the supply of labor and the delivery of materials, etc., may be of interest. Except for lumber and staple foods, practically all supplies are shipped from the outside, chiefly from the United States. Shipment from New York is made by boat to Puerto Bolivar, a small port on the east side of the Gulf of Guayaquil, thence by small craft to Santa Rosa, a town lying some distance up a small river, thence by muleback to the mine, about 45 miles over an exceedingly bad trail. All heavy machinery is sectionalized when possible to 100 lb. or less. All bulk material is put up in packages as nearly as possible to 100 lb. in weight, the standard mule load being 200 lb. Convenient freight can be moved over the trail in good weather for about 1c. per lb. Heavy and awkward pieces cost much more, and during the rainy season all freighting brings a higher price. The average charge for transportation from New York to the mine, covering all expenses, lies between $85 and $95 a ton.

Native labor has become fairly skillful after years of training. Untrained peons get one *sucre* a day, a *sucre* amounting to 48.7c. in U. S. currency. Carpenters range up to 3.50 *sucres* a day. The average wage of all company employees, exclusive of staff, during 1916, was 1.72 *sucres* ($0.84) per shift. To the wage must be added the cost of the free meals which the company provides, which averaged 0.2867 *sucres* ($0.14) per shift per man in 1916.

The company uses water power altogether, the stamp mill and main hoist being driven direct, and compressed air and electric current are similarly generated. A counter-current decantation plant is being built to replace amalgamation and sand leaching, and this, as noted in the following report, involved reconstructing that part of the water-power installation lying between the new plant and the old stamp mill. To carry out this work with the minimum of interruption to operations, and without accident, was a consideration of first importance.

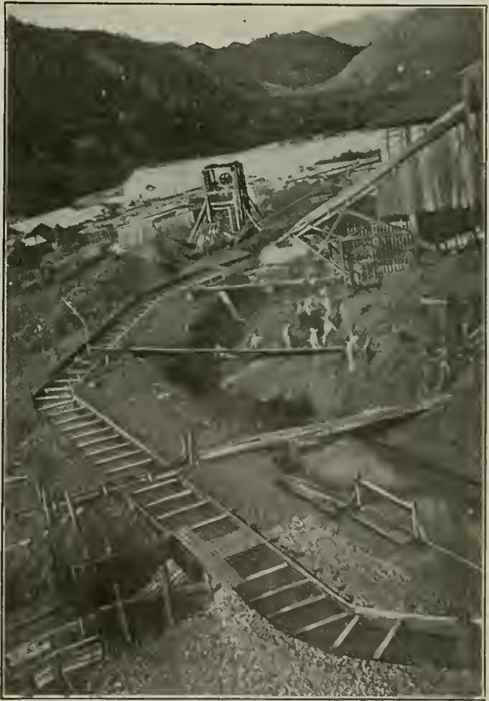

FIG. 1. VIEW SHOWING RELATION OF DIVERSION CANAL TO THE EARTHEN CANAL

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Referring to Fig. 2. it may be seen that at the edge of the new millsite was the earthen canal which supplied water to two 36-in. steel pipes; the latter delivered the water under 40-ft. head to Pelton wheels driving four 10 x 16-in., sectionalized, quadruplex air compressors. The canal also supplied water through two 18-in. steel pipes, for operating two Peltons, one of which was directly connected to a small air compressor and the other to the leaching-plant line shaft.

The earthen canal passed through the site of the new cyanide plant, and the new tank floor was to be 21 ft. below the bottom of the canal. The two 36-in. steel pipes furnishing water to the compressor-plant Pelton wheels also passed over the new cyanide-plant location and would have to be moved unless other conduits were provided for delivering water to the Peltons. It was decided to replace the earthen canal, spillway, penstocks and steel pipes with concrete structures.

The drawing, Fig. 2, also shows the relationship between the old and new hydraulic plants. It will be seen that the position of the new concrete canal is practically unchanged from that of the old canal; this condition introduced the problem of delivering the water to the 36-in. pipes during the reconstruction period otherwise than through the earthen canal. Emptying into the earthen canal were the water discharge from the stamp-mill Pelton wheel and the discharge from the electric-plant turbine. This water could have been run to waste but in the dry season it is necessary to conserve water for power purposes. The new conduit, a concrete tube, had to be constructed without interfering with the 36-in. steel pipes, and provision for changing over the flow to the concrete tube had to be accomplished with a minimum loss of time.

It was the intention to start excavation and construction work on both the new cyanide and the hydraulic plant simultaneously; but the shortage of materials made it necessary to hold back construction of the cyanide plant until completion of the hydraulic plant. It was decided, however, to excavate as much as possible for the new cyanide plant. Another factor that influenced the delay in construction was the shortage of skilled labor.

Temporary Diversion Canal Provided Water Power During Construction

The solution of the problem of construction was as follows: For delivering water to the 36-in. pipes a temporary diversion canal was used. This was excavated south of the earthen canal and at such a distance as to provide safe banks and at the same time be as close as possible in order not to interfere with the new cyanide-plant excavation. The intake of the diversion canal was placed as far east, that is upstream, as possible in order not to interfere with the construction of the new canal spillway and sand trap.

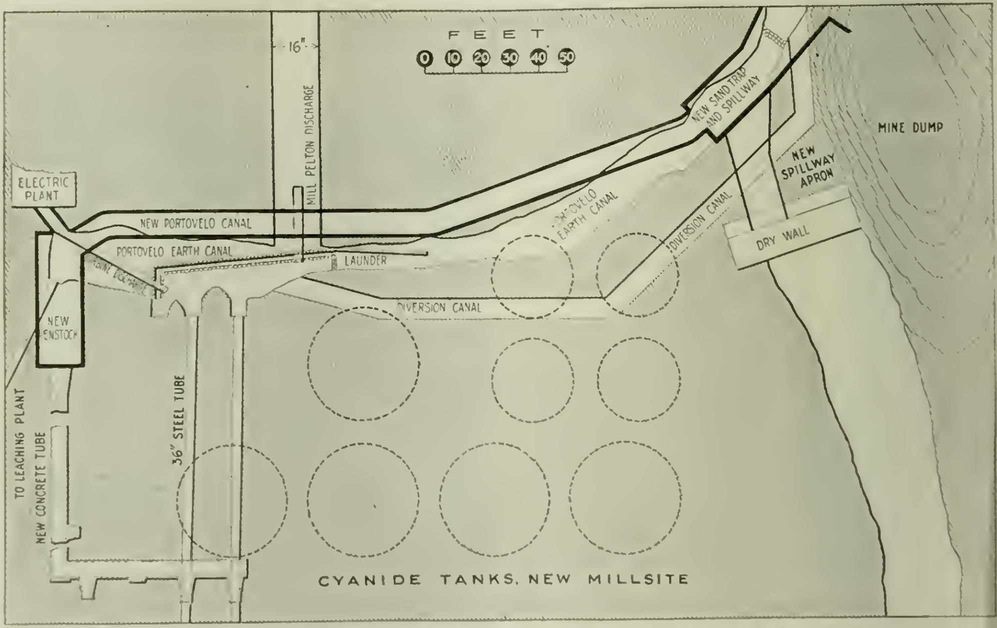

FIG. 2. GENERAL PLAN SHOWING RELATION OF OLD AND NEW WORKS

At the steel-pipe penstocks a cofferdam was built to reduce the cross section of the earthen canal to a minimum and thus allow space for the construction of the new canal at this point. The water from the stamp-mill Pelton wheel was carried in a flume from the discharge apron, over the new canal site, to the side of the cofferdam toward the compressors. Likewise the water discharge from the electric plant was carried to the side of the cofferdam.

It was desired that the new plant should have sufficient capacity to supply power easily for operating u to eight Pelton wheels for driving the existing an future compressor, a Pelton wheel for operating an auxiliary stamp-mill rope drive, and a possible installation of a Pelton wheel for an accumulated-slimes plant.

For continuous operation it was necessary to consider the flood waters of the rainy season and the great amount of débris brought down the canal during the first few months of that season. With the old plant considerable attention was required to keep the grizzlies open; the Pelton wheels and buckets were continually breaking and the nozzles had to be cleaned regularly.

Fig. 5 shows the general design of the sand trap and spillway; the spillway area is sufficient to handle any excessive quantity of water that may flow through the intake canal during the rainy season. The overflow area, controlled by the flashboards, is such that the boards may be set to give the proper speed to the Pelton wheels, and at the same time the decreased overflow area is sufficient to take care of the daily water-level fluctuations. The "step up" from the bottom of the sand trap to the bottom of the canal prevents part of the sand and stones from entering the canal, and the underflow sluice affords means of flushing out the accumulated débris.

Fig. 3 shows a section of the new canal. The design was made upon the assumption that there would be no back fill and that the vibration of the walls, due to the stamp mills and tube mills, would be considerable. The grade of the canal is 0.2%. The elevations are determined by the elevation of the discharge apron of the stamp mill.

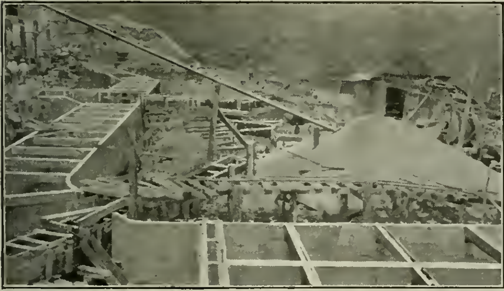

FIG. 3. CONSTRUCTING THE NEW CONCRETE CANAL

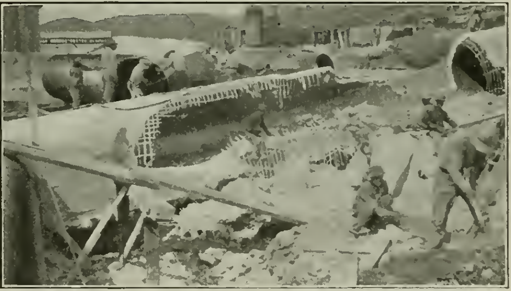

FIG. 7. VIEW SHOWING EFFECT OF RUPTURE IN TUBE

Penstock Has Two Independent Compartments

In the design of the penstock, provision was made to have a storage capacity sufficient to give a constant head of water to the compressor-plant Peltons; to divert all stones, sand and leaves that might pass the sand trap; to clean readily all débris accumulated; and to control the water so that the tube might be emptied. The water first passes through grizzlies and then through four 3 x 5-ft. gates. The penstock is divided into two compartments, each of which may be operated independently, and each compartment is controlled by two of the 3 x 5-ft. gates. At the tube end of these compartments there are walls, 5 ft. high, over which the sand and stones must pass to enter the tube; at the foot of these walls are two 18-in. gates—one in each compartment—which open to an 18-in. underflow sluice for flushing out the débris collected.

The details of design of the concrete tube are shown in Figs. 6 and 7. At the tube-header junction it was desired to curve the tube but, for various reasons, this was not practicable. In designing the header it was decided to make the center line intersect at right angles the center line of the 36-in. steel pipes. This meant that is was necessary for the header to be built around the steel pipes. For changing the flow of water from the steel pipes to the concrete tube, steel bulkheads were inserted in the header around the steel pipes.

It was planned that when everything was ready for making the change, the steel pipes were to be emptied and then cut, first where they entered the header and then inside of the concrete neck leading therefrom; pieces of pipe, cut as long as possible, were to be taken out. The plate or head was then to be bolted to the bulkhead ring and the water turned into the new plant. This plan was carried out when the time for the change over came.[1] The tube is 189 ft. long and has an inclination of 10° 20′. The header is horizontal and 68.75 ft. long.

Excavating Diversion Canal by Sluicing

Excavating for the diversion canal was started Mar. 1, and finished Mar. 16, 1916. Most of the excavating was done with water from two 2-in. nozzles working under a head of 150 ft. The material moved was a clayey gravel containing boulders as large as 2 ft. in diameter. Fig. 4 shows a section of the lining of the diversion canal. A lining was used on account of the new cyanide-plant excavation, which was to extend as near the canal as possible. The placing of the canal lining was started Mar. 16 and finished, with the exception of the two sets at either end, Mar. 26. An earth dam was left at each end of the diversion canal so that the water in the earth canal would not interfere with the work.

The length of the diversion canal was roughly 238 ft. The grade was the same as that of the earth canal,

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[1] At the time the concrete tube was put into commission and the steel pipes were cut off an examination was made of the two 36-in. pipes which supplied the four most easterly compressor Peltons. The more easterly of these two pipes was in by far the worse condition. This was apparently made of 11-gage sheet. U. S. standard, equivalent to 0.125 in. The westerly was of 8 gage, 0.172 in. The easterly pipe, if ever galvanized, had lost all its coating; it had worn and rusted thin, was easily cut and could have lasted only a little while longer. The westerly pipe had its galvanizing on the outside almost intact; on the inside the galvanizing was gone in places and the steel had pitted at these points. The pipe, however, was in excellent condition generally, and could have lasted many years longer. The steel in this pipe was reported by the master mechanic as of the highest quality. The easterly pipe was probably 20 years old, the westerly about 11 to 12 years.

0.2%. The minimum cross section of the earth canal was 21 sq.ft. and that of the diversion canal 31.5 sq.ft. On Mar. 26 the diversion canal was ready for the water and the change was made on that day. The water was shut off from the earth canal; the dams at each end were taken out and the last few sections of the lining were placed in position. In the earth canal, dams of sand bags and rock were placed so as to exclude the water from that part of the canal that was paralleled by the diversion canal. Fig. 2 shows the position of the diversion canal. After the diversion canal was in operation the cofferdam was built and then all the water was drained out of the earth canal.

Excavating for the permanent canal was started Apr. 15 and finished May 5. The excavating was done in a manner similar to that of the diversion canal. The class of material moved was the same. Vertical banks of this ground, 15 ft. high, stand without support as long as they are kept dry. After the canal excavation was almost completed, excavating was started for the sand trap and spillway. There was not much material to be moved at this point. This work was started May 5 and finished in 10 days.

Placing the forms for the concrete lining of the sand trap was started May 25 and finished June 13. They were made as panels; 2 x 4-in. material was used in the frames and the facing was of 1-in. material. These panels were bolted to vertical members of 2 x 4-in. material spaced every 2 ft. Pouring of concrete in the sand-trap forms was started June 19 and finished June 22. The operation was intermittent; about sixty batches of concrete being sent to the forms daily.

The reinforcement in the sand trap consists of old pipe and angle bars bent to an angle of 90°, one side 8 ft. long and the other 2 ft. long. The long side was placed in the floor and the short turned up into the wall. These pieces were staggered and spaced at 12-in. centers. All old pipe used was first flattened. The sand trap forms were removed June 26, and those for the canal were then placed in position.

The canal forms were made as panels; 2 x 4-in. material was used for the frame and 1-in. boards for the facing. These forms were made interchangeable as far as possible and were arranged to be bolted to the vertical members of 2 x 4-in. material. The inside forms were 10 ft. long and 6 ft. 2 in. high. The circular forms at the connection between floor and walls were made of ribs of 1-in. material cut to the proper radius and faced with 1 x ½-in. strips. Outside forms were 10 ft. long and 8 ft. high. Placing of the canal forms started June 13 and was finished July 17. The total length of the canal is 232 ft. Enough forms were made to pour about 50 ft. at each setting.

The reinforcement in the canal consists of old pipe, flattened, and angle bars of the same dimensions as those used in the sand trap and placed in the same manner. In the south canal wall above the cyanide-plant agitator No. 1, reinforcement was inserted as follows: Three lengths of cable, each 35 ft. long, were placed in the wall as horizontal bars, spaced about 2 ft. apart, and to the cables were tied old rails as vertical members; the rails were spaced at 3-ft. centers.

The construction of the penstock was carried on in two sections on account of the proximity of the electric-plant building, a concrete structure, the foundations of which are not as deep as the foundation for the penstock. Referring to Fig. 2 it will be noted that the new canal passes directly in front of the electric building, the minimum distance from the electric building to the north wall of the canal being only 5 ft. Where the canal empties into the penstock there is a drop of 5 ft., and this point is 17 ft. from the electric building. The ground excavated at this point was soft and running, necessitating spiling.

The first penstock section extended from the tube junction to the point where the water drops from the canal into the penstock. Excavation was started May 17 and finished June 20. The placing of the forms began July 17, the canal forms being employed. By Sept. 1 all concrete work on the penstock was finished.

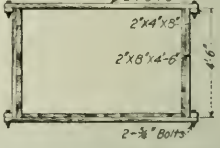


FIG. 4 SECTION OF THE DIVERSION CANAL

Excavating for the header and tube started Mar. 10 and was finished Apr. 28. Placing of forms began May 2, and the tube-header construction was finished July 25. The first forms were set at the junction of the header and tube and then advanced in both directions. Blaw collapsible steel forms being on hand, were used in this construction for the lower part of the tube, and 1-in. boards, cut into chords of the proper radius and faced with 1-in. strips, were used for the upper forms. Using the steel forms in this manner doubled the number available for each setting. The pouring of the header was divided into four parts, the piers, the center rib, the part around the lower steel forms and the part around the upper forms. The center rib along the center line of the piers was poured to such a height that the inside forms could rest upon it. Anchor bars were placed in the rib at specified distances; to the anchor bars were tied longitudinal bars, and then the bars that passed around the tube were tied to the longitudinal bars.

DISTRIBUTION OF CONCRETE-CANAL CONCRETE COSTS

Job	Supplies	Labor	Pro Rata Supplies	Pro Rata Labor	Total Supplies	Total Labor	Per Cent of Total Supplies	Per Cent of Total Labor
Forms[4]	$445 41	$885 92			$445 41	$885 92	$9 44	$18 78
Sand and gravel[1]	21	25 04	$158 96	$231 27	158 96	255 61	3 37	5 41
Cement[3]	2,050 20				2,050 20		41 46	
Reinforcement	134 66	161 73			134 66	161 73	2 85	3 43
Mixing and pouring[2]	4 60	347 16	88 52	18 08	93 12	365 24	1 97	7 74
Transportation	29 42	137 16			29 42	137 16	62	3 91
Total					$2,914 99	$1 805 35	$61 71	$38 27

[1] The pro-rata costs under "sand and gravel" include one-half of the first cost of the screening plant.
[2] The pro-rata costs under "mixing and pouring" include one-half of the first cost of the mixer.
[3] Cement costs, in Portovelo, $12 39 per barrel.
[4] Lumber costs, $52 60 per thousand.

COST OF RECONSTRUCTION, PORTOVELO CANAL *

General Expense

General Expense	Supplies	Labor	Total
Supervision and engineering		$954 28	$954 28
Tools and general construction eqpt	$592 25	55 05	647.30
Sluice boxes	3 50	63 63	67 13
Trommel and bins	537 82	718 06	1,255 88
Elevator and frame	12 50	17 04	29 53
Concrete mixer	310 31	64 97	375 28
Machine shop and pro rata	22 99	233 01	256 00
Carpenter shop and pro rata	147 35	189 73	337 08
Watchmen	4 96	273 63	278 59
Clearing, wrecking, changing operating equipment	228 33	370 37	598.70
Total			$4,799.77
Diversion Canal:			
Excavating and filling	27 91	348.47	376.38
Dams	2 48	48 25	50.73
Flume construction	31 35	534.70	566 05
Lumber	964 91	88 81	1,053.72
Hardware	86 68	20.09	106.77
Total			$2,153.66
New Concrete Canal:			
Excavating and filling	46.04	801 50	847 54
Forms	445 42	885 92	1,331 34
Sand and gravel	21	24 03	24.24
Cement	2,050 20		2,050 20
Reinforcement	134 66	161 73	296.39
Mixing and pouring	4 60	347 16	351 76
Transportation	29 41	137 16	166.57
Dams	7 05	92 13	99 18
Rock walls	46	30 85	31 31
Total			$5,198 55
Sand Trap and Spillway:			
Excavating and filling	63 03	348 46	411 49
Forms	387 56	396.66	784 02
Sand and gravel	05	6 96	7 01
Cement	1,044 03		1,044 03
Reinforcement	28 90	3 14	32.04
Mixing and pouring	1 65	209 29	210.94
Transportation	107 02	47.24	154 26
Finishing	1 29		1 29
Dams	26 11	14 49	40 60
Rock walls	30 32	268 45	298 77
Hardware	21 43		21 43
Iron and steel	39 01	373 92	412.93
Total			$3,418 86
Penstock:			
Excavating and filling	$54 10	$585 05	$639 15
Forms	290 25	722 46	1,012.71
Sand and gravel	31	23 26	23 57
Cement	1,627 78		1,627 78
Reinforcement	169 44	121 67	291 11
Mixing and pouring	4 12	279 03	283 15
Transportation	1 87	67 95	69.82
Dams	2.36	31 29	33 65
Rock walls	86	59 56	60 42
Hardware	19 01		19 01
Iron and steel	325 93	91 25	418 18
Total			$4,478 59
Compressor Tube:			
Excavating and filling	10 07	247 05	257 12
Forms	345 78	453 01	798 79
Sand and gravel	17	12.02	12 19
Cement	2,170.15	1 40	2,171 55
Reinforcement	178 32	206 06	384 38
Mixing and pouring	6 73	299 13	305 86
Transportation	8 07	187 27	195 34
Finishing	39 15		39 15
Rock walls	02	1 66	1 68
Hardware	108 05		108 05
Iron and steel	7 91		7 91
Total			$4,282 02
Compressor-Tube Header:			
Excavating and filling	3 77	86.38	90 15
Forms	258 46	622 75	881 21
Sand and gravel	51	17 48	17 99
Cement	1,413 62	3 50	1,417 12
Reinforcement	183 09	158 95	342 04
Mixing and pouring	2 85	186 38	189 23
Transportation	4 18	86 53	90 71
Finishing		19 90	19 90
Rock walls	1 97	124 02	125 99
Hardware	260.07		260 07
ron and steel	20.19	233 51	253 70
Total			$3,687 77
Compressor-Tube Reconstruction:			
Excavating and filling	9 32	201 89	211.21
Forms	81 72	180 12	261 83
Cement	1,109 98		1,109 98
Reinforcement	33 90	30 69	64 59
Mixing and pouring	7 37	71.17	78 54
Transportation		33 57	33 57
Dams		22 62	22 62
Rock walls		156 35	156 35
Hardware	134 18		134 18
ron and steel	629 37	407 42	1,036 79
Changing operating equipment	43.68	9.69	53 37
Total			$3,163 03
Grand total of charges to Portovelo Canal reconstruction	$17,006.06	$14,175.92	$31,181 98

* Cost has been converted into U. S. currency on the basis of one sucre equaling 8.7c., the normal rate of exchange for the Ecuadorian monetary unit.

The same scheme of pouring and placing of forms was practiced with the tube, but the reinforcement was not spaced according to specifications, which called for ¼-in. bars placed in the tube at distances between centers ranging from 3 in. at the bottom to 12 in. at the top of the tube. Instead of the bars being set around the tube helically, as specified, anchor bars were set in the center rib on 12-in. centers for the entire length of the tube and projecting 18 in. on each side; to the anchor bars were tied longitudinal bars and to these were fastened the bars passing around the tube.

All concrete work involved in the Portovelo canal reconstruction, with the exceptions of the wing walls and discharge apron of the sand trap, was finished Sept. 1, but the plant was not tested out until Sept. 30. The method of testing was to fill the concrete tube and header with water diverted from the electric-plant draft-tube discharge.

The first test showed that the tube and header were porous. To remedy this feature the inside surface of the concrete was given a finishing coat at the porous spots with a rich mixture of sand and cement. A second test of the tube showed that the finishing process was not satisfactory, so the whole surface was given one coat of coal-tar paint. The completed plant was put in operation the night of Nov. 12, and ran for three hours, when the concrete tube failed.

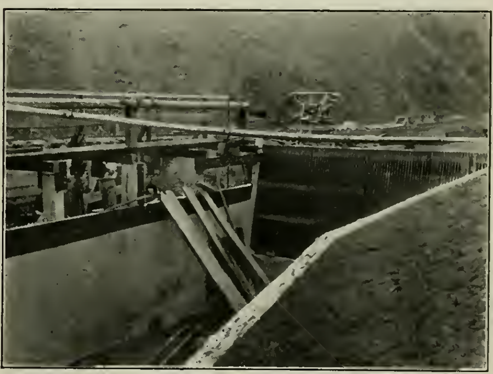


FIG. 5. VIEW OF SAND TRAP AND SPILLWAY

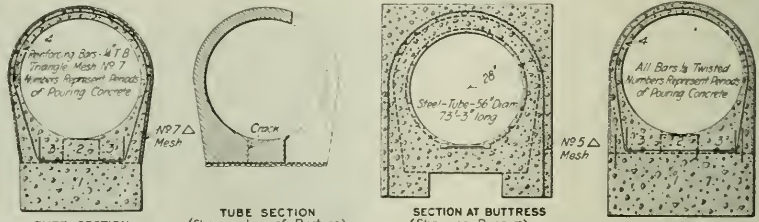
FAILURE OF CONCRETE TUBE AND ITS REDESIGN

An inspection of the tube, Fig. 7, showed that from a point 2 ft. north of the header to a point 10 ft. north of the auxiliary mill-drive feeder, the east side of the tube was torn out. The auxiliary mill-drive feeder fell away from the tube as one piece. Reinforcing bars that tied the feeder to the tube extended from the top and bottom of the tube and not, as specified, clear around the tube. The tube-header junction was intact, though the lower part of the tube had moved out from the center rib, showing a side of the rib as smooth as a board, indicating that there had been no bond. The anchor bars in the center rib failed. In the interior of the tube two cracks along the bottom, corresponding with the sides of the center rib, could be seen, and the more easterly, along which the failure occurred, extended for a distance of about 40 ft. up the tube from the header.

To repair the damage quickly and permanently the following scheme was decided upon: Sheet steel happened to be available so punched and in such sections as to make up a pipe 56 in. in diameter and the required length of 73 ft. This was made up into sectional lengths of about 15 ft. The first section was worked up into the tube through the break to such a distance as to make room for the second section; which was then riveted to the first. This procedure was followed until the whole pipe line was finished, after which it was slipped back so that the lower end reached the tube-header junction. Before the steel pipe had been slipped into the concrete tube, crossbars were imbedded in the lower part of the latter. These bars facilitated the moving of the steel pipe in the tube. After the steel pipe was in the proper position a concrete jacket was poured around the outside.

COST OF EXCAVATIONS

Job	Cu Yd	Per Cu. Yd Supplies	Labor	Total
Concrete canal	1,097 63	$0 041	$0 730	$0 77
Sand trap and spillway	202 36	313	1 743	2 05
Penstock	447 00	121	1 309	1 44
Compressor tube	272 43	037	968	94
Compressor-tube header	169 91	026	508	53
Diversion canal	787 69	035	442	48



TUBE SECTION

TUBE SECTION (Showing Line of Rupture)

SECTION AT BUTTRESS (Showing Repairs)

HEADER SECTION

FIG. 6 TUBE SECTIONS, SHOWING CONSTRUCTION, REINFORCEMENT AND LINE OF RUPTURE

To supply water to the compressor-plant Peltons while the tube reconstruction was going on, a bulkhead of concrete with timber braces behind was placed in the header a few feet east of the most westerly Pelton feeder. The 36-in. pipes were connected to the header steel bulkheads so as to deliver water from the diversion canal to the header. Soon after the tube and header were finished, circumferential cracks developed. To strengthen the tube at these points, reinforced-concrete buttresses were placed on both sides and tied across the top of the tube. The repair to the tube was made in 26 days. The whole plant was again in operation on Dec. 8 and has operated satisfactorily since.

The concrete plant consists of a rock-screening equipment and a No. 3 Ransome mixer. Fig. 2 shows the situation of the screening equipment with reference to that of the hydraulic plant. The rock, taken from the mine dump, consisted principally of andesite. It was screened to three sizes in a 3 x 8-ft. Allis-Chalmers trommel, which was set up over two bins. The first screen on the trommel was sheet steel punched with ¼-in. holes. Material passed through this screen was classed as sand. The second screen was punched with holes of 1-in. diameter; the oversize from the trommel passed over a 2-in. grizzly.

COST OF CONCRETE

Job	Cu Yd	Per Cu Yd Supplies	Labor	Pro Rata Supplies	Labor	Total Supplies	Labor	Total
Concrete canal......	128	$20 83	$12 17	$1 91	$1 81	$22 77	$13 98	$36 75
Sand trap and spillway	67	23 39	9 95	1 93	1 81	25 32	11 76	37 08
Penstock	76	27 41	15 88	1 89	1 75	29 27	17 63	46 90
Compressor tube	105	26 28	11 07	1 88	1 73	28 18	12 81	40 99
Compressor-tube header	74	25 09	14 75	1 91	1 77	27 01	16 52	43 53

So long as the mine dump was high enough to allow the material to be carried by water through a launder to the trommel, the scheme for washing the material was to discharge it from the launder into a box. This box had ends sloping at 30 deg. and was set on a platform in front of the trommel at such a distance that the material could be shoveled directly into the trommel. Where the dirty water overflowed, clean water from a hose was played on the material as it entered the trommel. All the dirty water was not eliminated but if it was allowed to remain in the sand bin the slime settled, which was undesirable. To eliminate this, holes were bored in one side of the sand bin to allow the water to escape.

After the mine dump had been lowered to a point where the material could not be run into the box on the platform at the trommel elevation a single-strand chain elevator was installed on the mine-dump side of the trommel. The material was shoveled into a launder carrying water which discharged directly into the boot of the elevator. This worked satisfactorily. The concrete mixer has a capacity of 8 cu.ft. per batch and 7 batches per hour. The mixer gave entire satisfaction. In the time—one year—that the machine was in operation no repairs were made.

Ferromanganese Supplies

Manganese ore imports for the fiscal year ended June 30 are reported by the Department of Commerce at 492,860 tons in 1915-1916, and 656,088 tons in 1916-1917, an increase of 163,228 tons, or 33.1%. This is by far the heaviest quantity ever reported. The production of ferromanganese and spiegeleisen for the eight months to Sept. 1, as shown by the blast-furnace reports, was 288,993 tons, with the make increasing each month, so that the total for the year will probably be about 440,000 tons. Allowing for the low-grade spiegeleisen, this would be equivalent to about 280,000 tons of ferromanganese, carrying 80% manganese. As our requirements on the present steel output are estimated at 336,000 tons yearly, this would leave only 56,000 tons to be imported, at least a part of which will be offset by the increased make here. The imports of ore, as above reported, with the still moderate domestic production, will supply sufficient raw material for all the ferromanganese that will be made.

Domestic Potash Production

Stoppage of foreign supplies of potash raised prices and not only permitted but necessitated the development of domestic resources. Largest output was secured from natural brines in Nebraska, Utah and California. Alunite deposits in Utah yielded high-grade potassium sulphate. In the aggregate considerable potash was obtained from sugar-factory wastes and from wood ashes. Blast-furnace dust and that from cement kilns furnish important quantities of potash, some plants selling high-grade salts. Experimental work continues with processes to extract potash from feldspar and other silicate rocks. Further search for natural deposits was carried on by Government and by private interests.

A SHORTAGE of potash salts was felt in the United States practically at the outbreak of the war, in 1914; after the German government placed an embargo on the export of potash salts, Jan. 30, 1915, all available markets of the world were searched for potash stocks, largely of German origin. As these sources began to fail, the domestic demands at times carried the price of potash to a high figure. Such a condition of affairs gave to the search for domestic sources of potash a stimulus greater than ever before. Hoyt S. Gale has prepared a comprehensive review[1] of the situation, describing the methods used in 1916 for extracting potash from natural deposits and from residues of certain manufactures.

PRINCIPAL USES OF POTASH

Most of the potash consumed in the United States is used as fertilizer. For certain manufacturing industries potash is an important item, and for some explosives it is absolutely necessary. It is used extensively in the manufacture of matches. Soap makers use caustic potash for the best soaps, though caustic soda can be employed for the common grades. Practically all the liquid soaps, shaving soaps and shampoo preparations require at least some potash. A hydrated potassium carbonate is used in the manufacture of glass, and in normal times about 3000 short tons, valued at about $250,000, has been imported for making the higher grades of glass. The tanning and dyeing industries require potash, largely as bichromate and ferricyanide. In metallurgy potassium cyanide is used for leaching gold and silver ores, but sodium cyanide will serve. Minor amounts of potash are used in electroplating, in photography, in medicines and in miscellaneous chemical compounds.

Natural deposits of saline material usually consist largely of sodium salts, but probably every such deposit of salt, brine or saline water contains at least a small percentage of potash. Many samples have been sent to Government offices for analysis and, as is often the case in the mining industry, optimists believe that a small percentage at the surface indicates rich deposits at depth. Ordinary sea water contains about 3½% of dissolved salts and an average of about 0.04% potash (K_2O). Under ordinary conditions it is not profitable to extract the potash from sea water. Where salt plants are established to recover sodium chloride from sea water, potash may be profitably recovered as a byproduct. A summary of the potash production in the United States in 1916—about 35,739 tons of 27% average K_2O content—has already been published in the *Journal*[2], in tabular form. The following notes review the principal sources of our present domestic production, sketching briefly the recovery methods used in 1916 in the United States.

NEBRASKA FURNISHED LARGEST OUTPUT

Alkali lakes in western Nebraska furnished the largest output of domestic potash in 1916. Investigation of these deposits was commenced in about 1911, and commercial operation was undertaken about the middle of 1915 by the Potash Products Co., of Omaha, Neb. From Jesse Lake, in Secs. 25 and 26, T. 25 N., R. 46 W., brine is pumped and conveyed by a 3-mile pipe line to the plant at Hoffland, on the Chicago, Burlington & Quincy Ry., where the water is evaporated and the salts are dried for shipment without refining. The lake is shallow and the bottom is composed of greenish mud, beneath which is sand charged with brine. In October, 1916, about 200 wells were being pumped, yielding brine reported to contain 19.32% of solids in solution. An analysis of the solids showed: K_2O, 30.85%; Na_2O, 25.31%; SO_3, 13.77%; CO_2, 19.79%; HCO_2, 7.74%; and Cl, 4.07%. The evaporated salts are mostly sulphates. The Hord Alkali Products Co. and the Palmer Alkali Co. operate near Lakeside, Neb.; and in 1916, the American Potash Co. and the Nebraska Potash Works Co. projected the building of plants at Antioch.

SEARLES LAKE A PRODUCER

The Searles Lake deposit, in southeastern California, was reported as being brought to the producing stage in 1916. This so-called lake, described[3] in detail by Mr. Gale, is practically dry during the greater part of the year. In the central part of the ancient-lake basin is a crust of crystallized salts, averaging 60 to 75 ft. in thickness. The crust reaches a maximum thickness of about 100 ft., but is thin at the edges, where it extends far under the surface of a marginal mud zone. The brine that permeates the deposit is a saturated solution that contains more potash than the crystallized salts. The combination of brine, salts and mud makes the deposit dangerous and difficult to work. A plan for pumping the brine promised to give the best results; but methods for separating the constituents, giving good results in the laboratory, were not entirely successful when tried on a commercial scale. Analysis of the salts in the brine shows: KCl, 4.02%; $Na_2B_4O_7$ (borax), 1.08%; Na_2CO_3, 4.26%; Na_2SO_4, 6.40%; and NaCl, 17.18%. The American Trona Corporation (its subsidiary is the California Trona Co.) erected an evaporating plant at Trona and a refinery at San Pedro, Calif., to be in operation in 1916. The plant at Trona is said to be capable of treating 400,000 gal. of brine per day. It is believed that the brine is simply evaporated, the first crystals consisting chiefly of NaCl. Crude salts have been marketed, and also a high-grade potassium chloride, 98% pure. When in full operation, the refinery is to have a capacity of about 200 tons of potash and 60 or more tons of borax per day.

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[1] "Potash in 1916," "Mineral Resources of the United States, 1916," Part 2, pp. 73-171.

[2] "The Potash Situation in United States," p. 1015, June 9, 1917.

[3] "Salines in the Owens, Searles and Panamint Basins, Southeastern California," Bull. 580, U. S. Geol. Surv., pp. 251-323, 1915.

Another potash enterprise at Searles Lake is under the joint management of the Pacific Coast Borax Co. and the Solvay Process Co. at Borosolvay. Work on the first commercial unit was commenced in October, 1916, and it was to be placed in operation about Apr. 1, 1917. It was reported, in newspapers, that the output of the preliminary unit would be about 40 tons per day of a 60 to 70% KCl product, the intention being ultimately to increase the standard to 85 or 90 per cent.

POTASH FROM GREAT SALT LAKE

Two establishments have been built in Utah for recovering potash salts from Great Salt Lake. The water of Great Salt Lake carries about 20% of dissolved salts and analysis of the constituents shows: KCl, 3.16%; NaCl, 75.91%; $MgCl_2$, 10.92%; Na_2SO_4, 9.52%; $CaSO_4$, 0.34%; and $CaCO_3$, 0.15%. The Utah Chemical Co., allied with the Virginia-Carolina Chemical Co., has a plant near Saltair and treats the "mother liquors" from the salt works of the Inland Crystal Salt Co., containing about 2.5% of K_2O. The liquor is evaporated first in open vats and, later, by artificial heat, under cover. The liquor throws down a crop of crystals, mostly NaCl and Na_2SO_4, which is discarded. The liquor is then passed to a multiple-effect evaporating system, fitted with salt traps to remove as much NaCl as possible before the potassium chloride is thrown down. The final product, a mixture of $MgCl_2$, NaCl and KCl, carrying about 9 to 12% K_2O, is dried and sacked for shipment.

The Salt Lake Chemical Co., a subsidiary of the Diamond Match Co., has a plant near Grants station on the Western Pacific R.R. Brine is pumped directly from Great Salt Lake to large vats covering about 300 acres. After concentration by natural evaporation, with deposition of NaCl and some Na_2SO_4, the residual bittern contains about 4% or more of K_2O. This liquor is concentrated in artificial evaporators, the process apparently consisting mainly or entirely of evaporation of the liquor and crystallization of the salts. The first shipment of product was made at the end of 1916.

Salduro Salt Marsh, at Salduro station, on the Western Pacific R.R., in Utah, was staked in salt claims and worked by the Monticello Salt Co. Later the property was leased to the Capell Salt Co. and finally taken over by the Solvay Process Co. The deposit resembles that of Searles Lake, but the salt mass is only 3 to 5 ft. in depth, overlying a saline mud of unknown depth. The crystallized salt contains only a little potash. The brine is more saturated than the water of Great Salt Lake, containing about 27.07% of dissolved salts, analysis of which shows: KCl, 7.03%; NaCl, 81.04%; $MgCl_2$, 9.07%; Na_2SO_4, 1.98%; and $CaSO_4$, 0.88%. The deposit was described in the *Journal*[4] as a possible source of potash. The erection of a plant was commenced in the latter part of 1916.

Production of potash salts is reported by the Whitney Chemical Co. from residues of salt-refining works at San Mateo, Calif., and attention is called to the possibility of producing potash from the "spent liquors" obtained by the separation of soda at Owens Lake, Calif., and at salt works in various parts of the country.

ALUNITE A PROMISING SOURCE

The production of potash from alunite was maintained at Marysvale, Utah, by the Mineral Products Corporation during the greater part of the year. Owing to the destruction of the mine equipment by fire in October, 1916,[5] the property was shut down from Nov. 1 until the end of the year. The alunite is obtained from the Gillan-Custer claims in the high mountains southwest of Marysvale and is delivered by an aërial tram to wagons in Little Cottonwood Canyon, whence it is hauled about 3½ miles to the mill, which is about five miles southwest of Marysvale. The Utah Potash Co. conducted experimental work at Sigurd, about 36 miles north of Marysvale. The Florence Mining and Milling Co., controlling claims to the north of the Gillan-Custer group, built a mill and calcining furnace about one mile south of Marysvale, but made no output in 1916. Several companies have been formed to operate alunite deposits near Marysvale, and some exploration work was undertaken. The discovery of alunite was also reported from several localities in Nevada, California, Arizona, Colorado and Texas. Recent U. S. patents for reducing alunite were: No. 1,161,239, Nov. 23, 1916, to G. S. Morgan; No. 1,175,439, Mar. 14, 1916, to C. F. Hagedorn; No. 1,189,254, July 4, 1916, to P. R. Hershman and Raymond Cooke; No. 1,191,104, July 11, 1916, to P. R. Hershman; No. 1,195,655, Aug. 22, 1916, to H. F. Chappell. The Chappell process is used by the Mineral Products Corporation. The ore is crushed to about ¼-in. size and passed slowly through a rotary kiln at about 750° C. The roasted alunite is then digested for several hours with boiling water and filtered through Kelly presses. The cake, consisting mainly of alumina, is stored for possible later use. The filtrate is treated in a multiple-effect evaporator and a product of 95% K_2SO_4, practically free of chlorine, is obtained by crystallization. The ore treated at this plant averages about 8 to 9% potash.

POTASH IN FELDSPAR AND OTHER SILICATES

Potash is a constituent of certain feldspar and other silicate minerals, widely distributed in nature. Volcanic rocks often contain high percentages, a sample of tailings from a mill in the Cripple Creek district, Colo., showing 12.08% K_2O. A long list is given of patents granted for processes of extracting potash from silicates, as well as a bibliography of literature on the subject. In 1916 experimental work along this line was conducted by the Kaolin Products Corporation at Jonespoint, N. Y.; by the Waverly Chemical Co. at Camden, N. J.; by the Atlantic Potash Co. at Northampton, Penn.; by the Electric Smelting and Aluminum Co. at Sewaren, N. J. and at Lockport, N. Y.; and by various others.

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[4] "Potash in Salduro Salt Deposit," Hoyt S. Gale, pp. 780-782, Oct. 28, 1916.

[5] [A dispatch from Salt Lake City, dated Oct. 26, 1917, stated that a fire of mysterious origin, preceded by an explosion, destroyed the potash plant of the Mineral Products Corporation at Alunite, Utah, causing a loss estimated at $250,000.—Editor.]

The American Potash Co. of Denver, Colo., which proposes to extract potash from the Leucite Hills, near Rock Springs, Wyo., reported little progress in 1916. The leucite rock carries from 8.5 to 10% K_2O and processes for working it have been described by A. H. Rogers.[6]

Much potash is now obtained from the dust of blast furnaces and cement kilns, the former source having been described in the *Journal*[7] in abstract form. The Bethlehem Steel Co. has sold at a good profit the potash-bearing flue dust that settles from its blast-furnace gases, representing less than 2% of the total potash charged into the furnaces. Several cement companies obtain potash salts as byproducts. The Riverside Portland Cement Co. of Riverside, Calif., leaches potash-bearing dust with hot water and produces high-grade salts carrying 80% potassium sulphate.

PACIFIC COAST KELP INDUSTRY

In 1916, nine companies produced potash and potash fertilizer from kelp. Near San Diego, Calif., are the works of the Hercules Powder Co., Swift & Co. and the Kelp Products Co. Near Long Beach, Calif., are those of the Lorned Manufacturing Co., the Sea Products Co., the Pacific Products Co. of California, and the National Kelp Potash Co. The Diamond Match Co. extracts potash at Wilmington, Calif., and the National Potash and Iodine Co. has a plant at Fort Stanley, Wash. Fifteen other plants were announced as being under construction, or contemplated, in California, Oregon and Washington, but none of them reported production in 1916. An interesting suggestion has been made[8] to exploit the seaweed of the Sargasso Sea for its potash content. The weed, when dried, is said to yield about 9% K_2O. Suggestions have also been made to utilize the weed, of the Sargasso type, that accumulates on the coasts of the Bahama Islands.

Various processes are used in the United States for recovering potash from kelp. The products are: Dried kelp, ground for use in fertilizer; ground "char" or ash of kelp; and refined KCl and K_2SO_4. At the Hercules Powder Co. plant, at Chula Vista, Calif., the kelp is cut from beds off San Diego Harbor and brought to the plant in barges. After maceration, and the addition of water and lime, the kelp is allowed to ferment in tanks having an aggregate capacity of about 12,000,000 gal. By temperature control and aeration the kelp is decomposed without putrefaction, and, after a week or more, fermentation is stopped by heating to the boiling point. Acetic acid, formed in the fermentation, unites with the lime, and potash and soda go into solution mostly as chlorides. The coarser fragments of kelp leaf, mainly cellulose but containing about 4% KCl, are screened out and reserved for possible future treatment. The solution is settled and clarified. Clear liquor is drawn off and the sludge filtered. The solid residue is treated for its potash content and the solution, with about 4 to 5% of dissolved salts, is concentrated in multiple-effect evaporators, further concentrated in open boiling tanks and finally run into crystallizers. By alternate hot and cold treatment a mixture of sodium and potassium salts is crystallized out, most of the acetate remaining in solution. The chloride salts are redissolved and refined by hot and cold treatment and fractional crystallization until a product of 90% KCl is obtained. It is planned to convert the acetates to acetone by a special process. The capacity of the plant is estimated as 20 tons, or more, of potash per day.

WOOD ASHES, DISTILLERY WASTE AND MISCELLANEOUS SOURCES OF POTASH

The old method of extraction from wood ashes, responsible for the name of potash, is still practiced to some extent. In 1850 there were 509 establishments, in the United States, that produced from wood ashes a quantity of potash valued at $1,401,533. Due to the abundant supply of cheap salts from Germany, in 1905 there were reported only 39 establishments, the product of which was valued at $104,655. For 1916 the reported production was about 825 tons, valued at $270,000; from 27 firms in Michigan, 14 in Wisconsin, two or three in Maine and one in Ohio.

The potash produced in 1916 from refuse of beet- and cane-sugar manufacture, mainly waste from distilleries that produce alcohol from molasses, was valued at $500,000. A large plant at New Orleans, La., was reported as producing at the rate of 3000 lb. (K_2O) per day as potassium chloride. The Western Grain and Sugar Products Co. at Agnew, Calif., produced salts carrying 40% of K_2O at the rate of 700 short tons per month at the close of 1916. The entire output was used as fertilizer. Other plants operated at Harvey, La., near Boston, Mass., and at Bay City, Mich.

Ground tobacco stems carry 5 to 6% K_2O, and a small amount of chloride salts has been made from them, but they are generally dried and used as an ingredient of fertilizer. Their nitrogen content has a value and they also serve as a "drier" to absorb the excess moisture of other ingredients. Some potash is recovered from the washings of wool factories, notably at Lawrence, Mass., where the Diamond Match Co. has produced some potassium chloride for its needs. Australian wool is said to give a larger yield than domestic wool.

Activity of producers is increasing, but when prices fall, many will be forced out of business. Investigations by the Government and by private interests continue and it is hoped that this country can be made independent of foreign supplies through the discovery of deposits that can be exploited so as to compete on equal terms with foreign producers. Drilling has been conducted, particularly in northwestern Texas and southeastern New Mexico, with the view of ascertaining whether the salt beds contain appreciable quantities of potash. It is noted that deposits of potash have been found in the Permian in central Germany, in the Oligocene (Tertiary) in Alsace, in the lower Miocene (Tertiary) in Galicia, and in the supposed Eocene or Oligocene (Tertiary) in northeastern Spain, everywhere accompanied by deposits of common salt, dolomite and gypsum, and there seems to be no valid reason why similar deposits should not eventually be found in the United States.

Consumption of Black Blasting Powder in the United States in 1916 amounted to over 8,600,000 kegs of 25 lb. each. Of this amount, metal and coal mining consumed 7,392,000 kegs, the remainder being used in other operations.

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[6] "Met. and Chem. Eng.," p. 387, June, 1915.

[7] "Potash from Blast Furnaces," p. 176, Jan. 27, 1917.

[8] "Manufacturers' Record," Nov. 30, 1916.

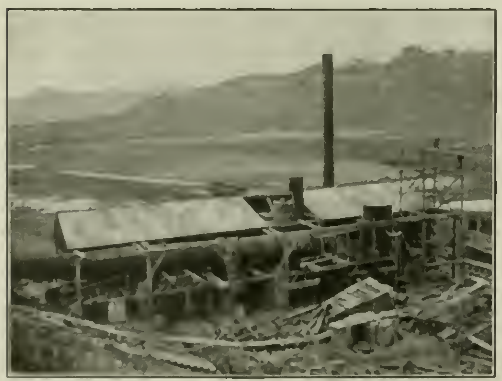
Alunite Potash Plants in Utah

Salt Lake Correspondence

The potash plant of the Mineral Products Corporation at Alunite, six miles west of Marysvale in Piute County, Utah, was destroyed by a fire starting at six o'clock on the evening of Oct. 25, 1917. The fire originated in the coal drier, and was preceded by an explosion. A fire-fighting crew was quickly organized among the employees and inhabitants of the town of Alunite, but there was difficulty in getting a sufficient supply of water on the buildings. The main mill building—in which were installed a part of the calciner, the digesters, evaporators, and the sacking and loading department for the potassium sulphate—was completely burned. The accounting office, general manager's office, laboratory, garage, and crusher plant were saved. The loss—according to officials of the company—is placed at about $250,000; which, however, may be reduced $50,000 by the salvage of the calciner, digesters, and possibly the evaporators. Only the rear end of the calciner was connected with the main mill building, and this can undoubtedly be put in repair. Two stokers, who were working at the coal drier and rear end of the calciner before the explosion, were severely burned.

ALUNITE POTASH PLANT OF MINERAL PRODUCTS CORPORATION, NEAR MARYSVALE, PIUTE COUNTY, UTAH

Partly destroyed by fire, Oct. 25, 1917. Roaster stack on right, power stacks on left and center. Crushing plant, in right foreground, not damaged. This view, taken in April, 1917, shows 9000 tons of alunite in stock pile.



ALUNITE CALCINING PLANT OF FLORENCE MINING AND MILLING CO., NEAR MARYSVALE, UTAH

Under construction in April, 1917, calciner in foreground. This plant is now working three shifts and is reported to be shipping up to six carloads of calcined alunite per week

During last May and June there were seven fires of mysterious origin, and the company had built a fence around the entire plant. The plant was the first successfully operated potash mill in the United States, producing high-grade potassium sulphate. The ore is alunite—hydrous sulphate of alumina and potash—and the plant has handled up to 175 tons of this material daily. The Armours, of Chicago, and the United States Smelting, Refining and Mining Co. are interested in the Minerals Products Corporation. John W. Hornsey is consulting chemist, and Howard S. Chappell president of the corporation. About 250 men are employed in and around the mill, which has been working three shifts. The plant will undoubtedly be rebuilt.

Special Mining Regiment

The Engineer Corps of the United States Army has been authorized to raise by voluntary enlistment a special mining regiment, to consist of six companies of 250 men each and to be known as the 27th Engineers, National Army. As announced in the *Journal* of Nov. 3, this regiment is now being recruited. The first company has been formed and is in training at Camp Meade, Md. The regiment will be made up entirely of picked men from the various mining sections of the country. All trades and occupations in and around a mine will be represented, and each company will have a sufficient number of men skilled in each trade to enable it to operate as a unit.

The work to be done is purely military in character and what is known as "first-line" work. It consists of the preparation of underground shelters for the fighting troops and the placing of explosive mines. This requires a high degree of skill in rapid tunnel construction and involves the handling of all sorts of material, from clay and chalk to hard rock. In addition to the regular engineer equipment, each company will be provided with special tools, such as tunneling and boring machines, drills, compressors, hoists, lighting sets, etc. While most of the work of the 27th Engineers will be underground mining, the regiment will be trained to fight as well as to mine. The commanding officer will be a regular army engineer officer, the remaining officers being drawn largely from the mining engineers who have volunteered their services and who have been given the necessary military training at the Officers' Training Camps. All men who volunteer for this service will be enlisted as privates, but those who prove qualified will be made non-commissioned officers. Any recruiting officer will enlist men for this regiment, but each man must show proper qualifications by way of experience and pass the usual physical examination. All men between the ages of 18 and 41 are eligible for enlistment, if not actually drawn on the draft. The 27th Engineers offers a great opportunity for the miners of this country to show their skill and courage. Any experienced mining man who wants first-line service in France is urged to enlist at once.

Experienced miners, both hand and machine drillers muckers, trammers, timbermen, tracklayers, pumpmen hoistmen, blacksmiths and tool sharpeners, electricians machinists, carpenters, surveyors, timekeepers, cook shift bosses, mine foremen and topmen, are needed b this special mining regiment.

The personnel of a company is shown in the accompanying table, which also gives the rates of pay. After a man has enlisted he is clothed, fed, sheltered and transported at Government expense. He also receives free medical and surgical attention. Pay as shown in the table is practically clear money. Those who "want in" should go to the nearest recruiting office and enlist for the 27th Engineers, Camp Meade, Md. If unable to enlist in this regiment at the nearest recruiting office, one may mail an application to the Commanding Officer, 27th Engineers, Office of the Chief of Engineers, Washington, D. C. The application should be made out in the following form, beginning each new item on a separate line: Date; name; age; address, street and number, city and state; occupation or trade; present position; number of years' experience; schooling; do you speak or read French or German?; are you subject to draft?; have you been drafted?; give present address; have you been refused enlistment in any branch of the Army?; if so, why and when?; signature.

PERSONNEL OF COMPANY OF SPECIAL MINING REGIMENT AND RATES OF PAY

	In Each Company	Monthly Pay of Each When Abroad
First Sergeant	1	$60 00
Sergeant, first class	4	60 00
Supply Sergeant	1	51 20
Mess Sergeant	1	51 20
Stable Sergeant	1	51 20
Sergeant	10	51 20
Corporal	20	40 80
Horseshoer	1	44 00
Saddler	1	40.20
Wagoner	5	40 20
Cook	5	44 00
Bugler	2	33.00
Private, first class	66	36 60
Private	132	33 00
Total	250	
Battalion Headquarters		
Master Engineer, senior grade	2	96 00
Master Engineer, junior grade	4	84 00
Battalion Sergeant Major	1	60 00
Battalion Supply Sergeant	1	60 00

A complementary regiment of quarrymen, to be designated the 28th Engineers, will also be organized by voluntary enlistment.

Clifton-Morenci Strike Settled

The strike in the Clifton-Morenci-Metcalf copper district of Arizona has been settled, according to a telegram received in Washington on Nov. 1 from the President's Mediation Commission. The dispatch said:

> The strike in the Clifton-Morenci-Metcalf copper district of Arizona is settled and the prompt resumption of copper production in this great copper center is assured. The President's Mediation Commission has devised a settlement which will open up the important mines of the Arizona, Detroit, and Shannon Copper companies. The normal monthly output of this district is about 10,000,000 lb. of copper, requiring a working force of about 6000 men. The mines have been idle since July, and various attempts toward settlement have been unavailing. The Government's urgent need of copper made necessary the intervention of the President's Mediation Commission, now successfully concluded.
>
> ### Men Must Abandon Strikes
>
> In arriving at a settlement the President's commission proceeded upon a few basic principles. The country must have the uninterrupted maximum output of copper during the period of the war. Therefore, for the period of the war the strike as a means of remedying grievances must be abandoned by the men. In place of dislocation strikes the Government must assure the men, for their own and the Government's protection, security in their employment (where there is no just cause for discharge), as well as fair and practical machinery for the ordinary adjustment of grievances, whether real or imaginary, without causing any stoppage of production.
>
> To carry these principles into execution the President's commission has directed a settlement, accepted by both sides, embodying these features: Companies and men must exert their utmost efforts to secure the highest possible efficiency in the production of copper consistent with proper discipline and due regard for the health and safety of the workmen.
>
> The companies will continue to recognize workmen's grievance committees previously existing in the district. Heretofore, however, there was a feeling of impotence as to these committees, because the final say was with the managers. There is, therefore, added to the existing scheme remedying grievances an appeal to the United States administrator, whose decision is binding upon both sides.
>
> Reëmployment is assured to all striking workmen without discrimination, except those guilty of seditious utterances against the United States, or those who have membership in an organization which does not recognize the obligation of contract, or those of demonstrated unfitness for work.
>
> ### Increased Wages May Advance Copper Price
>
> A claim for increased wages, to conform to the high wage scale in the Globe-Miami district, was one of the causes of the strike. The justice of this claim requires a detailed study of local conditions, both as to cost of living and the financial ability of the companies of this district, as compared with those of the Globe-Miami district. Such an investigation, if it is to be conducted in an authoritative way, would take a great deal of time.
>
> The President's commission therefore did not deem it within its province to enter upon such investigation. Instead, it laid down the principles which should control such a claim for wage increase, and left the application of the principles to the facts as they should be found by the United States administrator. The commission provided that the administrator should determine if any adjustment of wage scale is called for in order to secure a fair living wage, having regard to the high cost of living, to the efficiency, or lack of efficiency, and to the financial ability of the companies.
>
> If the administrator should recommend a wage increase and such a wage scale allows a fair profit to the companies under the existing price of copper, the President's commission shall at once promulgate such new wage scale and the company shall pay all such increases in wages as of the first day of the return of men to work. If, however, such wage scale recognized by the administrator does not leave a fair profit under existing prices of copper, the President's commission shall recommend to the President an increased selling price which will yield a fair profit, and the wage increase recommended by the administrator shall not be made effective until such selling price has been obtained.
>
> In order to secure this wage scale, and in order to determine the fair profit of the companies, the administrator is given complete access to all the records of the companies and has authority to employ all necessary expert assistants. The administrator is Hywel Davies, of Kentucky, who has heretofore rendered valuable service as mediator for the Department of Labor.

The paragraph relating to the reëmployment of striking workmen is assumed to be for the purpose of barring members of the I. W. W. and similar organizations. The Commission has gone to Bisbee, Arizona.

Recruits for Gas and Flame Service

The 30th Engineers is now being recruited from men volunteering for the Gas and Flame Service and will be ready for France by Thanksgiving. Those who can qualify include chemists (analytical, research and manufacturing), chemical workers, powdermen, men experienced in gas manufacture, machinists, automobile repair men, men able to operate and repair gas or steam engines, pipe fitters, electricians, designers, interpreters, carpenters, blacksmiths, plumbers, boiler-makers and chauffeurs. Men with long experience in their trade are especially desired to fill the master-engineer grades. They must be between 18 and 40 years of age and not have been called by a local board in the draft. Application should be made at the nearest recruiting station or United States District Engineering Office.

History of Wire Hoisting Ropes with Notes on Factors of Safety[*]

Stranded bronze-wire ropes were found in the Pompeian ruins. Modern wire ropes were a development of the 19th century. In recent American practice, imported steels have been supplanted by acid openhearth steel of domestic manufacture. Bending stresses of wire ropes vary inversely as the diameter of sheaves and drums, and reverse bending due to underwound drums will decrease the life of a rope from 10 to 25%. Rope ends are preferably fastened by means of clips instead of sockets, and ropes should be protected from corrosion and frequently inspected.

THE application of wires in the form of ropes for engineering purposes was first introduced in 1813 for use as supporting ropes on the Geneva suspension bridge. They were, however, not constructed in what today would be strictly classed as wire rope, but were formed of a series of wires laid parallel with one another and bound together by means of smaller wires which in turn were covered with tarred yarn. There seems to be no authoritative data available as to the number and sizes of the individual wires used in making up the supporting ropes for this bridge, but it is taken for granted that the material from which the wires were produced was undoubtedly charcoal or BB iron which at that period, and for some time later, was almost exclusively used in the production of wire ropes.

At a later date, 1835, some ropes of this type were produced for the Freiburg suspension bridge which has a span of over 800 ft. in the clear. The supporting ropes for this bridge were composed of about 20 bundles of iron wires laid parallel, each wire being 0.125 in. in diameter and the combined total making a rope about 5½ in. in diameter. There is no doubt that this type of rope, when properly constructed, would present a breaking efficiency nearly equal to the tensile strength of its individual component wires, and perhaps it is the only construction of wire rope in which each wire bears as nearly as possible its due and proportionate share of the load stress. Ropes of this class, while not extensively manufactured, have been applied in this country on the Niagara suspension bridge and the Ohio River bridge and have been used for the large main supporting cables on the Brooklyn suspension bridge; also more recently on the new East River or Williamsburg bridge. This type of wire rope is known as the "selvagee" construction. Unfortunately it cannot be utilized for hoisting purposes.

Early Stranded-Wire Ropes

In 1834 a mining engineer named Albert, of Clausthal, Germany, interested in the mining industries in Saxony, who became later the director of the Hanoverian mines, finally succeeded in fabricating, with considerable difficulty, a "stranded" wire rope composed of iron wires. He put this rope in operation for hoisting ore in the shafts of the Harz mines, where its superiority was immediately recognized over its hempen predecessor; and Albert's efforts were crowned with success. In 1837 Albert, before an engineering society in Berlin, read a paper on the construction and manufacture of stranded-wire ropes. This paper advocated the production of wire ropes along the same lines of construction as were previously applied to the manufacture of hemp and fiber ropes, then employed exclusively in the mining industry. The size of the wire entering into the manufacture of the first stranded-wire rope produced by Albert is said to have been 0.144 in. in diameter, with a tensile strength of about a thousand pounds each, or approximately 27.5 tons per sq.in. of actual cross section. As to the exact number of wires in the strands and the number of strands employed there seems to be no absolutely reliable information. However, it is known that ropes manufactured between 1835 and 1838 were made up of four wires to the strand, each wire being about $\frac{3}{32}$ in. in diameter and the ropes composed of four, six and eight strands. It is evident that there was some variation in sizes of wires as the number of strands increased.

Commercial Manufacture of Wire Ropes

It must thus be conceded that as a direct result of Albert's experiments the commercial world was given a mechanical appliance to which can be traced the establishment of many of the foremost industrial activities of modern times. It was immediately after the first successful experiments, carried out by Albert, that a partnership was formed by Felten & Guilleaume, of Cologne, to manufacture wire ropes upon a commercial scale. These two men were quick to realize the possibilities of a product adaptable to numerous enterprises, and for some time manufactured wire rope for mining purposes in Germany and France. In the Musio Borbonico at Naples is to be found on exhibition a short length of bronze-wire rope, about 1 in. in diameter, which was excavated from the ruins of Pompeii, but beyond the fact that it was made of wires twisted into strands, and the strands in turn laid into rope, there is no other information except that it proves to us that wire ropes made of bronze wires were in existence before the destruction of Pompeii in the year 79 A.D. Beyond this period there is no trace of any stranded ropes, but it is an established fact that the ancients, many centuries before the process of drawing wire through dies was invented, made wire from precious metals by hammering.

First British Patent for Cored Strands

The application of wires to ropes was known to exist in Germany as early as 1813, but their practical introduction in England did not apparently transpire until some years later. Before a meeting of the British Association, held at Newcastle in 1838, Mr. Taylor, F.R.S., read a paper on wire ropes, by Count Brenner, and in the same year R. S. Newell, of Dundee, England, acting upon information and advice from a friend who was studying mining conditions in Saxony, designed some rather crude machinery for the purpose of manufacturing wire ropes with four strands, each strand containing four wires. Mr. Newell carried on some experiments with his early inventions, on which he gradually improved, until in August, 1840, he was granted his first letters patent in England for improvements in the manufacture of wire ropes and the machinery designed for the process. With these improvements there apparently came the introduction of cores or "hearts," as such were then termed, as Mr. Newell's patent related to the construction of rope with wires laid around a core or heart to form the strand, and several strands laid around a central core or heart to form the finished rope. After these letters patent were obtained by Mr. Newell a company was formed, and under his personal supervision wire ropes were manufactured in England on a commercial scale.

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[*] Paper read by M. H. Sigafoos, general manager, Hazard Manufacturing Co., Wilkes-Barre, Penn., before the mining-section meeting of the sixth annual congress of the National Safety Council, New York, Sept. 12, 1917.

History of American Wire Ropes

In the United States wire rope was first manufactured in the early 40's and has been improved upon year by year until the present time, when it represents the very highest development of this means of hoisting and haulage. In the last fifty years there has been a gradual change from the use of one kind of rope material to another, and this was brought about by the demand for an increased production by speed and efficiency. In the preceding paragraphs I have shown that iron was practically the only material used for wire rope, and this continued to be the case until the introduction of crucible cast steel, which opened the second period in the manufacture of wire rope. The third period came with the introduction of higher-carbon steel known by the trade as plough and special high-strength steel. In none of these periods has the material in the production of wire rope of the preceding period been forgotten, for certain operations still demand iron cables and there are other operations in which it is out of the question to substitute plough steel or the special high-strength steel for cast steel.

Materials Used in Manufacture of Ropes

The material entering into the manufacture of wire ropes is perhaps of greatest importance in the wire-rope industry, for upon its quality depends largely the final result of the finished product. Through careful selection, constant experimentation and analysis, with minute researches into the physical and chemical properties of the raw materials, the industry is guided toward the production of a dependable wire rope with durability and ductility as two of its fundamental qualities.

Until recent years in the manufacture of wire rope it was generally conceded that the foreign steels were by far the best, due principally to the use of Swedish ores. Foreign steel material as imported by the American manufacturer for wire rope purposes is made to meet rigid specifications. This insures as nearly as possible a uniform quality. Such steel is carefully tested and analyzed to verify the percentages of manganese, silicon and carbon as well as of sulphur and phosphorus, which must be extremely low. Acid, openhearth steels are generally admitted to be of better quality than basic openhearth and it has been suggested that this is due to the higher oxygen content in the basic steel.

Much has been claimed for the qualities of chemically treated steels, such as vanadium, chronium, etc., and in many instances the manufacturers of steel products have proved the claims made for them. So far as their adoption to wire rope is concerned, however, they are still in the experimental stages, and no data are available at this time. Without doubt such elements may eventually be used in connection with domestic ores and produce a finished article for the wire-rope industry as it has for other purposes.

Wires made from materials intended for the manufacture of wire rope for ordinary purposes are divided into three classes, as previously stated, namely, iron with a breaking strain of approximately 80,000 lb. per sq.in., cast-steel, often erroneously called crucible-cast, which has a breaking strain of 170,000 to 180,000 lb. per sq.in., and plough-steel with a breaking strain of 200,000 to 250,000 lb. per sq.in. Wire of higher tensile strength is often drawn, but this is rarely used for any other purpose than for standing rigging on racing yachts, where maximum strength with the lightest possible weight is essential. Such wires are sometimes drawn to 260,000 lb. per sq.in. Small sizes of even higher tensile strength are drawn for wire rope or strands for aëroplane guys.

Life, Stresses and Speeds

There has been much discussion on the question: When has a wire rope reached the end of its usefulness, and when should it be removed? Up to the present, it seems, the question remains unanswered—at least, satisfactorily. In an exhaustive investigation[1] conducted by the Bureau of Standards on this subject the recommendation was made that a rope should be removed after a certain number of broken wires appear in each of the strands. These tables have undoubtedly been compiled from stated loads, speeds, head-sheave and drum diameters; from shafts of various depths, the torsional and load stresses being taken into consideration. It is, no doubt, a useful guide, provided it can be applied where conditions are the same or as nearly alike as those from which these tables and figures were compiled. However, as there is no standard of sheave and drum diameters, except those recommended by rope manufacturers, or any set rule for maximum loads, it is evident that with each variation in the diameter of sheaves or loads there will be a variation in the bending and load stresses. Both stresses are of great importance and each has a direct bearing on the factor of safety. The various conditions of operation that exist in different mines make it almost impossible to find any two that are alike. There can always be found considerable differences in the diameter of sheaves, loads and speeds, therefore it is obvious that no set rule can be laid down by which all mining operations can be governed.

In the catalog of the wire-rope manufacturers are to be found the "proper working loads" of wire ropes for the given sizes and grades. This proper working load in almost all cases is approximately 20% of the breaking strength of the rope, and would appear to be a factor of safety of five. This, however, is not the case, as will be shown, and it is important, in calculating the proper size of rope for a certain load with a required factor of safety, that this proper working load should not be confused with the actual factor of safety. While the proper working load does show approximately one-fifth of the breaking strength of the rope, it does not by any means indicate that in operation a rope, selected on account of its showing a proper working load in the list corresponding to the load which it is desired to lift, would have a factor of safety of five. This is due to the fact that in addition to the working load there are other stresses to which ample consideration must be given; the most important of these is the stress due to bending over the sheaves and drums. If the rope to be used is operated over standard-sized sheaves and drums, as recommended by the rope manufacturers, the general average of this bending stress equals about 10% of the approximate breaking strength of the rope. For instance in a cast-steel wire rope, of 1-in. diameter and composed of six strands having 19 wires to the strand, the approximate breaking strength is 30 tons and shows a proper working load of one-fifth, or six tons. This, however, is only to be used on a minimum-size sheave or drum of 4 ft., as recommended by the manufacturer. The bending stress would be 2.7 tons, or 9⅓% of the approximate breaking strength of the rope. It is thus evident that by adding 9⅓% to the 20% load stress we have utilized 29⅓% of the ultimate; and, instead of an apparent factor of safety of five, we actually have only 3.41. This factor is still further reduced by the stress due to starting the load, and also, in some cases by the stress due to the weight of the rope and its inertia. The latter, of course, varies with the size and length of the rope, and in calculating the proper sizes of rope required for hoisting operations, where ropes are often long and heavy, their weight must be considered and added to the ore load, weight of cage and cars, or skip, as the case may be, in order to arrive at any true factor of safety. For short lengths of rope of small diameter, such as used on derricks, etc., this latter calculation is not necessary.

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[1] Bull. 75, U. S. Bureau of Standards, Washington, D. C

Effect of Sheave and Drum Diameters

It is often impracticable to utilize the sizes of sheave and drum recommended by the manufacturer. When different diameters must be used, the bending stresses will vary inversely as the diameters. For instance, assume in the example given that a 2-ft. diameter sheave is to be used. The bending stress produced would be 5.58 tons, or about 18⅗% of the breaking strain of the rope. This, in addition to the working load, would be 38⅗% of the ultimate strength of the rope, thus reducing the factor of safety to 2.6. Under these conditions the total working stress would be greater than one-third of the ultimate breaking strength of the rope when new, and this factor of safety is not considered good engineering practice. Obviously under such conditions a wire rope could not possibly give the same service as when operated over the standard or larger-sized sheaves or drums. On the other hand, if we should employ sheaves of twice the diameter of those recommended by the manufacturers, or 96 in., the bending stress would be only 1.4 tons (approximately) or about 4⅔% of the ultimate strength of the rope. It is evident that by reducing the bending stress to a minimum more economical service could be obtained; and in many cases a smaller diameter of rope could be applied to do the required work, thereby increasing the efficiency of the rope and making a considerable saving in first cost.

Reverse Bends Reduce Strength and Life of Ropes

Regarding bending stresses it might be well to describe briefly the effect of these stresses on the initial structure of the metal in the wire rope. , It has been shown repeatedly that reverse bends play an important part in the early deterioration of a wire rope. The under-wind rope in which there are reverse bends will invariably give a shorter service than the over-wind rope. The difference in service of the two ropes on a hoist varies a great deal, but from experience it has been observed that the over-wind rope will give 10% to 25% more service. The reason for this is quite obvious, but I shall endeavor to explain as clearly as possible the causes leading to the shorter service of the under-wind rope.

The under-wind rope as it comes off the head-sheaves has taken somewhat of a set, the permanence of which depends altogether on the relation of rope diameter to sheave diameter. The smaller the sheave, the greater the set. The rope now travels to the take-up drum which is set some distance away and will wind on the drum in the opposite direction to the way it came off the head-sheave. A reverse bend is thus thrown into the rope and consequently into the wires themselves. The rope cannot recover itself in most cases, for the set received at the head-sheave is not entirely overcome before it strikes the take-up drum, and consequently the effect of the latter bend is more severe. Wires removed from ropes that have been retired from service, operating under conditions of reverse bending, show under the microscope that minute cracks have been set up in the steel, sometimes running in planes between the grains, while in other cases the grains themselves have cracked. Examination made of the steel at different points shows that the nearer the break, the more developed are the cracks and fissures. Of course these minute cracks will eventually develop into larger cracks which will in due course cause the wire to part, and later, if the rope be not removed in time, the breaking of the entire rope.

Repeated Shocks Weaken Ropes

Another cause for failure of wire ropes can be attributed to repeated shocks. A rope may fail because of combined stresses beyond the breaking strain, or on account of a succession of applied loads in excess of the elastic limit, and it may also fail by reason of repeated shocks; that is, loads applied that may reach the elastic limit at intervals of minutes or hours. The effect of these strains, or over-strains as they may be called, is shown best by a microscopic examination of the metal. They lead to crystallization with a consequent embrittlement of the steel.

A rope will wind on a drum, coil beside coil successively, until the end of the drum or drum flange is reached. At this point the rope will have to wind upon itself. After making the first coil upon itself there is a tendency for the second coil to mount or overlap upon the first. This at once readjusts itself by the instability of the position, but the act of slipping into place alongside the first coil is accompanied by a sharp snap which always occurs at the same point on the rope. The effect of this is twofold:

1. It will cause jerks that will increase the load on the rope by an amount dependent upon the amount of slack between the drum and the head-sheave. In most cases this is small, but in time the wires will show the effect of these shocks not only from the increased load but also from the vibration in the rope which usually settles at one point, causing trouble later on.
2. The inner series of wires will crush somewhat from the squeezing between the top and bottom layer and will assume a pear or bell shape. In this disturbed condition it is impossible for the inner wires to perform their proper function, and the outer wires will be forced to take more than their share of the stresses. Not only this but they will also gradually assume the shape of their cushion, the inner series, causing trouble as a result of abrasion.

Of course we know that overlapping cannot be eliminated in most cases on account of the amount of rope that must be taken up on the drum, but the point to emphasize is the fact that frequent inspection must be made of the rope in order to minimize accidents.

METHODS FOR FASTENING ROPE ENDS

The effect of overloading has already been referred to in the foregoing, but in addition it might be well to state that wire ropes are constructed to take care of certain loads, and when these loads are exceeded, the steel in the rope must suffer. The rope as made has a certain lay and the method of attachment to the load has a great deal to do with the running out of the lay and stretch of the rope. This should not be confused with the material itself. There are several methods of fastening ropes to the load, and it can be done by means of either sockets or clips. Fastening by means of either of these methods can be done in such a manner as to break the rope before the connection gives out. In the case where sockets are used it was formerly thought necessary to turn or bend back the strands or wires into the basket of the socket. This method is now being replaced by a process of opening the wires in the strand of the rope which is to be socketed, thoroughly cleaning them with muriatic acid, cut down with zinc, and pouring in molten zinc. Tests of this method of socketing have proved that a more uniform strain on each individual wire can be depended upon. However, it necessitates taking great pains and carries with it at all times the danger of no possible means of inspection. The connection made with clips, if properly applied, is equally strong, and careful inspection can always be made of such a fastening. The latter connection should be made with the curved section of the U-bolt clip over the short end of the rope. This insures more safety, as there is then no indentation on the main section of the rope made by the U-bolt. From a safety point of view it is preferable to socketing.

I believe that all users of wire rope appreciate the value of protecting the rope from mine and other injurious waters which corrode and take into solution the steel of the rope, but it might be well to state that the most dangerous element is often neglected. In mine water the sulphur has been taken into solution, resulting in the formation of sulphuric acid, and when this acid attacks the steel there is liberated hydrogen, which causes a great deal of trouble. . . . In order to keep corrosion at a minimum it is absolutely necessary to cover the rope, or at least fill the interstices of the rope, with some sort of protective preparation. A mineral compound of the right consistency has been found to be the proper material to use for this purpose.

In dealing with the problems in which wire rope plays an important part it is most essential that a man be employed who is familiar with the construction of wire rope and its application. This knowledge has resulted in the employment by most mining companies of an inspector. The duties of the inspector are too numerous to mention, but the mere fact that there is such a position emphasizes the point that wire rope is a part of the equipment that requires expert knowledge, careful handling and the most rigid inspection.

In conclusion, I wish to state that the points covered in this paper are the results of practical experience covering a period of nearly three-fourths of a century. During this time the merits of suggestions offered have been proved by test and actual service, and have been adopted as standards by our engineers.

A Great Byproduct Coke Plant

The Carnegie Steel Co. is progressing well in the construction of the new byproduct-coke plant at its Clairton works. Three towboats and a fleet of barges are nearly completed to carry coal from the company's mines in the sixth pool on the Monongahela to Clairton. Work is in progress on the branch railroad which is to carry the finished coke to the works at Braddock, Homestead and Duquesne, and contracts have been let for the pipe line which is to convey gas from the coke works to the Edgar Thomson and Duquesne plants. This pipe line will be about 10 miles long, in part 40 in. and in part 30 in. in diameter.

The plant at Clairton is to be a large one and the intention is to make it the center of fuel supply for the company's chain of works around Pittsburgh. It is expected to reduce the cost of fuel to these works, besides regulating the supply, and there will be a considerable profit from the byproducts.

Tax Assessment of Michigan Mines

BY A. L. H. STREET*

Under the provisions of the Michigan tax laws, to the effect that for the purposes of taxation the "cash value" of property shall be taken to be its "usual selling value," the price at which an iron mine was recently sold is only a circumstance to be considered in assessing the property, and is not conclusive as to the "cash value" of the mine, according to the decision of the Michigan Supreme Court recently announced in the case of Cleveland-Cliffs Iron Co. vs. Republic Township, 163 Northwestern Reporter, 90.

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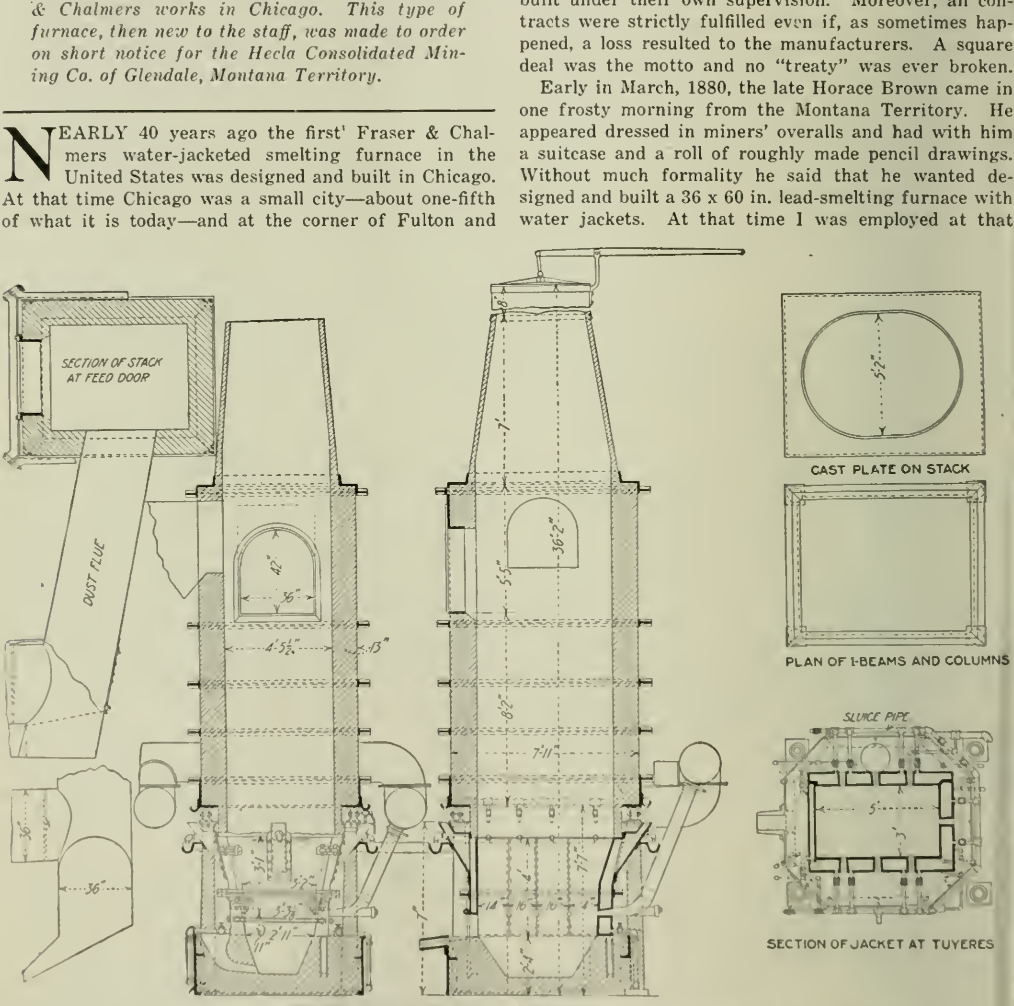
An Early Type of Water-Jacketed Smelting Furnace

By CHARLES C. CHRISTENSEN*

An account of the building of the first water-jacketed lead-smelting furnace at the old Fraser & Chalmers works in Chicago. This type of furnace, then new to the staff, was made to order on short notice for the Hecla Consolidated Mining Co. of Glendale, Montana Territory.

NEARLY 40 years ago the first[1] Fraser & Chalmers water-jacketed smelting furnace in the United States was designed and built in Chicago. At that time Chicago was a small city—about one-fifth of what it is today—and at the corner of Fulton and Union Sts. there was a machine shop where mining machinery was made. Mining men from the Western territories, whenever they had some new ideas, made a "bee line" for this Chicago corner because at the Fraser & Chalmers shops they could have their ideas transformed into drawings, specifications and machinery built under their own supervision. Moreover, all contracts were strictly fulfilled even if, as sometimes happened, a loss resulted to the manufacturers. A square deal was the motto and no "treaty" was ever broken.



SECTIONS OF WATER JACKET FURNACE

DESIGN OF A FURNACE BUILT IN 1880 AT THE FRASER & CHALMERS WORKS IN CHICAGO

Early in March, 1880, the late Horace Brown came in one frosty morning from the Montana Territory. He appeared dressed in miners' overalls and had with him a suitcase and a roll of roughly made pencil drawings. Without much formality he said that he wanted designed and built a 36 x 60 in. lead-smelting furnace with water jackets. At that time I was employed at that interesting corner as a mechanical engineer and draftsman, and was appointed to wait on Mr. Brown and make all the drawings to suit his idea.

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[1] In volumes 40 and 41 of the "Journal," 1885 and 1886, the question as to who built the first water-jacketed furnace was thoroughly discussed. Two communications are reprinted on p. 844 of this issue. In the "Journal" of Nov. 9, 1878, on p. 329, F. Kupelmeiser describes briefly the type of furnace used by the Detroit and Lake Superior Smelting Co. at Hancock and at Detroit, Mich., for smelting slags from Lake Superior copper ores. The boshes, he says, were formed by a hollow casting, 1 ft 8¼ in. high, cooled with water.—Editor.]

This was before the blue-printing time. The general drawings were made on heavy, white paper, inked and colored to show the different kinds of material. A tracing was made of these drawings for the customers. The details were drawn on plain yellow paper, inked and traced. These tracings were pasted on heavy cardboards, varnished over and forwarded to the shops. Sometimes even the general drawings had to be forwarded to the shops—for instance, when a new machine, never built before, had to be assembled before shipment. So it was in this case and the shopworn condition of the original drawing is responsible for any variations in the accompanying reproduction.

The curb of this furnace was 2 ft. 4 in. high, and had heavy, ribbed cast-iron sides made up in six sections and bolted together as shown. The cast-iron spout was bolted to the end curb plate under the tap opening. The water-jacketed portion of the furnace was 36 x 60 in. at the tuyere line and 48 in. high. It consisted of eight cast-iron side jackets, two rear-end jackets, all boshed 8½ in., and one straight, front-end jacket, 37 in. high, leaving the 11-in. high tapping breast. All the jackets had ears cast on, for connection by clamps and keys, and were also provided with heavy T-steel binders.

To each jacket was bolted a cast-iron overflow spout with nipples and elbow for discharge into the overflow launder surrounding the furnace. There were seven Y-type tuyeres 3½ in. in diameter tapering to 2¾ in. in diameter in the jacket tuyere openings. They had canvas hose connections to the air gates which were connected by short cast-iron nozzles to the 20-in. bustle pipe. The sluice pipes were laid horizontally on top of the curb, bending over at the edge, and came down below the floor and there connected to a main discharge pipe running outside the furnace building.

The supply water main was placed right above the overflow spouts with a tee and nipple connecting to each spout. Hangers, supporting this water main, were bolted on the brick-stack deck plate. Four cast-iron columns, 7 ft. long, 6 in. in outside diameter at top, 8 in. in outside diameter at bottom, of 1-in. metal, supported the mantel frame which consisted of two 7-in. 15-lb. I-beams at the sides and ends, with corner angles, pipe spacers and bolts for connections.

Upon the mantel frame rested the heavy, cast-iron angle deck plate supporting the brick stack, the outside dimensions of which were 7 ft. 11 in. by 6 ft. 7½ in., with 13-in. thick brick walls. The binders were made of T-steel—five sets as shown—clamped together at the corners by U-bolts, washers and keys. To the cast-iron top plate was bolted a sheet-steel, conical hood, 7 ft. high, which was brick-lined. On top of the hood was a steel stack, 8 ft. high and 48 in. in diameter, with damper, also brick lined. The feed-door frame, 36 in. wide by 42 in. high, was of arched design. The downtake opening was 36 x 36 in. with circular top. A sheet-steel downtake of same dimensions, with damper, completed the furnace.

The general dimensions were as follows: Floor to top of curb, 2 ft. 4 in.; to tuyere line 3 ft. 3 in.; to top of jackets 6 ft. 4 in.; to stack deck plate 7 ft. 7 in.; to charging floor 15 ft. 9 in.; to top of brick stack 21 ft. 2 in.; to top of hood 28 ft. 2 in.; and total height of furnace, with stack, 36 ft. 2 in. The furnace was designed, built and shipped in a remarkably short time. It was built for the Hecla Consolidated Mining Co., of Glendale, Montana Territory. The capacity of the furnace was 50 tons of charge per day of 24 hours.

Rumanian Consolidated Oilfields

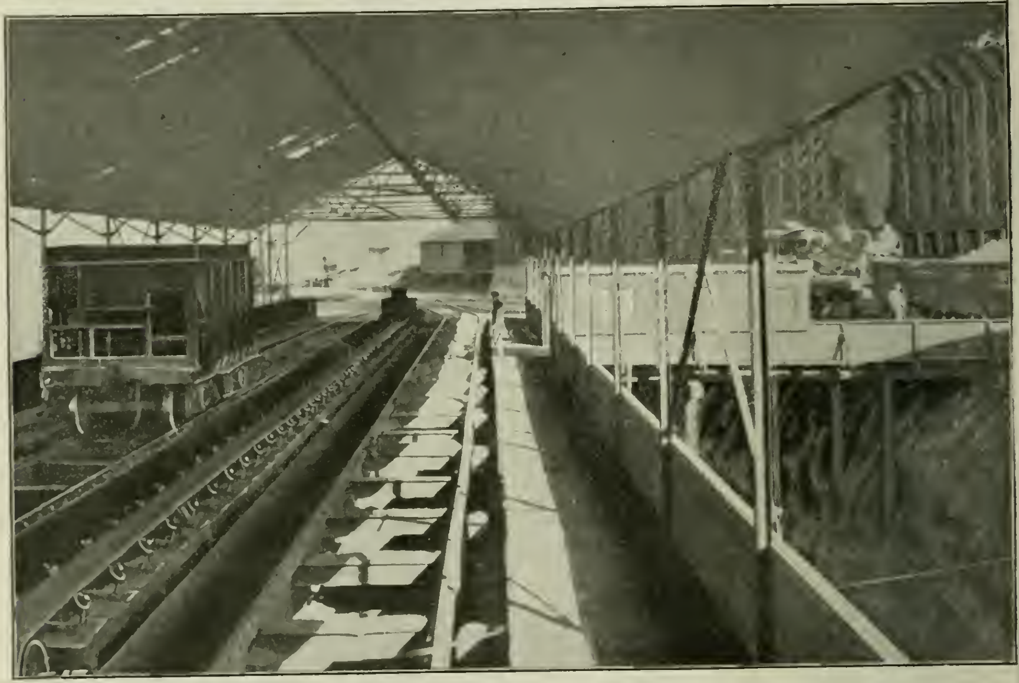
The report of the Rumanian Consolidated Oilfields, Ltd., for the year ended June 30, 1917, shows that the operations of this company are now suspended and the works and other improvements destroyed. During its first four years a total of £500,537 was earned and was mainly employed in development and extension. While the development work incident to every new undertaking was being actively carried out, crude oil was produced to the amount of 313,628 tons, and, notwithstanding all the difficulties caused by the European war (in which Rumania was neutral until the end of August, 1916), the company's position in November, 1916, was: Acreage (upwards of 90% still undeveloped and large areas not yet tested), over 5000 acres; refineries, two; workshops, five; oil pipelines, 175 km., steam, water and other pipelines, 120 km.; tankage on fields, etc., 60,500 tons; tankage at Constanza (for shipping purposes), 5000 tons. The company had installations with producing wells at Bana Moreni, Baicoi, Chiciura, Bordeni, Telega, Bustenari and Campina, all of which were in operation in November, 1916. In that month and in December, for military reasons, the property was carefully and systematically destroyed.

The destruction of the works and plant has been so complete that the company will have to begin exploitation all over again. Its claim against the British government is for £1,270,700, and in addition it asks for 5% per annum interest on this sum as from Nov. 27 last to the date of payment. For its own property the Rumanian Consolidated claims £856,100, the chief items being £235,100 for wells, £197,700 for stocks of oil and refined products, £102,800 for pipelines and fittings, £80,900 for materials in stores, £61,500 for tanks and £46,800 for drilling tools. For the Chiciura (a controlled) property the claim is £136,500. A sum representing loss of earning capacity during replacement calculated at 8½% interest for two years on the more or less fixed assets means an addition of £278,100. Besides this the company expects to put in other claims. These would cover any material damage done to such lands and damages for the expiry and possible loss of some of the leases during hostile occupation.

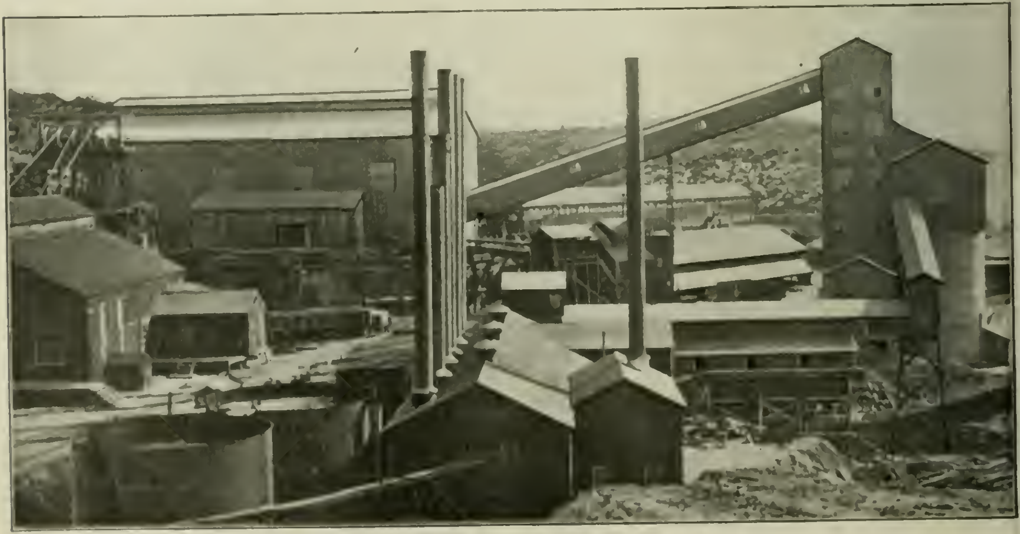
There are 14 English companies in a similar position and it is proposed to form some sort of amalgamation for the purpose of presenting their claims in a systematic manner and making some arrangements to resume work after the war.

Coke-Oven Accidents, it appears, are greater on byproduct coke ovens than in the case of beehive ovens. According to statistics collected by Albert H. Fay, of the United States Bureau of Mines, the fatality rate for all ovens in 1916 was 1.32 per 1000 men employed, and was 1.21 in 1915. The total number of men reported employed in this industry was 31,603 in 1916, and the number of coke ovens in operation 68,796, of which 7090 were byproduct ovens. The fatality rate for beehive ovens was 1.29 per thousand 300-day workers, and for byproduct ovens 1.35; corresponding rates for 1915 were 0.65 and 1.75. The byproduct-oven injury rate last year was 217.09 as compared with 100.37 for the beehive oven.

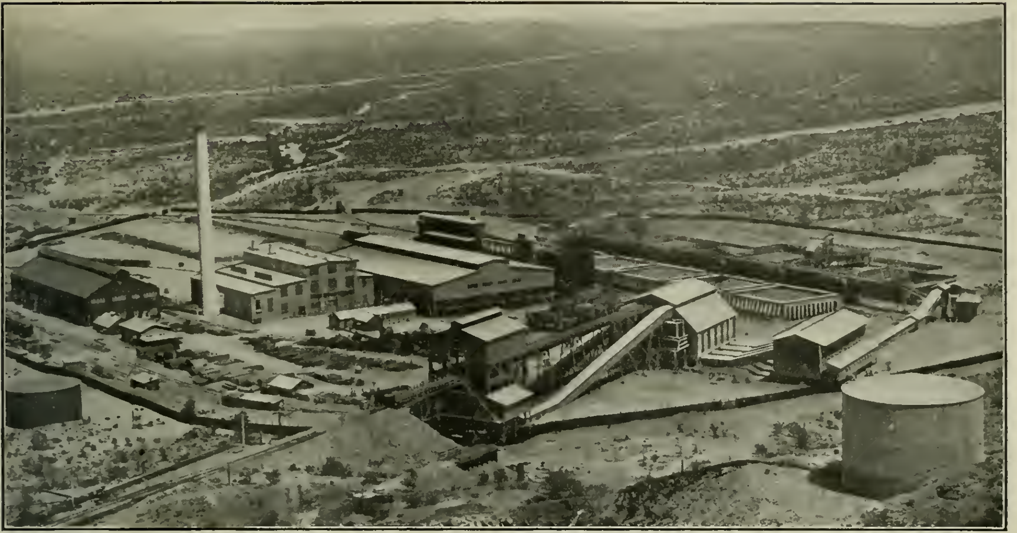
Photographs from the Field



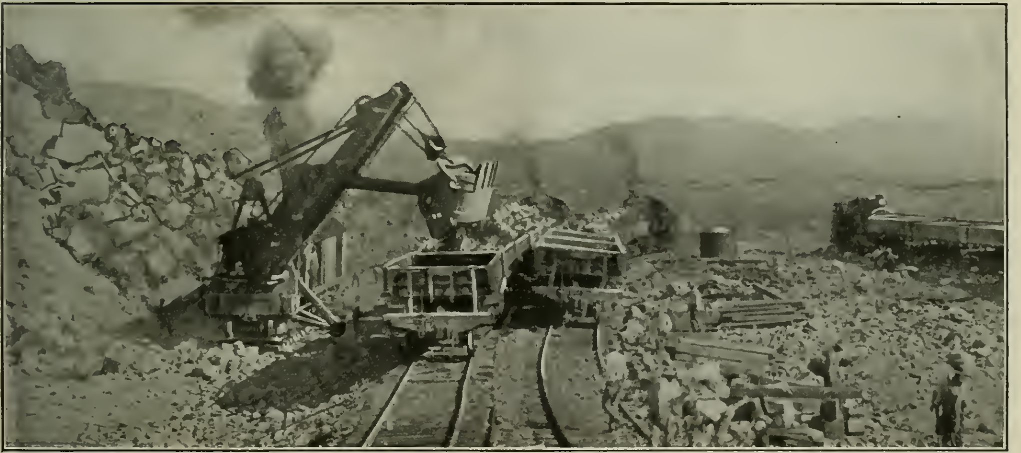
STOCK BINS AT OLD DOMINION SMELTERY, GLOBE, ARIZ., SHOWING TRACK SYSTEM



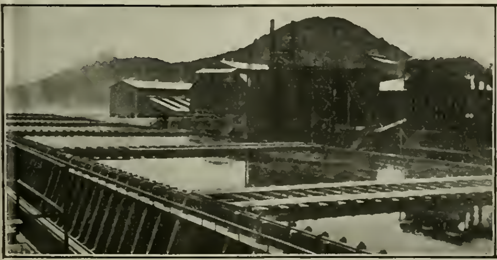
CRUSHING AND SAMPLING PLANTS AND ORE-STORAGE BINS AT OLD DOMINION CO., GLOBE, ARIZ.



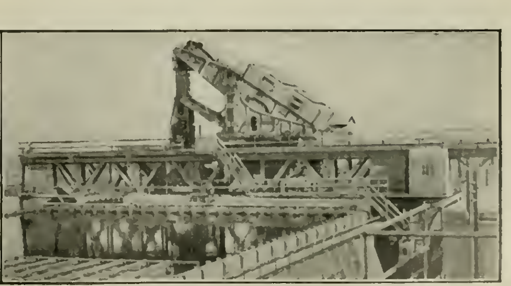
GENERAL VIEW OF THE WORKS OF THE CORNELIA COPPER CO., AT AJO, ARIZ.



STEAM SHOVEL AT THE NEW CORNELIA COPPER CO.'S PROPERTY AT AJO, ARIZ.



LEACHING TANKS AND ROASTERS



HULETT UNLOADER AT LEACHING TANKS

Correspondence and Discussion

Some Observations on Arizona Strikes

In an article entitled "Some Observations on Arizona Strikes," published in the *Journal* on Oct. 13, 1917, the statement was made: "The situation at Clifton-Morenci was more like a real strike than at any other place. About two years ago a four-months' strike occurred in the district which was finally settled by concessions on the part of the mine operators."

The operators of this district have called to my attention the fact that this might be misinterpreted. At the outset of the strike in September, 1915, the operators made the statement that they would take up the question of grievances, wages, etc., just as soon as the Western Federation agitators had been eliminated; the strike was really settled and the men returned to work after the elimination of the Western Federation of Miners about four months later, the local unions having abrogated their charters and returned them to Denver headquarters. This was the real settlement of the strike, for the men returned to work under exactly the same conditions as when they struck; but shortly after operations were resumed and conditions had become normal, the managers called a conference of their employees to discuss conditions, the result of which was the drawing up of an agreement to cover the working conditions of the future. CHARLES F. WILLIS.

Tucson, Ariz., Oct. 19, 1917.

[A satisfactory adjustment of the 1917 labor troubles in the Clifton-Morenci-Metcalf district appears to have been effected by President Wilson's Mediation Commission, which on Nov. 1 informed him that the strike had been settled and resumption of output assured.—Editor.]

The Zinc Situation

The *Journal* has recently referred to the spelter market as having probably reached bottom, because a large share of the zinc output of this country is now being produced at cost or below. This is very much the case in the Joplin district, where the Webb City sheet-ground camp is almost entirely shut down and the mines are being abandoned and flooded. Yet the sheet-ground mines have yielded one-half of the output of the district for the last 10 years. Under the stimulus of high ore prices the new Miami field has been rapidly increasing its yield of zinc and lead. But even in the Miami camp the majority of the mines find that there is now no profit in producing ore to sell at $60. This price represents less to the miner today than did $40 in 1914. Wages, dynamite, fuel and all other items of cost are about double what they were in normal times. Referring again to the opinion of the *Journal* that the price of zinc has hit bottom, unless production is to be radically curtailed: That is the condition in October. But looking forward into the near future, three conditions stand out against production being maintained: (1) Cold weather; (2) increasing scarcity of labor; (3) increasing scarcity of fuel. To these may be added the dampening effect of low ore and metal prices.

About 10% of our miners have gone into military service. These, obviously, have been our most vigorous and efficient young men. The same thing has occurred in the coal fields and already, before winter has set in, the fuel question has reached a hand-to-mouth situation. A blind man can see shutdowns and curtailment ahead.

In war time, when zinc and lead are vital items in industry and with labor and fuel shortage plainly impending, it would seem bad business or "non-preparedness" to press prices down to the point of reducing production. In normal times a surplus production will correct itself by reducing the price of the product. But now, with growing shortage of fuel and labor so certain, the forcing down of production seems an error and the creation of moderate reserves would appear a wiser policy. TEMPLE CHAPMAN.

Joplin, Mo., Oct. 29, 1917.

Recovery of Pyrite From Coal

I notice that on p. 513 of the Sept. 22 issue the *Journal* has summarized my University of Illinois bulletin entitled "The Utilization of Pyrite Occurring in Illinois Bituminous Coal." As a footnote the *Journal* published the following statement: "The flow sheet is reproduced from the original in which the screenings size and No. 5 nut seem to be transposed."

The flow sheet is as I intended. The coal called screenings size is in Illinois generally all sizes mixed from 1½ or 2 in. down to 0, so that evidently the tailings product coming from a Harz jig which treats 1½ to ¼ in. would approximately be of screenings size. The coal referred to as No. 5 nut is the undersize from a ¼- or ⅜-in. hole. This size would, of course, be comparable with the Wilfley table tailings from treating a product under ¼ in. in size. E. A. HOLBROOK.

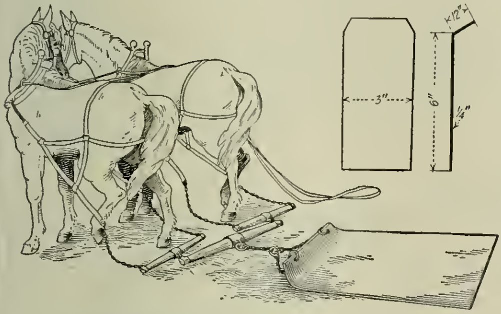
Urbana, Ill., Oct. 4, 1917.

[The *Journal* is glad to learn authoritatively the data regarding sizes of Illinois coal. The "Pittsburgh scale" for bituminous coal, formerly used in many of the Western fields (with the apparent exception of Illinois) provided for four grades: Run-of-mine, or unscreened coal; lump, which includes all coal passing over a straight-bar screen with bars 1¼ in. apart in the clear; nut, which includes all coal passing through a 1¼-in. and over a ¾-in. screen; slack, including all that passes through the ¾-in. screen. In the 35th Annual Coal Report of Illinois, 1916, the grades of Illinois coal are indicated on p. 23 as: Mine-run, lump, egg, nut, pea or screenings, and slack or waste. Professor Holbrook can hardly blame the *Journal* for presuming that the 1916 Illinois grades were still in fashion.—Editor.]

Details of Practical Mining

Sheet-Steel Slip for Hauling

An excellent conveyance for hauling loads, such as castings, pipe, drill steel, etc., may be made from a piece of discarded sheet steel, about 3 x 6 ft., bent up at one end to avoid obstructions, and fitted with a set of double trees for a team.

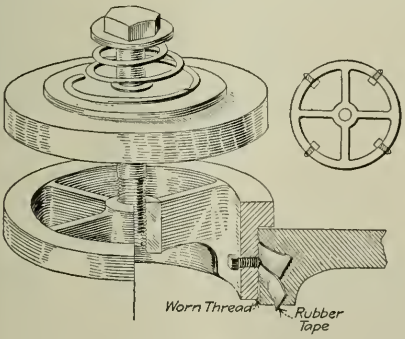


SLIP FOR HAULING MADE FROM OLD STEEL PLATE

A great advantage over a wagon is the ease with which it can be loaded, as it is not necessary to lift the material up 3 or 4 ft., which is the case with a wagon, thereby effecting a saving both of time and labor.

Loose Pump-Valve Seat Secured To Prevent Shutdown

Quick repairs are sometimes necessary in order to avoid an expensive shutdown, and in many cases a simple remedy applied quickly will keep things going until there is time to make permanent repairs. J. W. Stanley in *Power* tells of a method used in making temporary repairs on a boiler-feed pump. The threads in the valve plate of one of the suction-valve seats were so corroded that nothing was left to hold the valve seat in place and it was necessary to get the pump in working order as soon as possible. Four holes were drilled and tapped for ¼-in. setscrews through the side of the valve seat and midway between the ribs. The valve seat was wrapped around with two turns of insulating tape, driven to a solid seat and the setscrews tightened. This gave satisfactory service until permanent repairs could be made.



SETSCREWS TO HOLD VALVE SEAT IN PLACE

A Tack Map for Superintendents

To secure a better idea of the conditions existing in a group of mines that had been worked in a haphazard manner, H. D. Easton makes use of a tack map which he explains in *Coal Age*. The tack map shows each working place and what progress is being made from week to week.

Moore push-points in different colors are used, the scheme of colors, or legend, being: Blue, for narrow work, such as entries and aircourses; red, for rooms; white with black eye, for robbing work; orange, for air punchers; yellow, for electric mining machines; purple, for pumps; black, for siphons; white, for fans; and green, for sidetracks.

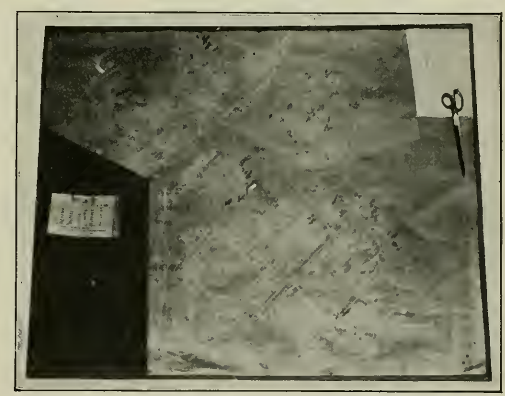


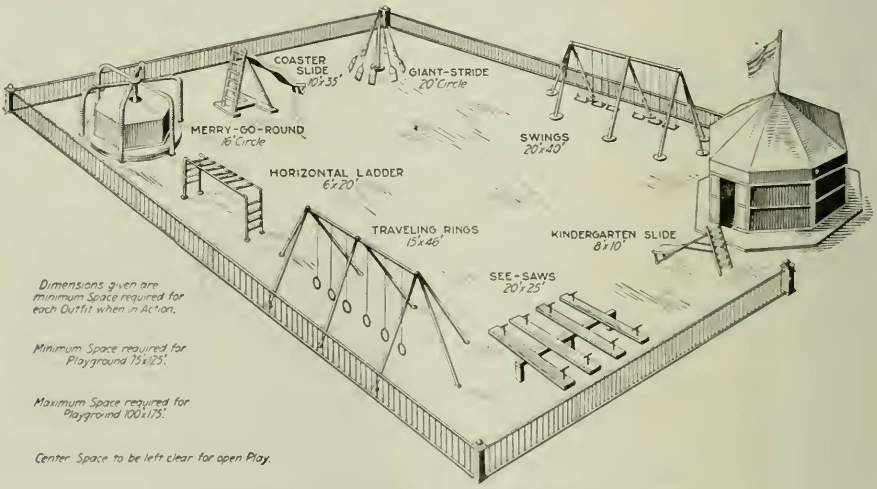
ILLUSTRATION OF TACK MAP

A single blueprint map, showing five mines on a scale of 300 ft. to the inch, is fastened to a board background on an easel so as to be easily moved. This arrangement places the tack map within reach so it can be studied and the tacks shifted about to keep pace with changes inside the mines.

The daily mine foreman's reports are provided with a place for noting information for the engineering department, members of which are required to keep all mine maps up to date, give sights for all new rooms and immediately measure up and map every worked-out place. Each foreman is instructed to write on his daily mine report "sights needed" and "places driven up," and the engineers must note these things from the reports, which are kept on file at the desks of the assistant superintendent and the chief mine foreman. The engineers move the tacks on the map each week.

Playgrounds for Miners' Children

The modern idea for maintaining good labor conditions at mining properties is to select men that are fitted for the work to be done and then make the environment such that the workers will feel at home. Wanderers are seldom efficient, and a constantly changing working force is a direct cause of high costs and of a high accident rate. Where there are no children, no true homes exist. When children live in a mining community, the natural exuberance of childish activity tends to lead them into dangerous forms of play unless something is provided to transmute "devilishness" into harmless mischief. In a recent issue of *Coal Age* some good suggestions for playgrounds are given by H. Blain Lacy[1] and in the accompanying illustration is shown a form of playground which has proved a good investment in the coal-mining regions of Pennsylvania. With an attraction like this, the attendance of children at the waste pile, tipple and railroad tracks falls off, and a source of hindrance to the operation of the mining plant is minimized.


COASTER SLIDE 10'x35'
GIANT-STRIDE 20' Circle
MERRY-GO-ROUND 16' Circle
SWINGS 20'x40'
HORIZONTAL LADDER 6'x20'
TRAVELING RINGS 15'x46'
KINDERGARTEN SLIDE 8'x10'
SEE-SAWS 20'x25'
Dimensions given are minimum Space required for each Outfit when in Action.
Minimum Space required for Playground 75'x125'.
Maximum Space required for Playground 100'x175'.
Center Space to be left clear for open Play.

LAYOUT FOR A PLAYGROUND FOR MINERS' CHILDREN

In the playground shown, the various pieces of apparatus are grouped around a common center, which is left vacant for running games, drills, etc. It is important that apparatus should be so constructed that there is no danger of its working loose from the severe vibration to which it is subjected. A joint recommended by the author is that of the "Diamond" all-steel playground apparatus, which consists of the pipe being held securely in the fittings by means of compression dogs. The dogs are drawn tight by means of bolts which fit close into the fitting, eliminating any protruding setscrew. In the summer house is a sand pile and around the inner wall is a bench. Experience has shown that the mothers in a mining community like to bring their small children to play in the sand pile, while they can sit and knit and gossip a bit or do odd jobs of sewing as they tend the little ones and at the same time keep their larger progeny more or less under surveillance.

It has been found that a playground will give better results if placed in charge of an instructor a few hours every day. As a rule, the school teacher of the community is the best instructor for a summer playground. Where several mines are situated within easy communication, it is a good plan to secure the services of an experienced playground instructor to spend a few hours each day at each of the playgrounds. The children can be directed in their play and taught beneficial games which can be continued after the supervisor leaves.

At one mine, where such a playground was installed, the superintendent is quoted as saying that it paid for itself in a short time by the saving of broken windows in the community. At another property, where no playground had been installed, three miners stated as their reason for quitting that at the neighboring mine there was a place for their children to play.

Two Narrow Roads Instead of One Wide Road

In Italy there are numerous single-track roads through the mountains, whereon traffic is permitted to travel only in one direction, according to *Engineering and Contracting*, Sept. 5, 1917. This, of course, necessitates two parallel roads to accommodate traffic in opposite directions, but it has been found not only that two narrow roads can usually be built more cheaply than a single wide road but that there are fewer accidents, for collisions are impossible. A narrow side-hill cut can often be made entirely in earth where a wide side-hill cut would run into rock. Moreover, where the traffic is entirely in one direction, sharper curves can be used.

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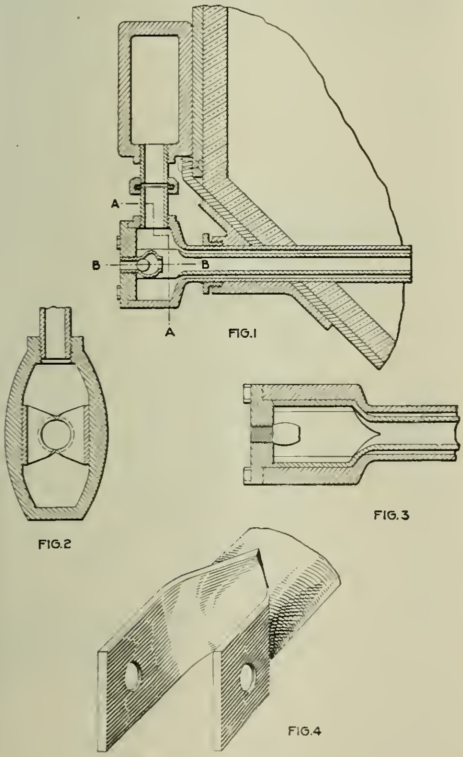
[1] President, Safety First Supply Co., Pittsburgh, Penn.

Details of Milling and Smelting

Golden's Converter Tuyere

The converter tuyere shown in the accompanying drawing was devised by George D. Golden[1] while working at the United Verde Copper Co.'s old smelting plant at Jerome, Ariz. The construction was patented (U. S. No. 1,229,938, June 12, 1917) by Mr. Golden, who gives some particulars regarding its construction. The device is intended to provide an improved tuyere which may be quickly and easily removable, this being accomplished by placing an inner tube in the tuyere, capable of independent removal without injury to the converter shell. Mr. Golden states that permission was secured to experiment at Jerome with two 2-in. tuyeres placed at the center of the converter, the remaining 14 tuyeres of the converter being of the original kind, made of 1½-in. pipe. Within the two 2-in. tuyeres were placed 1½-in. pipe running the full length of the tuyere and connecting with the wind box in such a manner as to allow the blast to pass between the inner and the outer tube; also through the inner tube. After the converter was burnt out and the brick all gone from around the 14 original tuyeres there still remained 6 in. of brick around and between the two 2-in. tuyeres having the inner tubes. In the event of the blast being suddenly shut off from a converter equipped with these tuyeres, it is claimed that the inner tubes can be readily removed. The inner tube is kept in a relatively cool condition by a circulation of air, and the metal which is more or less drawn within the tuyere by the hot punch rod does not stick on the tuyere; also the inner tube tends to prevent the brick from being jarred or torn away from the outer tube during punching. Referring to the illustrations, Fig. 1 shows the enlarged sectional view through the tuyere with a segment of the converter body. Fig. 2 represents a vertical sectional view on the line AA; Fig. 3 a sectional view on the line BB, and Fig. 4 a segmental perspective view of the removable inner tube removed. It will be noticed that the splitting of the end of the removable inner tube permits a method of fastening it in place and still allowing the air to circulate around the inner tube.



GOLDEN'S INNER-TUBE CONVERTER TUYERE

Hydro-Metallurgical Treatment of Concentrate vs. Smelting

By A. E. Drucker[*]

I would like to bring to the notice of mine owners the importance of treating, when possible, all table and flotation concentrate on the spot, thereby avoiding the present high cost for marketing such material. The cost for drying, bagging, carting, shipping, sampling, smelting and deductions, refining, and other charges will vary between $9 and $40 per ton of concentrate. Cyanidation of raw and roasted gold- and silver-bearing concentrate has within the last few years saved many hundreds of thousands of dollars for various mining companies in different parts of the world. The Oriental Consolidated of Chosen, the Alaska Treadwell, the Goldfields Consolidated of Nevada, the North Star of California, the Golden Horseshoe, Lake View, Brownhill, and Ivanhoe companies of Australia, and the Waihi company in New Zealand, are a few examples. The cost for treating concentrate varies between $2 and $6 per ton, while the extraction (90 to 97%) of the precious metals by wet processes was equal and sometimes more than that allowed by the smelter.

Up to the present time several companies (Anaconda, for instance) have solved the problem of hydro-metallurgical treatment of zinc concentrate, producing electrolytic zinc direct for the market. Many old smelting methods are being gradually replaced by more economical wet methods. There is also at our disposal a hydro-metallurgical method for the recovery of marketable copper on the spot from table and flotation concentrate. Combined roasting, acid-leaching, and electro-deposition may in the near future be a serious competitor to smelting. Such a process would cost from \$3 to \$6 per ton, and would effect a considerable saving over the usual methods of transporting and smelting concentrate.

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[1] Converterman, Humboldt, Ariz.

[*] Consulting engineer, 50 Church St., New York.

First Water-Jacket Blast Furnace

It is usually dangerous to state that anything is the first or largest of its kind. An article appearing in this issue concerning an early copper blast furnace recalls a lengthy discussion that appeared in the *Journal*, more than 30 years ago, as to the original inventor and date of invention of the water-jacket furnace for lead and copper smelting. During 1885 and 1886 a number of letters on this subject were received from Messrs. Harnickel, Rolker, Courtis, Kleinschmidt, Williams, Hahn, Howe, Arents, Douglas, Daggett, Curtis, and Tew. Two of these communications are here reproduced:

> (From the *Engineering and Mining Journal*, Sept. 12, 1885, p. 180)
>
> In your issue of the 22nd of August, you speak of Balbach's Works, at Newark, N. J., in 1873, as being the probable place and time of the first use of the water jacket. About the year 1865 the father of the writer, Mr. John Williams, then manager of the Portage Lake Smelting Works, at Houghton, Lake Superior, erected a number of water-jacket cupola or blast furnaces for experimental smelting of the Calumet ores, and these furnaces are the first erected to my knowledge. If there are records of any earlier water jackets, I should be interested to learn of them.
>
> J. J. WILLIAMS
>
> San Francisco, Calif., Aug. 31.

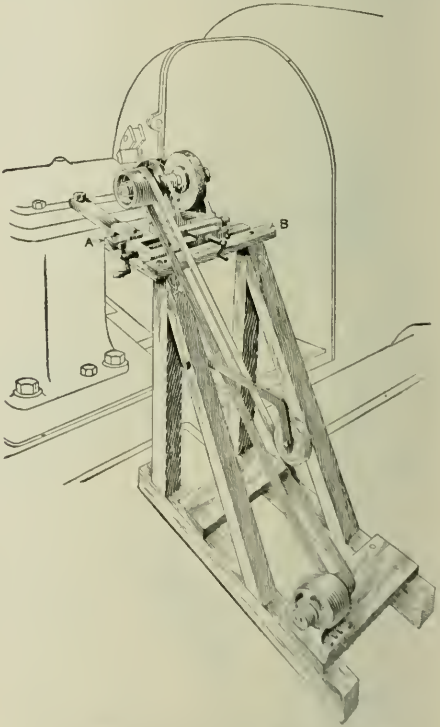
> (From the *Engineering and Mining Journal*, Nov. 7, 1885, p. 318)
>
> In response to your inquiry regarding water jackets in lead smelting I would say that in the summer of 1872 I made drawings for a set of cast-iron water jackets. They were made in Council Bluffs, and set up and started at the Winnamuck Works, in Bingham Cañon, Utah, then in my charge, in the fall of 1872—just what month I cannot state.
>
> Their introduction cannot be attributed, notwithstanding Mr. Hahn's suggestion, either to the drawing of the Raschette furnace in Percy's *Lead*, as that work did not form a part of my library till 1873, or to the pamphlet of the McKenzie cupola and blower, which, as I now recollect it, was for an iron-foundry cupola not water-jacketed at all. The idea originated with Mr. Meyers, then my foreman, and myself, and was simply the outgrowth of necessity, to avoid too frequent interruption for repairs.
>
> In the year 1875 I saw in successful operation at the Muldenerhütte, in Freiberg, a large (62 tons of material a day) furnace with wrought-iron water jackets, which I was told had been put in during the latter part of the year 1872. The above are the first uses, so far as I know, of water jackets in lead smelting. In the years 1873 and 1874 they were introduced into the Flagstaff and other works in Salt Lake Valley.
>
> ELLSWORTH DAGGETT.

The question attracted some attention at the time, in view of royalty claims made by J. V. Woodhouse, of Missouri, as noted on p. 61 of the *Journal* of July 25, 1885. The claims were made by virtue of U. S. Pats. No. 115,921, dated June 13, 1871, and No. 168,440, dated Oct. 5, 1875. A test case was brought against the Colorado Iron Works. In corroboration of Mr. Daggett's claim there may be cited the fact that he made definite mention of a "water tymp" in describing the Winnamuck furnace in an article appearing in the *Journal* of July 1 and July 8, 1873. The main design was after the Pilz furnace at Eureka, Nevada, erected by C. von Liebenan in 1870. Until further testimony is advanced, it may be assumed that the Williams furnaces in Michigan were the first of their kind in the United States.

Grinding Collector Rings on Turbo-Generators

An arrangement for grinding the collector rings on a turbo-generator, etc., is shown in the accompanying sketch published in *Power*, Oct. 2, 1917. This consists of a frame made of 2 x 3-in. stock. An extension piece *A* is secured in place by two cross-irons and bolted securely. This headpiece forms a bed for the emery-wheel carriage, the body of which is bolted in place between the headpieces *A* and *B*. The emery-wheel carriage is moved endwise by means of a threaded rod that screws into a thread hole in the bottom of the carriage body. A cross movement for the bearing body is obtained in a like manner. In fact, the lengthwise and crosswise movement is practically the same as the cross feeding is accomplished on the cutting tool of a lathe.

When the collector rings require regrinding, as they do frequently because of the flat surface that forms opposite the wire connection, the rig is placed in position and an iron brace is bolted to the bearing cap by one of the cap bolts. This brings the 7-in. emery wheel close to the collector rings, and further adjustment is had by the hand-feed screw. On the base of the frame a ¼-hp. motor is secured and belted to the 12-in. diameter, 12-in. wide, flat-face pulley on the emery-wheel shaft. In order to provide for a back-and-forth movement of the emery wheel, an idler pulley is used to take up the slack of the belt.



RIG FOR GRINDING COLLECTOR RINGS

Events and Economics of the War

The Teuton drive into northern Italy continues. The Italians, after attempting to hold their positions at the Tagliamento River, have again been obliged to fall back, having lost to date 200,000 men and 1800 guns—which losses are mainly workmen and machine guns, according to word from Rome. French and British troops are moving to their aid. The embargo here has been modified to permit Italy to obtain much needed supplies. The Germans have fallen back a mile in the Aisne sector, being closely followed by the French forces. A German cruiser and 11 patrol boats were sunk by the British in the Cattegat. Norway has protested to Berlin against the sinking of her ships by U-boats. A German uprising in southern Brazil is reported.

In this country little of importance has happened during the week. Francis S. Peabody has been appointed to administer the Explosives Act. A Federal board has raised the wage scale from 10 to 30% for shipbuilders on the Pacific Coast. Strikes have occurred at 21 Kansas coal mines and among oil workers in the Texas-Louisiana field. The American transport "Finland" was torpedoed on her return voyage, but succeeded in returning to a European port.

Food License Plan in Operation

The licensing system through which Food Administrator Hoover purposes to control the price of food to the consumer is now in effect. The Food Administration has so complete a control over the manufacturer, the wholesaler and the jobber that it is possible indirectly to govern the prices and practices of the retail dealer. This is the first important step in the campaign to keep prices of all fundamental foodstuffs at their normal levels throughout the United States. The manufacturer is prohibited from selling above a certain price and the wholesaler and jobber likewise may not sell at exorbitant prices on pain of losing their licenses. Control over the retailer is obtained by forbidding the wholesalers to sell to any person or firm which is charging more than a legitimate retail price to the ultimate consumer.

Over 40,000 licenses have been applied for, of which number 18,000 have been prepared for issue. The purposes of the licenses are: Limitation of the prices charged by every licensee to a reasonable amount and prevention of speculative profits on a rising market; movement as rapidly as possible of all foods to the consumer; limitations of dealings in future contracts. Persons who have applied for licenses may continue to operate, unless advised to the contrary, on the assumption that the licenses are in process of issuance. Those who have not yet applied are counseled to do so at once, and thus escape penalty for failure to comply with the rule governing applications. Retailers doing a gross business of more than $100,000 annually must take out licenses as well. The regulations are to be issued in pamphlet form to all dealers licensed, and will be sent with the licenses. The Food Administration plans to keep in close touch with the operations of all licensees through a system of monthly reports. These will include statements as to the volume of business done and the amount of stock on hand at the beginning of each month.

New War Taxes in Effect

Many new taxes imposed by the War-Revenue Act went into effect on Nov. 1. They include:

One cent on each dime paid for amusement admissions.

Three per cent. on payments for freight transportation.

Eight per cent. on passenger fares except for commuters traveling less than 60 miles per day.

Ten per cent. on payments for Pullman and similar accommodations.

Five per cent. on oil pipe-line transportation.

One cent for each 20c. or fraction paid for express packages.

Five cents on each telegraph, telephone or radio message costing 15c. or more.

Various taxes on cigars, cigarettes, tobacco and products.

Ten per cent. on club dues and lodge fees that are $12 per year or more.

Eight cents on each $100 of new life insurance.

One cent on each dollar of premiums paid on fire, marine, casualty and other insurance policies.

Increases in first-class mail rates probably will be most generally felt by the people. The law provides that the postage on letters except "drop" or local letters shall be 3c.; and that on postcards, including private mailing cards, shall be 1c. more than heretofore. This increase includes picture postcards. The advances are construed to begin with letters and postcards postmarked Nov. 2. Other taxes of the new law, including those on hard and soft drinks, incomes and war-excess profits, have been in effect since the law was approved Oct. 3, but in indirect form. On Dec. 1 the new stamp taxes, including those on parcel-post packages, will be payable, putting the entire law into complete operation, except for increased rates on second-class mail, postponed until July 1 next.

Business Votes on Price Control

Sentiment on the part of business men throughout the country for legislation permitting fuller price control by the Government during the war has been indicated by the vote cast in the referendum recently conducted by the Chamber of Commerce of the United States through its constituent bodies. On the question of whether there should be additional price-controlling authority during the war the favorable vote was 974, 110 votes being cast in the negative. The organization voted 978 to 116 that authority to control prices should be extended to all articles of importance in basic industries and to those necessary in everyday life, and also that price control should extend to the prices the public has to pay as well as to those that the Government pays. The proposal that price-control authority should be vested in a small board appointed by President Wilson was supported, as was the suggestion that an agency working with such a board should have power to distribute available supplies where they would most benefit the public. It was also voted that each leading industry should have a representative to advise with price-control and distribution agencies.

Organizing the Alien Property Bureau

By executive order the President has vested A. Mitchell Palmer with full powers as Alien Property Custodian, requiring him to give bond in the amount of $100,000, fixed his salary at $5000 a year and allotted money for carrying out the Trading-with-the-Enemy law. Mr. Palmer is authorized to form whatever organization he deems necessary, to designate depositaries for property taken through the operation of the law and to require these depositaries to execute bonds. Any banks or trust companies may be named by Mr. Palmer to receive stocks, bonds, notes, time drafts, bills of exchange and any other securities or properties except money, checks and demand drafts of enemy aliens and allies of enemy aliens. Money was allotted to the Treasury Department, the Federal Trade Commission and the War Trade Board by the executive order for the investigation work they will do for the Alien Property Custodian. The sum of $100,000 was made immediately available for the direct use of Mr. Palmer's organization. The time in which reports must be made to Mr. Palmer of property and money which should come into his custody has been extended until Dec. 5, owing to the delay in the custodian's appointment.

J. Lionberger Davis, president of the Chamber of Commerce of St. Louis and vice president of the St. Louis Trust Co., has been named as Mr. Palmer's chief assistant. Mr. Davis will be known as managing director of the Alien Property Bureau. In reality he will be president of what will virtually be an enormous trust company formed under the administration of Mr. Palmer. It is estimated that the property of enemies and alien enemies of which the Alien Property Custodian will take charge will reach $1,000,000,000. Mr. Davis will be in effect the president of the largest trust company in the world. Ralph Stone, of Detroit, Mich., was appointed trust officer and will assist Mr. Davis. He is president of the Detroit Trust Co., one of the largest financial institutions in Michigan.

Conscription of Labor for War Work

The National City Bank of New York in its November bulletin directs attention to the necessity of curtailing private work in order to fill the requirements of the Government, which will necessarily be large, as indicated by the $20,000,000,000 of war appropriations made by Congress.

"The available supply of labor," says the bank, "is limited, and competition for it increases costs without increasing product. The payment of extraordinary wages will attract labor to the war industries, but if it is drawn from coal mines, railways and farms the situation may be so disorganized that even war work will be impeded. The situation is most effectually handled by having the Government exercise priority rights. It is doing this as to materials and equipment, and may have to go further and exercise a priority right to labor If conscription for Government work is deemed impracticable, the object may be accomplished by restricting the employment of labor in non-essential industries."

The imminent necessity of speeding up ship construction was emphasized at a conference on Oct. 29 between Atlantic Coast shipbuilders and officials of the Emergency Fleet Corporation, the Navy Department, the Department of Labor, and the American Federation of Labor. The labor question was discussed in detail, special consideration being given to feasible methods for attracting skilled workers to shipyards. Unless the present labor shortage is relieved without delay, officials may consider methods of conscription.

New Railroad Laws Proposed

Federal regulation of the issuance of railroad securities and additional recommendations for further railroad legislation were indorsed by the affiliated trade and commercial organizations of the Chamber of Commerce of the United States, in a referendum just concluded. The vote strongly backed up a report of the Chamber's railroad committee. Other proposals indorsed were: Passage by Congress of a general railroad incorporation law under which all railroad carriers subject to the jurisdiction of the Interstate Commerce Commission may organize, compulsion of carriers to organize under such law, and recommendation that the Interstate Commerce Commission be given authority to regulate intrastate rates when those rates affect interstate commerce.

Norwegian Nickel for Germany

Germany is soon to receive large quantities of nickel from a plant in Christiania, Norway, for use in manufacturing torpedo tubes, according to information that has reached Washington. The Christiania factory is about to resume operations and beginning in January is expected to deliver 100 tons of nickel a month to the Germans, to whom it will be of great military value. This source of nickel supply has been cut off for some time. Norwegian papers are expressing dissatisfaction that Germany is to receive such aid, in view of the sinking of Norwegian ships by U-boats.

Enemy-Owned Patents Thrown Open

About 20,000 articles covered by patents and copyrights owned in Germany are affected by the order o the Federal Trade Commission prescribing the rules fo licensing their manufacture by citizens of the Unite States, in accordance with the provisions of the Trading with-the-Enemy Act. These include dyestuff formula of vital importance to American industries and mechanical devices of wide use, though the humanitarian effec of the order attracts the widest attention. Germa thought for many years has been in the forefront o medical research, evolving remedies for disease and fo alleviation of pain, all of which that are patented in th United States will now become available in this cou try. Whether prices for drugs so manufactured unde license will be determined by the commission was n announced, but it was intimated that it would saf guard the public against exploitation. Prices of drugs have greatly increased since 1914, many remedies costing ten times as much as formerly.

Losses of German Mercantile Marine

According to the German periodical *Weltwirtschaft*, says the *Iron and Coal Trades Review* (British), the number of German merchant ships lost during the war, and their gross registered tonnages are as follows: Taken at sea, 74, tons 187,000; seized in British ports, 182, tons 456,000; French and Russian ports, 94, tons 143,000; Italian ports, 39, tons 172,000; Portuguese ports, 75, tons 227,000; American ports, 88, tons 630,000; Brazilian ports, 46, tons 236,000; Greek ports, 9, tons 18,500; Japanese ports, 12, tons 24,500; Chinese ports, 11, tons 22,000; total, 630, tons 2,116,000. The list is not complete, as it does not include the nine ships of a total of 19,000 tons, seized by Siam, and probably the number and tonnage of ships seized by China have been understated. Moreover, according to another source, the number of German ships seized by the United States was 101, and their tonnage 636,039 tons. The aggregate tonnage of the German merchant fleet before the war is stated to have been 5,459,296 tons.

Many War-Device Patents

War has caused an anomalous situation in the Patent Office at Washington, where the number of applications for patents on war devices increases daily, and the fear of giving valuable information to the enemy is causing the withholding of patent rights to scores of inventions. The Patents Commissioner's Office has announced that within the last few weeks patents have been refused to about 60 war inventions, acting under the recent law giving the Federal Trade Commission and the Patent Office authority to prevent publication of information concerning patents that the enemy might use.

A corps of West Point and Annapolis graduates, trained in the technical problems of war, scan the thousand or more patent papers issued weekly for details of military significance, and choose those on which patent proceedings should be suspended during the war. Inventors thus deprived of patent rights may offer their devices to the Government, and sue after the war for compensation.

Prices Fixed for Mine-Run Coal at Docks on the Great Lakes

The prices at which various grades of coal shipped o the docks situated on Lake Michigan and Lake Superior may be sold have been announced by the Fuel Administration. These docks are not classed as jobbers or retailers, and hence the rules heretofore promulgated do not apply except to a small proportion of etail business done at the docks to accommodate local onsumers. The bulk of the coal goes to the Northwest and comes from Lake Erie ports. Ordinarily it is reeived as run of mine, screened and separated into the everal sizes by the dock companies before forwarding by rail. The prices announced include the cost of coal at the mines and of transportation by rail to the Lakes and thence by vessel to the docks. For run of mine (or run of pile) the prices range from $6.20 to $7 per ton, the customary differentials being made for lump and screenings. It is estimated that for the remainder of the season 2,292,000 tons shipped for domestic purposes alone will be affected by these prices, resulting in a saving to the domestic consumers of the Northwest for the present year of $1,200,000.

Concrete Ship Launched in Norway

A dispatch from Christiania to a London paper says: "The first Norwegian iron and concrete ship was launched at the Porsgrund Cement Works in the presence of the Prime Minister, M. Knudsen. The ship is built on an entirely new system, with the bottom upward, in which extraordinary position the launching took place on a sort of underlying sledge, which glided out with the ship.

"When the water was reached the hull became detached from the sledge, gradually sank up to a certain point and then subsequently righted itself. This particular ship, which is of 200 tons burden, was built in three weeks, but the next will only require about half that time, as the original frame will be used for each subsequent ship of the same size. The casting of the ship, when the frame is completed, will this time take only two days. It is intended to start the wholesale building of iron and concrete ships of 200, 500 and 1000 tons. A 1000-ton ship will be completed in six weeks."

Export Embargo Raised for Italy

All export restrictions will be waived by the Government in forwarding supplies to Italy to aid in meeting the Austro-German invasion. The Italian government is to be permitted to take the kind of materials needed most to the limit of its tonnage capacity, regardless of prospective shortages here. Request has already been made for 2,000,000 tons of coal and has been granted without hesitation by the Fuel Administration. Approximately 100,000 tons of shipping has been promised Italy by the Shipping Board. The shortage of ships is so serious, however, that the Board has to pick them up as it can find them, and the whole amount of tonnage promised may not be available under 30 days. The shipping the United States is able to release will be totally inadequate to meet the demand for coal and to carry food and ammunition.

F. S. Peabody Appointed to Enforce Explosives Law

Francis S. Peabody, Chicago coal operator and chairman of the Committee on Coal Production of the Council of National Defense, has been appointed assistant to the Director of the U. S. Bureau of Mines to enforce the law regulating the manufacture, sale, storage, and use of explosives which becomes effective Nov. 15. Strict enforcement is expected to prevent to a great extent dynamite outrages and incendiary fires by enemy sympathizers or agents. Mr. Peabody will receive a salary of $1 per year.

Industrial News from Washington

By Paul Wooton, Special Correspondent

Mediation Commission's Report on Warren District

From Bisbee, Ariz., the Mediation Commission telegraphed the President on Nov. 7 as follows:

"The President's Mediation Commission found conditions different in the Warren copper district from those that prevailed in the other camps visited. In this district are the large mines and smelteries of the Copper Queen and Calumet & Arizona companies, with a normal output of about 17,000,000 lb. of copper per month. So far as the immediate output of copper is concerned, the Commission found the situation satisfactory. The strikes in the Globe-Miami and the Clifton-Morenci-Metcalf districts resulted in a substantial shutdown of the mines. Federal intervention was needed to secure resumption of operations. Here the strike called on June 26, which materially affected the production in the district, was broken by the deportation from Bisbee on July 12 of 1186 men.

"The task that confronted the President's Mediation Commission was therefore not to secure a mere resumption of operations but to insure continuation of operations during the period of the war in Bisbee as in the other camps. The strike came to a head because of the lack of a proper mediation board whereby the grievances of the employees could find adjustment through an orderly process of adjudication and a decision made by some final disinterested tribunal in whose fairness both sides would have confidence and before whom the rights of each would have equal weight. The Commission has launched a plan of settlement that has been accepted by the companies and provides for the establishment of grievance committees at each mine, the members of which are to be selected entirely by the men, by and before whom all grievances must in the first instance be presented. In a case where just redress be denied, the grievance committee may make appeal to the United States Administrator appointed for the purpose of supervising the operations of the settlements made by commissions in the entire district. Claims of discrimination against union members have been particularly insistent in this district and hereafter such discriminations are prohibited, and the enforcement of the prohibition is vested in the United States Administrator. Thus there is an assurance of effective means by which all questions in dispute between the companies and the men can be promptly and justly settled under the impartial supervision of Federal authority. Resort to strikes, for the period of the war, at least, is therefore unnecessary and will not be used by the men.

"There is every basis for assurance that the copper production of this district will be continued without interruption by labor difficulties. The President's Commission could not make provisions for the future copper production of the district without inquiry into the Bisbee deportation of July 12 and the events that preceded and followed. The result of this inquiry will shortly be embodied in a report to President Wilson."

Hookworm in California Mines

Stamping out the hookworm infection among miners of the Mother Lode district of California is essential to the material prosperity of that district, according to Dr. James G. Coming, director of the bureau of communicable diseases of the California state board of health, and Joseph H. White, sanitary engineer with the United States Bureau of Mines. Inasmuch as 50 to 80% of the men working in the mines are infected, drastic recommendations for eradicating the disease have been drawn up. The possibility of the infection being spread by mine rats has received attention.

Potash Prospecting in the Southwest

The extension of wildcatting for oil into the Red-Beds zone of the Southwest will facilitate the prospecting for potash. More than 60 holes in that region are projected, states N. H. Darton of the U. S. Geological Survey, who has just completed a trip through the section. Having failed to discover potash at Cliffside, Tex., the Survey will direct its energies to a careful examination of the drill cores coming from 25 wells which are being sunk in the area favorable to the occurrence of the salt. This policy will be pursued at least until drilling materials are lower in price and more available than at present. Government chemists are testing the cores from the wells and will endeavor to make tests wherever new holes are started. Accurate drill records will add to the knowledge of underground geology of a section about which little is now known.

Abrogation of Contracts Interests Federal Trade Commission

The Federal Trade Commission has made the following request of various members of the iron and steel industry:

> The commission would be pleased to receive from you an expression of opinion, in case prices should be fixed by law, of the advantages and disadvantages of providing that prior bona fide contracts for materials and for products bought and sold should be abrogated. In connection with any opinion, statistical data in support of your views are desired.

The Commission, it is said, has taken no stand on the question of abrogation of contracts, but is simply gathering information on the subject, in case Congress may call for it when the Pomerene bill or similar measures are taken up. Since Congress frequently takes action that destroys the effect of a contract there are prominent lawyers in Washington who maintain that contracts may be abrogated without conflicting with the constitution.

Concentration of Wulfenite and vanadinite ores is the subject of study at the mine experiment station of the United States Bureau of Mines at Golden, Colorado.

Editorials

Mining in Russia

SOMETHING seems to have gone wrong with the developments at the smelting works of the Irtysh Corporation at Ekibastus, in Siberia, for the zinc smeltery which was put in operation in the latter part of 1916 has been unable to increase its output, which was only about 50 tons per month during 1917. According to the last report of the technical committee of this company, the smaller of the two blast furnaces of the lead smeltery was expected to be put in commission early in 1917, and the larger one during the summer; but up to the beginning of September no lead was reported produced. It is to be noted also that the monthly reports show diminishing outputs of the Ridder and Sokolni mines and of the collieries. Similarly we get reports of decreased production from the Spassky copper mines.

The true explanation of this is unfortunately to be found in the political and economic troubles of the country. The workmen have practically taken possession of the mines and works, even those owned by foreign companies. The titles to the properties remain with their owners, but the workmen have so enforced their demands for higher wages as to preëmpt all profits. This is an injury to the companies. But the workmen go further and by their repudiation of discipline, their refusal to work hard and their ousting of the foreign technical staffs they let production fall off and so injure their country. The foreign administrative officers are so shorn of their authority that some of them have left the country in disgust, while others remain at their posts, hoping that their workmen will come to their senses when they learn what a mess of things they have made. At present, however, the workmen regard these officials as high-priced excrescenses, who draw more than their share from the business. This follows from the socialistic theory that all workers ought to divide equally.

These experiences in Russia are simply in line with the childishness that is permeating the masses all over the world. The child ignoring advice is not satisfied until he has torn a clock to pieces to find out how it works, and the only way he can be convinced that he ought not to touch a red-hot stove is to try it. Similarly our representatives in the Congress of the relatively enlightened American people reject expert advice and enact a disastrous revenue bill so that they may see how badly it will work. We cannot criticize the Russians too severely for being more childish than we are. However they are affording us some useful object lessons.

The Irtysh Corporation, for example, went into a remote part of Siberia and with financial boldness and the intelligent use of expert knowledge acquired an orebody that previously was of no good to anybody. It developed mines and erected concentrating mills and lead and zinc smelteries. The boldness, resourcefulness, and patience of anybody contemplating the inauguration of zinc smelting in such a remote region can be appreciated properly only by those who are experienced in the art. The Irtysh Corporation had not yet consummated its plans when the revolution came, but turning to the experiences of older, dividend-paying mining enterprises in Siberia, which had similarly created new industries furnishing employment to the population, we observe a virtual confiscation of them by their employees, who are finding, however, or soon will find, that they have grasped but a shadow, for in their hands the properties that previously yielded profits cease to do so. In their ignorance they discarded the managements—the brains—that made these properties valuable. In their eyes the managements consisted merely of high-priced officials, and they had no idea that those officials received high salaries because they *earned* them many fold.

The program of the I. W. W. in the United States, which fortunately was scotched, was similar. In the recent strikes in the copper-mining districts there was a demand for a six-hour day. It was useless for the administrators to argue on that subject with the agitators, for the latter said openly that if they got a six-hour day they would then demand five hours, and would continue their demands down to two hours and to what would be virtually confiscation of the mines. Then we should have had the same disappearance of profits as in Russia, and eventually our greatest orebodies would have been no more valuable than the rock of Pike's Peak.

Look at the great mines of the day and consider what they would be without brains. The entire group of porphyry coppers would be simply worthless rock peppered with a little copper had it not been for the genius of Jackling in leading the way. Anaconda, which towers above everything else in the excellence of its metallurgy, and is one of the most profitable of all mining enterprises, would be decadent had it not been for the hierarchy of able administrators who in 20 years of work have made it the Mecca to which metallurgists from all over the world go for inspiration. Calumet & Hecla, the pride of Boston and Lake Superior, would also have been decadent had it not been for MacNaughton. The zinc deposits of Broken Hill might still have been the baffling problem that they had been for a quarter of a century previously if Hoover had not solved it. In all of these things capital has played a great part, but, after all, only a subordinate part. It was no great feat for the Guggenheims to supply $15,000,000 for the development of Chuquicamata after Yeatman had worked out the engineering and Cappelen-Smith the metallurgy. But in general the capital for such undertakings has been supplied not by one group of rich men but by the subscriptions of many thousands of people—whom the Bolsheviki contemptuously call the bourgeois class—who by thrift have saved it out of their earnings. The workmen who think that the industries in which they work ought to belong to them have the same right to buy into them that others have had and have exercised.

The Decline in the Stock Market

FOR nearly a full year the stock market has been a declining one. During the last month the decline has been all but cataclysmic. Many seasoned stocks have fallen below the levels when the Stock Exchange was closed in July, 1914; below the levels of the panic of 1907. Railways, industrials and bonds of all kinds have shared in the decline. Values have ceased to cut any figure. The shares of one large steamship company have sold for less than the equivalent of the cash and Liberty bonds in its treasury. What is the reason for this? The best explanation, we think, is offered by the accomplished financial editor of the *Evening Post* as follows:

> The severe and continuous fall in stocks on this occasion does not necessarily mean, as it has almost invariably meant at other times, a similar reaction in general industry. It certainly does not mean, as in 1907 or 1904, that institutions or individual capitalists are facing embarrassment. Nothing of the sort is even intimated. The production and earnings statements on the one hand, and the Liberty Loan subscriptions on the other, completely dispose of any such supposition. What it manifestly does mean is that the enormous and (relatively speaking) very sudden burdens, imposed on both institutions and individuals by the Government's finance plans, have left large holders of investment securities in great bewilderment as to how far they will presently be obliged to have cash in hand instead of securities. The process of converting the one into the other has been carried on with needless haste, but of its existence as a cause there is no reasonable doubt. Naturally, the liquidation thus occasioned has influenced prices more emphatically because so great a part of the whole community's available capital is at the moment tied up in war-loan subscriptions.

By the Government's finance plans is meant, of course, not only its borrowing program, but also its taxation. Too little attention has been given to the retroactive character of the latter, the bill that was passed imposing an enormous burden upon a year whereof three-fourths has already passed, the earnings accumulated during that period having been previously appropriated. Moreover, the confusion is increased by the continued absence of knowledge as to what the taxation under the war profits chapter is really to be and the recognition that it remains for the Bureau of Internal Revenue to determine the rules. With these conditions as a basis the stock market declined first for reasons that were practical and later for reasons that were partly psychological. The absence of buying power has been conspicuous all along, but there would have been buying power had not the downward movement gained such impetus that many people who appreciated that securities were low would not buy in view of the probability that they would go lower. What, then, is to produce the change of mind that will check the decline? As to this the *Post* proceeds:

> As to what is to be or can be the remedy, Wall Street is undoubtedly in a state of unusual perplexity. It must be said first and positively, however, that fixing of minimum prices would not help the situation any more than would, say, the closing of the Stock Exchange. Such expedients disguise symptoms while they greatly aggravate the malady and they are really warranted only in a sudden and overwhelming crisis of an entirely different sort from the present position. A great victory in the field would certainly help. Beyond question, and irrespective of close points of theoretical controversy, the granting by the Interstate Commerce Commission of the higher rates asked by the railways would do it. Action in this matter, moreover, ought to be very largely influenced by the fact that the railways are now vitally important factors in the Government's war plans, and that the maintenance of full efficiency is as essential in its way as maintenance of the army.
>
> Whether it is possible, through the executive messages and reports or through the proceedings of next month's Congressional session, to start machinery for a war-taxation programme more orderly and scientific than the set of schedules which the late conference committee left to the perplexed and bewildered taxpayer—this is a larger question. Any step in that direction would, however, touch the heart of the present difficulty. This would not be because it would be taken to mean reduction in the burden of taxation—no one anticipates that. But it would at least give ground for hoping that the many and disturbing results which have been feared from the present experimental statute might be properly corrected.

It seems certain now that relief is to be granted the railways, the Administration, through the Comptroller of the Currency as a mouthpiece, being in favor of this, and the shippers who heretofore have contested the demands of the railways having withdrawn their opposition. Favorable action by the Interstate Commerce Commission is therefore expected.

The Price of Lead

THE cut in the price of lead to 5½c. stimulated buying and during the week following transactions were far in excess of the normal. It is generally a good policy in such a declining market as was being experienced in lead for some big interest to take the bull by the horns and cut the price to such a low figure that buyers cannot fail to be interested, after which the market has a chance to build up again. The cut to 5½c. was immediately recognized as being probably a bedrock price. If the buying power of our dollar be now only two-thirds of the normal, and there is much evidence in support of that view, 5½c. for lead now is equivalent to only 3.6c. previous to the war, and we know that lead never continued long at so low a price. A price of 6c. now may correspond with 4c. formerly.

The first burst of buying last week was manifestly to a large extent to replenish the depleted stocks of distributers. Whether real consumption is to be revived remains to be seen. It is well known that the use of white lead was curtailed in 1916 and probably there was further curtailment in 1917. That means that a great deal of painting was deferred, even where it was really necessary for the maintenance of property. A lower price for the pigment should have the natural effect of increasing consumption for this purpose.

The report of the Federal commission that went to Arizona to settle the strikes in the Globe-Miami and Clifton-Morenci districts appears to contemplate that the workmen may be entitled to an increase in wages owing to increase in the cost of living, but that the companies may not be able to grant it if they cannot get more than 23½c. for their copper. This is simply what the companies have said, namely, to the demands of the men they replied *non possumus*. If the men could not afford to work at the old scale of wages the companies would have to close their mines, which they proceeded to do. However, Clifton-Morenci is one of our major copper producing districts, and its copper is needed. This situation confirms what we have previously intimated, namely, that the price of 23½c. for copper is not sufficiently high to maintain the necessary production. If things had been left alone by Washington we should have had higher prices for copper for a while, higher wages that would have attracted miners from the lead- and zinc-mining districts, where they are not needed, an abundance of copper and eventually a superfluity, just as in the cases of lead and zinc. Washington lacked both perspective and patience.

BY THE WAY

Hayden, Stone & Co. say: "The point of view of raising money by expansion, if need be by inflation, rather than contraction and confiscation, has not received all the attention it deserves by the powers that be, but we believe its truth will gradually be better realized. Indeed, there are already some signs of this; for instance, the invitation to reopen the railroad-rate case."

The high price of silver has caused the reopening of many old mines throughout the world. Some had been idle so long that they were considered thoroughly dead. That mining activity may often be directed along peculiar lines is illustrated by a dispatch printed in the New York *Sun*, which says that at Honolulu, in the territory of Hawaii, the police discovered on Nov. 1 that the tomb of King Lunalilo had been broken open and his silver crown and other emblems stolen. King Lunalilo died in 1874, and was the predecessor of the late King Kalakaua.

Some years ago a noted plainsman of the Southwest, a resourceful, adventurous spirit, was speaking in depreciation of technical education, says *Power*. Time and money devoted to such a thing, he argued, might be expended to better purpose. The "school of hard knocks" was nature's polytechnic, and it alone could qualify a boy to meet successfully the duties and exigencies of life. When his companion ventured the opinion that while any man with tools and material and a modicum of native wit could build a shack that would answer very well as a protection against the elements, no one in his right mind would undertake elaborate plans and specifications for a modern skyscraper without first qualifying himself in a thoroughgoing way for that character of work. "W-e-l-l," said the old plainsman, "well, maybe not a skyscraper, but there is no sense in putting up such high buildings anyway."

In the early days of Michigan mining the cost sheets did not entail the elaborate accounting that is required by present-day methods. Nevertheless the operators demanded some form of statement showing the expense under which the mine was producing. The following is related, as occurring at one of the Menominee range mines: The mining captain, a Cornishman, received word from his head office to send in some information on costs. So the first of the month he said to his bookkeeper, "Jimmie, m'son, 'ow's the costs commin'?" "A little high, Captain, a little high," replied Jimmie. "Little 'igh, be they. Well, m'son, I'll tell 'ee wot thee better do. Jus' pull out price o' that great roll 'oistin' rope thee's got in ware'ouse." And the month's accounts went in with a fair mining cost. Next month—"Jimmie, m'son, 'ow's cost this month?" 'Well, Captain," said Jimmie, "They're pretty low and the boys did fine." "Um-m, low be they. That'll 'ardly do, m'son. Dam-me, I think thee'd better charge up that there bit of 'oistin' rope."

We read that the chairman of the War Industries Board visited the President last week to obtain his decision respecting the price for nails. It is mortifying that our commander-in-chief, the head of our nation, who has more actual power than any king and any premier of Europe, is obliged to concern himself with such details. But we wonder why the President gave no attention to the recent deliberations of the Conference Committee of the Senate and the House, which dealt a blow to the business affairs of the country and according to one financial student "did more damage to the cause of the Allies than did the Russian socialists in the destruction of all government in Russia and in the break-up of Russia's defense."

Percy Creampuff Eclaire is at his old tricks again. Yes, indeed, the same Percy that wrote "The Bungle Book" about the awful conditions at the corned-beef foundry. This time Percy seems to have been hobnobbing with a bunch of coal-mine employees who never heard or even half appreciated what a jolly, old soul is old King Coal when his fiddlers observe the rules of harmony. When an author puts on red goggles and inks his typewriter with bile it is silly for anyone to look in the product for a rational presentation of facts. Those who prefer to think that the chief delight of capitalists is to make miserable the lot of the workers would derive great comfort from such a book. Responsible mining men who read it would do so only through curiosity to learn the nature of another new poison gas. "King Coal," through a curious coincidence, happens to be a new book written by somebody named Upton Sinclair. As we never heard of him as a mining man, the title may be misleading.

I was recently talking with a man close to the British embassy at Washington, says a writer in the *Boston News Bureau*, and he said: "Nothing the British government could ever do would be too much for the house of Morgan. Their business was done for us with extraordinary rapidity, accuracy and economy. They shipped us steel, copper, and everything else in a most magnificent manner. That Stettinius buying organization was a wonder; Stettinius put his cards right on the table and was fair to both buyer and seller and he saved us both time and money but the saving in time was the great thing for us. It is a pity that that great organization is not today working for the United States and all the allies. As to profits, I do not think Morgan ever thought of them. They were inconsiderable, never above 1% and later much less, but Morgan was not in it for profit. Many months ago, they asked us to release them, which we were very sorry to do." Lord Northcliffe says: "Mr. Morgan saved the British nation hundreds of millions of dollars by clever buying and aided the success on the Western front by the splendid way his firm financed munition plants. I regret they are no longer British government's purchasers. The buck was passed to me."

Spelter Production, Jan. 1 to Sept. 30, 1917

As the result of a canvass by the U. S. Geological Survey to ascertain the production of spelter in the United States during the third quarter of 1917, C. E. Siebenthal estimates, on the basis of returns of over 95% of the production, that the output of primary spelter from domestic ores was 132,700 short tons and from foreign ores 23,900 tons, a total of 156,600 tons, as compared with an average of 180,569 tons per quarter during the first half of 1917, 175,502 tons per quarter during the last half of 1916, and 158,226 tons per quarter during the first half of 1916. In addition to the primary spelter, the amount distilled from skimmings, drosses, etc., was 4400 tons, as compared with 6000 tons in each of the two quarters preceding. The total production for the first nine months of 1917 was 444,267 tons from domestic ores, 73,457 tons from foreign ores, and 16,550 tons from secondary materials. Returns not yet having been received from the Robert Lanyon Zinc and Acid Co., and the Clarksburg Zinc Co., it has been necessary to estimate their output together with that of two secondary plants. The stocks of spelter at smelteries Sept. 30 amounted to 47,186 tons, as compared with 33,147 tons June 30 and 17,598 tons at the beginning of the year.

The zinc content of zinc ore imported into the United States in the third quarter of 1917 was 15,000 tons, and the exports during July and August of spelter made from domestic ores were 16,800 tons and of spelter made from foreign ores 3000 tons. The number of idle retorts Sept. 30 was 64,626, or 28% of the total number of retorts, and included 18 entire plants, several of which are being dismantled. One electrolytic plant also will possibly be dismantled.

It is evident that many zinc smelters, loath to break up their labor forces while there was a probability that Governmental requirements might call for their full capacity, have continued smelting when it was no longer profitable, or even at a loss, thinking that the heavy orders expected when this country entered the war would eventually be placed; but it is also evident that this unprofitable production cannot much longer be maintained.

Potash from Cement Dust

One-half the normal consumption of potash for fertilizing can be produced from cement plants of the country, says the United States Department of Agriculture, in a recent publication.[1] That between 71,000 and 75,000 tons of available recoverable potash—about one-third of the quantity normally consumed in the United States—exists in the dust passing through or retained in the flues of the cement-manufacturing plants of the country is indicated by analyses made by the Bureau of Soils. By increasing the percentage of potash volatilized, by the addition of substances which will not affect the quality of the cement, the recoverable potash in flue dust can be increased, it is claimed, to more than 100,000 tons annually, or nearly one-half of the normal consumption of potash in the United States.

Numerous plants have installed electrical-precipitation equipment to recover the flue dust, and some plants are reported to be recovering 95% of the potash present in the raw materials fed into the furnaces. The dust recovered in the flue stacks, connecting kilns, and precipitation apparatus carries about 4.5% potash, while that recovered from the precipitation apparatus itself runs about 11% potash. The dust may be used as a source of cement material, may be disposed of as collected for use as a fertilizer or in fertilizer manufacturing, or may be leached to prepare concentrated potash salts.

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[1] Bul. 572, U. S. Dept. of Agriculture, Washington, D. C.

Chronolgy of Mining for the Month of October, 1917

Oct. 1—President Wilson signed the Potash Bill.—Embargo placed by Carranza government on shipment of gold and silver from Mexico.

Oct. 5—Bill passed by Congress providing for suspension of annual assessment work.

Oct. 6—Federal Reserve Board arranged to supply necessary amount of gold to permit American companies operating in Mexico to continue, under the Carranza embargo.

Oct. 8—American Institute of Mining Engineers convened at St. Louis, Mo.

Oct. 9—Strike of Aguila Oil Co. employees, started on Oct. 4, settled.

Oct. 16—President Wilson approves site of nitrate plant at Muscle Shoals, near Sheffield, Alabama.

Oct. 17—Second furnace of Bunker Hill & Sullivan company at Kellogg, Idaho, placed in operation.

Oct. 23—Globe-Miami strike settled through efforts of labor commission appointed by President Wilson.

Oct. 24—Headquarters of Metal Mine Workers at Anaconda, Mont., raided and strike leaders arrested on the charge of interference with copper production.

Oct. 30—Labor commission arranges settlement of strike in Clifton-Morenci-Metcalf copper district, in Arizona.—Labor strike reported in Texas and Louisiana oilfields; about 9000 men went out.—I. W. W. activity in Tulsa, Okla., oil fields reported.

Mother Lode Copper Mines Co.

A report for seven months ended Aug. 1, 1917, of the Mother Lode Copper Mines Co. of Alaska, shows that the mine produced shipping ore until Apr. 10, except during a 12-day strike for a wage increase. The mine was temporarily closed following Apr. 10, pending the installation of machinery. Excavation for an underground compressor chamber and hoist room was begun on May 4, and completed at a cost of $3168. Development in the mine amounted to 212 ft., making a total of 8018 ft. The ore reserves in sight and estimated, are reported as follows: Ore broken in stopes and at millsite, 20,165 tons; ore intact between various levels, 70,615 tons; ore on dumps, 25,150 tons.

Two ore zones exist. All workings are at present in the upper zone. The lower is separated by a 500-ft. limestone strata from the upper zone. A two-compartment vertical shaft will be sunk, at an estimated cost of about $25 per ft., to the lower zone to develop ore between the 600- and 800-ft. levels. A tunnel is being driven to develop the upper ore zone at 210 ft. below the Pittsburgh Tunnel level, which will replace the present stub tramway. The length will be about 830 ft. and the estimated cost, $17.66 per foot.

A concentrator unit will be installed this year and it is planned to build a permanent mill next summer, with 200-ton capacity per day, producing about 30 tons of 50% concentrates.

The power plant is being constructed and will be equipped with a 338-hp. boiler using oil burners, and two Worthington oil pumps connected with a 10,000-gal. supply tank, fed by a 4-in. pipe line, 1100 ft. long, from the railroad tank cars at the Mother Lode spur. One steam turbine direct-connected to a 240-volt, 780-amp., two-phase alternator will be installed. The maximum output of this plant will be 300 kw. In addition, a warehouse, wagon road, aërial tramway, three double bridges, 12 single truss bridges, 16 log bridges and 34 culverts are being constructed.

Brazil May Tax Manganese Ore Exported to United States

Government officials of the State of Minas Geraes are discussing the project of imposing a tax of about 8% on all manganese exported to the United States, the tax to be put into effect immediately. The present tax levied by the State of Minas Geraes is 4%, which it is proposed to increase to 8%. It is also said that a federal tax will be levied in addition to the state tax. The manganese content on which these taxes will be based has not been learned. The American Consul General at Rio de Janeiro has been engaged for many months in an effort to facilitate the movement of manganese to the coast. In spite of the endeavors of the Central Railroad to move as much manganese as ships bound for the United States can load, the movement is often accomplished only with great delay. Last month the movement over the Central Railroad exceeded for the first time 50,000 tons.

Arrangements concluded in 1915 with some important producers of manganese, fixing for them the price of transport at six milreis a ton, will expire at the end of December. This price being a high one, it is proposed to reduce it to three milreis, and it is suggested that the buyers and producers of manganese furnish the railroad with loading facilities.

Mining Alaska Coal

The Government railway has tapped two or three producing coal sections of southwestern Alaska that are steadily improving in quality of output. According to *Coal Age*, Secretary Lane is quoted as stating that the coal fields already opened are larger and richer than the Government had at first anticipated.

Bituminous coal that is equal to the very good quality produced in West Virginia has been uncovered, and there are anthracite fields yet to be reached. Under the improved outlook the Government is to continue railroad construction, even though the expense of materials and labor is very much higher than estimated, on the theory that the saving to the Navy in using Alaska coal will more than repay the increased cost of railroad construction. West Virginia navy coal now costs $14 to $15 per ton laid down on this coast; Alaska coal of good quality can be loaded on ship for $4 or $5 per ton.

The *Alaska Railroad Record*, published by the engineering commission, indicates three coal areas now in process of development. At the Eska creek mine, bunkhouses, a powder house and primer house have lately been completed, and also a loading trestle and coal pocket for loading engines. An office building has been erected, five acres of land have been cleared, and cottages are under construction. Coal is being taken out of the Martin coal bed, and 2905 long tons were shipped to Anchorage in September. At the Chickaloon mine a crosscut is being driven and permanent improvements for mine operations are being completed. Around each of these mines a little community of schools, business houses and cottages is growing up.

It will be the policy of the Government to open the mines and get access to the coal as rapidly as possible. By late spring of next year the engineering commission expects to be able to deliver coal in substantial quantities to the Navy. With a $10 saving on each ton of coal so delivered, Alaska fuel will begin paying back to the nation the substantial sums advanced for the development work.

Saving the Coal

The Fuel Administration is considering limiting the coal supply to plants manufacturing so-called "nonessentials." L. A. Snead of the Fuel Supply Division, has stated that regulations are soon to be announced governing the limitations. The "Great White Way" of the big cities may soon be darkened. An order, it is said, will soon be issued that all unnecessary outdoor lighting must be discontinued during the war. At the same time there will be an appeal for voluntary curtailment of indoor lighting.

An ample supply of fuel, however, has been promised to steel plants working on war orders, some of which, it has been reported, were about to close down for lack of coal. To meet this situation the Fuel Administration will modify the priority order under which large quantities of coal are moving to the Northwest and divert to steel plants "byproduct" coal needed for the production of coke. Other kinds of coal will do as well for the Northwest. If this step does not remove the shortage, plants will be supplied according to the work they are doing for the Government. The appointments have been announced of Wylie B. Bryan, of Louisville, Ky., as state fuel administrator for Kentucky, and of W. G. Bickelhaupt of Aberdeen, S. Dak., to the same position in South Dakota; also for Tennessee, W. E. Meyer of Nashville; Missouri, Wallace Crossley of Jefferson City; West Virginia, J. Walter Barnes of Fairmont; Wyoming, Augustine Kendall of Rock Springs; and for Texas, Wylie Blair of Dallas.

Ferrouranium Process recently patented (U. S. Pat. 1,240,056) by Louis F. Vogt and Robert M. Keeney, assigned to the Standard Chemical Co., uses fluorspar as a flux. Mr. Keeney writes that no other fluxing agent—as, for example, lime—could be used because all the uranium passed into the slag; also, without the use of fluorspar, the output of a furnace seems to be considerably less. The carbon in the production can be controlled down to about 2% by the amount of carbon charged.

Personals

William B. McKinlay has returned to Cuba

Harry J. Wolf examined manganese and silver properties in Custer County, Colo., recently

Hon. Martin Burrell has been appointed Canadian Secretary of State and Minister of Mines, in place of Hon. Arthur Meighen.

W. H. Wright has completed examinations of placer properties in Idaho and will return to Denver about the middle of November.

Rodolphe L. Agassiz, president of the Calumet & Hecla Mining Co., has returned to Boston after a business visit to the mine in Michigan.

L. O. Howard, a consulting mining engineer of Salt Lake City, has been appointed dean of the School of Mines of the State College of Washington.

F. P. Bassett has been appointed superintendent of the blast-furnace department of the Cia Fundidora de Fierro y Acero de Monterey, Monterey, Mexico.

J. R. Woodul, manager of transportation for the American Smelting and Refining Co. in Mexico, is making a tour of the various smelteries in Mexico.

Lawrence Addicks, consulting metallurgical engineer, of New York, has gone to Burma to make a metallurgical investigation of the ores of the Bawdwin mines.

J. B. Tyrrell of Toronto will shortly sail for England in connection with the affairs of the Anglo-French Exploration Co. and the Consolidated Mines Selection Co. of London.

G. A. Shaw has resigned as assistant superintendent of the Michigan mine in northern Michigan to become representative of the Denver Rock Drill and Machinery Co. in the Michigan iron districts.

S. F. Shaw, mining engineer with the American Smelting and Refining Co. at El Paso, Texas, has completed an examination of the Santo Domingo mine, near Monterey, N. L., and has returned to San Antonio, Texas.

David G. Kerr, vice president of the United States Steel Corporation, and **McGilvray Shiras**, ore agent for the same corporation, are making an inspection trip of the company's holdings on the Mesabi range.

O. E. Jager, who recently resigned the position of smeltery superintendent at Cerro de Pasco, Peru, to go to England for war work, has been appointed on the staff of one of the government-controlled lead plants in London.

Frederic G. Moses has been appointed hydrometallurgist at the Salt Lake City station of the United States Bureau of Mines. He has lately been engaged in the installation of pneumatic plants in the graphite fields of Alabama.

Fred H. Williams, president of the Victoria Copper Mining Co. of Boston, Mass., **Sydney S. Millett**, secretary, and **Willard S. Martin** and **A. W. Chesterton**, directors, recently visited the company's property at Victoria, Michigan.

H. DeWitt Smith has resigned as assistant manager at Kennecott, Alaska, for the Kennecott Copper Corporation, to accept the position of superintendent of the mining department of the United Verde Copper Co., at Jerome, Arizona.

R. N. Dickman, of Chicago, is on professional work in North Carolina, after making examinations at Cobalt and Gowganda Lake, Ontario, followed by a month's absence in the Far West. From North Carolina he will go to Butte, Montana.

Maj. Oscar B. Perry, E. O. R. C., formerly general manager of the Yukon Gold Co., is directing the formation of the mining regiment for the first-line service in France. **Capt. W. B. Landers** is in charge of recruiting. **Capt. Norval J. Welsh** is training one company of the regiment at Camp Meade, Maryland.

E. K. Judd, of the mining department of the School of Mines, Columbia University, has been appointed managing editor of the "Bulletin" of the American Institute of Mining Engineers, vice B. A. Robinson, who resigned in June. **Prof. G. A. Roush**, who has been acting temporarily as managing editor since Mr. Robinson resigned, will resume his usual duties in Lehigh University.

M. M. Pearlman, formerly president, treasurer and general manager of Pearlman Co., Inc., and the Clarksburg Zinc Co. of Clarksburg, W. Va., and general manager of the United Zinc Smelting Corporation of New York, has severed his connections with the above-named companies and established himself at 2 Rector St., New York, in the same line of business, under the name of M. M. Pearlman & Co.

Obituary

George T. Holloway, an eminent British metallurgist and head of George T. Holloway & Co., London, died in England on Oct. 24 after a prolonged period of ill health. He was graduated by the Royal School of Mines in 1886 and entered practice as a consulting metallurgist and assayer. He was also a junior demonstrator in chemistry at the School of Mines until 1897. In 1908 and 1909 he was a juror in metallurgy at the Franco-British Exhibition and an inspector at the International Exhibition. He was later appointed by the British government to the Ontario Nickel Commission of which he was chairman. On completion of this work last spring he returned to England, being then in poor health. He was an associate of the Royal College of Science and vice-president of the Institution of Mining and Metallurgy. He was also a Fellow of the Institute of Chemistry and of the Chemical Society and a member of several other scientific and technical societies. He made many friends during his stay in Canada.

Societies

Canadian Mining Institute—The Toronto branch of the Canadian Mining Institute has elected the following executive committee: E. P. Mathewson, chairman, Reginald E. Hore, secretary, W. A. Carlyle, Thomas W. Gibson, H. E. T. Haultain, R. W. Leonard, G. G. S. Lindsey, James McEvoy, Dr. Willet G. Miller, W. E. Segsworth, C. E. Smith and J. B. Tyrrell.

Colorado Metal Miners Association will hold its fifth annual meeting in Denver early in January. Some of the topics of discussion will be: Effects of war conditions on the mining industry; flotation patents and pending legislation; amelioration of the conditions facing gold mining companies due to increased cost of labor and supplies; silver mining and its future; new impetus given prospecting due to great demand and consequent rise in price of various metals. Steps will be taken to establish closer relationship with other similar organizations in Western states

American Mining Congress will meet at the Hotel Astor, New York, on Nov. 15, 1917, for the purpose of electing five directors to succeed Walter Douglas of Arizona, Carl Scholz of Illinois, S. A. Taylor of Pennsylvania, Charles S. Keith of Missouri, and L. A. Friedman of Nevada, whose terms of office expire; also one director for a term of one year to fill a vacancy. The committee on nominations has selected the same men as candidates, each to serve as director for three years; also John T. Barneson of California to serve for one year.

Colorado School of Mines—The board of trustees, at a meeting held on Oct. 29, elected Dr. Victor C. Alderson president of the school. The board also selected a faculty as follows: C. R. Burger, professor of mathematics; M. F. Coolbaugh, professor of chemistry; W. J. Hazard, professor of electrical engineering; J. L. Morse, professor of mechanical engineering; I. A. Palmer, professor of metallurgy; J. C. Roberts, professor of safety engineering; C. C. Van Nuys, professor of physics; H. J. Wolf, professor of mining; Victor Ziegler, professor of geology and mineralogy; G. E. F. Sherwood, associate professor of mathematics; H. M. Showman, assistant professor of mathematics and civil engineering; C. D. Test, assistant professor of chemistry; F. M. Van Tuyl, assistant professor of geology and mineralogy; J. C. Ballar, special extension work; J. C. Williams, assistant director experimental plant. The members of the faculty have been notified that they have been elected for a period of one year from Sept. 1, 1917. The student-fee fund, amounting to $31,600, has been transferred from the Rubey National Bank of Golden to State Treasurer Higgins.

American Society of Civil Engineers held a meeting, on Nov. 7, in the United Engineering Building, New York. The papers presented for discussion were: "The Subsidence of Muck and Peat Soils in Southern Louisiana and Florida," by Charles W. Okey, and "Pulsations in Pipe Lines, as Shown by Some Recent Tests," by H. C. Vensano. The society has moved its headquarters from 57th St. to the fifteenth floor of the United Engineering Building, where its reading room is now open.

Scientific and Industrial Research Council has, through its recommendations, caused the Canadian government to establish 20 studentships and five fellowships, the latter to be awarded to more advanced students who have completed their preliminary scientific training and show special ability in research. The holders of these scholarships will follow courses of study specially applicable to research as required for the practicable development of Canadian industries. A number of appointments have already been made, those obtaining fellowships being: A. D. Hone, M. A., University of Toronto; A. J. Walker, B. A., University of Saskatchewan, and George H. Henderson, M.A., B.Sc., Dalhousie University. In order to get in touch with Pacific Coast conditions the advisory council has decided to appoint an associate committee of representative men of the chief British Columbia industries to advise with them on matters coming within the scope of their work in that province.

New Patents

United States patent specification listed below may be obtained from "The engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

Abrasive Articles, Method of Making. Henry Urtel, La Salle, N. Y., assignor to The Carborundum Co., Niagara Falls, N. Y. (U. S. No. 1,243,783; Oct. 23, 1917.)

Cement—Process for the Manufacture of Cement, etc. Lucien Paul Basset, Paris, France. (U. S. No. 1,244,280; Oct. 23, 1917.)

Chlorination—Process for Separation of Gold and Silver from Minerals. Ricardo Reyes, Mexico, Mexico. (U. S. No. 1,243,976; Oct. 23, 1917.)

Crushing—Liner for Tube Mills. Frank E. Johnson, Salt Lake City, Utah, assignor to American Manganese Steel Co., Augusta, Me. (U. S. No. 1,243,742; Oct. 23, 1917.)

Drill—Hammer Drill. Dane Spehar, Miami, Ariz. (U. S. No. 1,244,386; Oct. 23, 1917.)

Electric Furnace and Method of Operation. William K. Booth, Chicago, Ill., assignor to Booth-Hall Co., Chicago, Ill. (U. S. No. 1,244,415; Oct. 23, 1917.)

Fuel—Apparatus for Feeding Pulverized Fuel. John E. Muhlfeld, Scarsdale, N. Y., assignor to Locomotive Pulverized Fuel Co. (U. S. No. 1,243,753; Oct. 23, 1917.)

Furnace for Smelting Ores. Charles James Beaver and Ernest Alexander Claremont, Cheshire, England. (U. S. No. 1,243,798; Oct. 23, 1917.)

Ingot Mold. Harry Suthann, Middletown, Ohio. (U. S. No. 1,243,779; Oct. 23, 1917.)

Ingot Molds—Process and Apparatus for Coating Molds for Metal Ingots. George Francis Downs, Buffalo, N. Y. (U. S. Nos. 1,243,717 and 1,243,718; Oct. 23, 1917.)

Jig—Universal Jig. John J. Hill, Tonopah, Nev. (U. S. No. 1,244,210; Oct. 23, 1917.)

Lead Pigments, Process of Producing. Alexander S. Ramage, Buffalo, N. Y., assignor to International Color and Chemical Co., Incorporated, Detroit, Mich. (U. S. No. 1,243,762; Oct. 23, 1917.)

Metal Coating — Apparatus for Coating Metal Sheets. James H. Caffrey, Beaver Falls, Penn., assignor to Asbestos Protected Metal Co., Pittsburgh, Penn. (U. S. No. 1,243,808; Oct. 23, 1917.)

Placer Mining—Method of and Apparatus for Placer Mining. Frank E. Hawkesworth, Los Angeles, Calif. (U. S. No. 1,244,203; Oct. 23, 1917.)

Refractories—Composition for Makin Fire-Brick and Furnace-Linings. Robert R Zell, Birmingham, Ala., assignor to Siliconite Refractories Co., Irondale, Ala. (U. S No. 1,244,275; Oct. 23, 1917.)

Separator—Apparatus for Separating o Concentrating Ores. David Cole, Morenci Ariz. (U. S. No. 1,243,814; Oct. 23, 1917.

Sulphides—Method of Reducing Sul phides. Raymond F. Bacon, Pittsburgh Penn., assignor, by mesne assignments, t Metals Research Co., New York, N. Y. (U S. No. 1,243,681; Oct. 23, 1917.)

Tungsten—Process for Extracting Tri oxide of Tungsten from Its Ores. Ludwi Rosenstein, San Francisco, and Ernest H Simonds, Oakland, Calif. (U. S. No. 1,241,082; Oct. 23, 1917.)

Editorial Correspondence

SAN FRANCISCO—Nov. 1

Evidence of Discovery of Gold by Marshall is said to be in the hands of Governor Stephens in the form of an admission reported to have been made by Peter Weimmer that Marshall picked up the first piece. So that is apparently settled. Now if the controversy between the Native Sons and Daughters of the Golden West and the remnant of the Argonauts, as to the exact spot may be settled, the historic fact may be written so plain as to preclude the possibility of further contention. Of course, the little boy who is said to have really found the first nugget, which he gave to Marshall, has been eliminated from the controversy and the story that Richard Henry Dana told in his "Two Years Before the Mast" should be obliterated from the minds of men who love to go back in history beyond the days of '48. Anyway, the monument will be put in presentable shape and a new highway lateral built, so that motor car tourists may see the manner of man who "attracted the attention of the civilized globe to California," as a local historian puts it.

Bureau of Mines Rescue Car No. 1 is in California and will remain until Dec. 4. The itinerary included Berkeley from Oct. 17 to 30, where there were lectures and classes for the benefit of professors and students of the University of California, employees of the Industrial Accident Commission, Bureau of Mines employees and their wives. The lectures were by Mr. Steidle on mine gases and Dr. Worley on sanitation and welfare work. The classes were conducted by Mr. Berry and Mr. Pyne. Motion pictures also were a part of the program at the University as they will be at other points to be visited. The further itinerary includes Stanford University at Palo Alto, Oct. 31 to Nov. 6; Martell, the railroad station for the Mother Lode mining districts in Amador County, Nov. 7 to 20; Chinese Camp, Tuolumne County, Nov. 21 to 27; Angels Camp, Calaveras County, Nov. 28 to Dec. 4. The car will return to headquarters at Reno, Nev., Dec. 5 and remain until about Feb. 10, 1918. In case of mine disaster during the stay of the car in California, it can be reached through communication with H. M. Wolflin, chief mine inspector for the Industrial Accident Commission, and Robert I. Kerr, secretary of the California Metal Producers Association at San Francisco. Edward Steidle, mining engineer, is in charge of the car. Instructors are sent also to mines and mining camps off the railroad, which can not be reached by the car.

Shortage of Oil-Drilling Machinery and materials in California may be relieved by coöperation of the State Council of Defense with the petroleum committee of the National Council of Defense, according to information given to Governor Stephens by Max Thelan, president of the State Railroad Commission. Mr. Thelan states that A. C. Bedford, chairman of the petroleum committee, offers to coöperate with the California defense council in an effort to find a way to assist the oil men who are unable to continue drilling on a scale demanded by the present shortage in oil storage. While the production of the fields is being fairly maintained, the increase in shipments is reducing the stocks to an alarming extent. In the last two years the shrinkage has been nearly 1,000,000 bbl. per month, or to be exact, 26,000,000 bbl. in 28 months. And this shrinkage is in a measure due to the shortage in drilling machinery and materials, as well as the high costs. It is true of course, that the withdrawal of lands by the Government and the several Federal suits that have tied up thousands of acres of oil lands, are responsible for much of the inactivity in drilling; but these causes largely affect the larger producers who are better situated and can obtain drills and drilling machinery more readily than the smaller producers. The drillers are practicing the closest economy, not only in the use of materials but in the selection of ground to be drilled. Mr. Bedford attributes the shortage in drilling materials to the utilizing of Eastern plants for the filling of war-munitions orders. That is plain enough. What California wants to know is the remedy, not the cause. Unless there shall be a remedy provided, and that within reasonable time, the shortage of oil fuel will become a menace. Another three years of the present rate of shrinkage in California will reduce the available supply in this state to zero. There is some compensation in the report of a new gusher development in Montebello field in Los Angeles district. The Standard has brought in a new well which flows 15,000 bbl. a day and is reasonable evidence of what may be expected from other wells. But it would require 10 such gushers to make an appreciable improvement in the storage supply. The shortage is considered serious in California and of such national importance that the Government can not afford to ignore it.

BUTTE—Nov. 3

Phillipsburg Manganese and Silver Ore shipments now average from 350 to 400 tons daily. This amount will gradually be increased to from 800 to 1000 tons a day as fast as some of the older properties can be put in shape for development and exploitation. The camp is experiencing considerable activity, due not only to the great demand for manganese ores, but also to the present high price of silver. In years gone by, the district was a large silver producer.

"Strike Bulletin" published by the strikers, although the strike is a thing of the past, has been coming out now and then with attacks on the mining companies of Butte and the men who are working for them, with the obvious object of curtailing the production of copper. One bulletin stated that the "workers of this country were far behind their brothers in Russia and that the latter had overthrown their old government," a statement taken to mean an effort to arouse a revolutionary spirit in this section. These utterances attracted the attention of the United States grand jury now in session at Butte and a number of witnesses were summoned with the idea of fixing the responsibility. The witnesses were men prominently identified with the metal mine workers' union of Butte and Anaconda. Five men, including Thomas Campbell, Daniel Shovlin and A. Maxwell, were subpœnæd, Oct. 26, and subpœnæs for a dozen more were secured since then, by Foreman Rowe of the grand jury. The result of the jury's investigation has not been announced as yet.

Increase in Cost of Supplies which affects cost of copper production includes materials of every kind. In an official statement from the Anaconda Copper Mining Co., in which employees are urged to economize in the use of materials, but are also advised not to save at the expense of safety or efficiency, attention is called to the constantly increasing cost of all supplies. "Since 1914, the average articles supplied for use around the mines mills and smelteries have doubled in cost," says the statement. "There are a few notable exceptions, such as lumber, lime and cement, but the price on these has, nevertheless, increased materially. This has been a spendthrift nation. The extravagance begins with our national affairs and extends through most branches of life, including the waste of company supplies. It is not altogether the question of cost of supplies which we waste. It is often a question of replacement at any price. There are assay materials, chemicals, etc., which are imported, some of which today can not be obtained at any figure. These, in some cases, are almost necessary for the operations of certain of the company's departments. The car shortage is daily growing worse and adds its contribution to the trouble." Attention is called to a few of the common supplies used in the mines, and the fact that dynamite costs twice as much as it did in 1914, and that even fuse costs 50% more. Bar steel has more than doubled, while plate steel is three times what it was three years ago. Wire rope, pipe fittings and high-grade oils have doubled in price. A foot of pipe which cost 20c., three years ago, costs more than 40c. now. All small tools have doubled in price, and so have bolts, smeltery brooms, nuts, manila rope and drill steel, while all asbestos material costs three times what it cost before the war.

SALT LAKE CITY—Nov. 2

Embargo at Two Murray Samplers of the Utah Ore Sampling Co., which has been on at these plants for about six weeks or since Sept. 4, will be lifted on Nov. 5. Owing to the high price of metals, a much larger tonnage than usual was sampled during the last few months. Congestion ensued. The capacity of the two plants together is 1000 to 1200 tons, a day. At times, there have been as many as 170 cars or upwards of 8000 tons of ore, in the yards awaiting sampling. The accumulation of ores has been considerably reduced. The Tintic sampling plant of this company is operating at capacity, and has been able to keep its yards clear.

Reduction in Freight Rates on low-grade copper ore between Gold Hill and Erickson, in the Deep Creek district, and International has been granted by the Public Utilities Commission to the Western Pacific R.R., operating the branch line into that district. The railroad filed a petition with the Public Utilities Commission on Oct. 26, and in granting the privilege, the usual 30 days' notice required by statute was dispensed with. The reductions are as follows: On $6 ores from Gold Hill to International the rate will be $1.25 a ton as compared with a former rate of $1.75; on $8 ores, $1.85 as compared to $2.50; $10 ores, $2 instead of $3 a ton; and on $15 ores, $3 instead of $3.50. The railroad hopes by these reductions, which will allow the moving of such low-grade ores as can be mined at a profit at present prices but which with normal freight rates and prices would not be handled, to encourage greater production of ores as well as the opening of new properties, expecting itself to benefit through the resultant increase in the tonnage transported.

DENVER—Nov. 2

Oil Survey of Colorado is being urged upon the Governor and members of the state council of defense, with the view of determining those regions which are likely to contain oil. This movement is stimulated by the rapid development of the oil industry in the neighboring states. During the last few years, a fund of about $100,000 has been accumulated by the state in fees for the inspection of oils and gasoline, and it is suggested that this fund be made available for use in connection with the proposed oil survey. The idea is regarded favorably by the defense council, and it is likely that the matter will be given serious consideration in the near future. Oil statistics available in Denver indicate that only about 8% of all the oil inspected in Colorado, during the year 1916, was produced within the state. Geologists state that there are many districts in Colorado which are favorable to the occurrence of oil. It appears that the present limited information relative to the state's oil resources is having the effect of greatly retarding the development of the oil industry within its boundaries.

WALLACE, IDAHO—Nov. 2

Bunker Hill Ore Reserves and other interesting conditions in the mine and the problems involved in its economical operation are reviewed by President F. W. Bradley in the company's answer to the American Smelting and Refining Co.'s suit for breach of contract, soon to be heard at Portland, Ore. Mr. Bradley stated: "Defendant's last annual report shows ore reserves blocked out totaling 3,453,146 tons, with bottom level of mine in the best orebody that it has ever enjoyed. As this is eight years' life at present rate of output, with geological conditions in favor of many years of additional life, defendant is fully justified in increasing the efficiency of its plant in order to fortify itself against periods of low prices for lead. This increase of efficiency is economically necessary with the growing depth of the mine, because of the continual expenditure for shafts, sinking machinery, pumping machinery, etc. It would be unwise for us to spend further amounts on the old water-concentrating plants in face of the continual progress being made in the art of metallurgy. In this line of progress the fire concentration now installed in the shape of our smelting plant is a step in advance over water-concentrating practice for our special conditions. So the 'wet process' method of concentration, already chemically worked out, but not yet commercially developed, promises to be a step in advance over fire concentration. This is because the 'wet process' concentration will not only give us metallic lead, but it will enable us to recover some of the other metals contained in our ores that it is not possible to recover commercially by fire concentration."

Star Mining Co.'s Suit against the Federal Mining and Smelting Co. was called in the United States court for the district of Idaho on Thursday, Nov. 1, Judge Frank S Deitrich having called a special session in this city for the purpose. The issues involved have heretofore been given in the "Journal" In his opening statement, John P. Gray, of counsel for the Star, outlined the contention of the plaintiff and stated he expected to prove that the defendant company, in the operation of the Morning mine, had trespassed upon the Evening Star and Mary R. fraction claims of the plaintiff and had wrongfully removed therefrom a large amount of ore. Having established this, the matter of damages and value of the ore thus extracted would be taken up later. Judge A Marshall, of Salt Lake City, who made the opening statement for the Federal, stated that there would be no dispute over the allegation of plaintiff that defendant had entered upon and extracted ore from ground beneath the surface boundaries of the Evening Star claim; this he admitted and stated that in doing so defendant was governed by the law of extralateral rights, and that he expected to prove that the vein containing the orebodies in question was identical with the vein that has its apex within the boundary lines of the Grouse and Iron Crown claims, the property of the defendant. The issue was thus made clear and it devolved upon the Federal company to prove its contention, and the taking of testimony in behalf of the defendant proceeded at once. Among the prominent engineers and geologists who are here to testify in the case are the following: For the Federal—Waldemar Lindgren, formerly of the United States Geological Survey; Joseph Barrell, professor of geology, Yale; Milnor Roberts, professor of geology, University of Washington, Seattle; H. A. Buehler, professor of geology, Missouri School of Mines, Rolla; J R. Finlay, mining engineer, New York. For the Star—Horace V. Winchell, geologist, Minneapolis; C K. Leith, special geologist, University of Wisconsin, Madison; Albert Burch, mining engineer, San Francisco; Walter Wiley, mining engineer, Los Angeles; Stanly A Easton, mining engineer, manager of Bunker Hill & Sullivan, Kellogg; Oscar Hershey, mining geologist for Bunker Hill & Sulivan, Kellogg; George Huston, mining geologist, Mullan, Idaho. In addition to these, there are numerous local engineers, practical prospectors, miners and others of wide experience in mining in this district who will be called on both sides. The trial is expected to occupy about two weeks and is expected to develop technical points of much interest.

CALUMET, MICH.—Nov. 3

Men Are Earning $5.50 and $6 per day in many instances in the Michigan copper mines, and as a result the contract system, against which the old Federation of Miners presented so much argument during the strike times of 1913-1914, is proving popular Even trammers are making high and unheard-of pay for their class of labor. They are also permitted to work on contract and many are getting as high as $4 50 to $5 per day, it is said. The mines of this district now employ approximately 20,000 men Mechanical equipment for handling labor in a great many kinds of work has replaced man power, but still more men are needed.

Ore Shipments from Marquette district will amount to 2,900,000 tons in round numbers for the year ended Nov. 1, being a decided decrease from the previous year. Approximately 470,000 tons of ore was forwarded from the Marquette and Presque Isle ore docks in October. The Lake Superior & Ishpeming dock forwarded 360,000 tons and the South Shore dock, 101,844 tons in October. To Nov. 1, the Presque Isle dock shipment was 2,233,278 tons and the South Shore dock shipment, 637,382 tons. These figures compare with a shipment to the corresponding date last year of 2,912,702 tons for the Presque Isle dock and 836,254 for the South Shore, a total of 3,748,956 tons. Thus the movement for 1917, to Nov. 1 is nearly 900,000 tons short of what it was at a corresponding date last year. The remaining four or five weeks of the season are not likely to decrease much of this shortage, even if a still further falling off does not occur. What the docks will be able to accomplish during the remaining weeks will depend on weather conditions. So far there has not been much trouble with frozen ore, but from now on it is expected to be an obstacle to the quick dispatch of boats.

VIRGINIA, MINN.—Nov. 3

Bureau of Mines Rescue Car, assigned to the Lake Superior district, arrived at Virginia, St. Louis County, and was at Gilbert and the Lincoln mine until Oct. 27, when it was transferred to the headquarters of the Oliver Iron Mining Co., where it will remain for two weeks. A meeting of Safety men with A. M. Gow, presiding was to be held on Nov. 1, for discussion of various types of rescue apparatus, especially in regard to the helmet type, probably because it was found that during the Cuyuna fires, that the Hibbing apparatus was not in the best working order.

JOPLIN, MO.—Nov. 3

Five-Million-Dollar Deal was reported to have taken place when Texas and Oklahoma men purchased the two mills of the St. Louis Smelting and Refining Co. together with a lease on the company's 160 acres of land about one mile east of Picher, Okla., and in addition, 1240 acres of leases about half a mile further east. It is announced that the new owners expect to start construction of seven new concentrating plants, mill sites already having been selected from drill showings. It is also stated that the new company proposes to build a zinc smeltery and on some of its properties will erect homes of better construction than any put up so far.

Water Power Instead of Steam will be used in the North Arkansas field, if the efforts of the Standard Zinc Co., which is operating at the mouth of Ingram Creek on Buffalo River, are successful. The Standard company has recently ordered a water-power survey to be made. Despite the fact that there is a large area of timber land in the north Arkansas mining field, and it can be obtained cheaply enough as it stands, the inability to get wood choppers has made the cost of wood almost prohibitive. Coal is not even as cheap or obtainable as wood, and lack of available fuel has held back development of the entire field considerably. It is with the hope of relieving this situation that H. Sour, manager of the Standard Zinc Co., recently employed Professor Gladson of the State University at Fayetteville to make a survey of the company's water power, in the hope that the latent power of this kind is sufficient to operate the mill.

The Mining News

ALABAMA

Jefferson County

GULF STATES STEEL (Birmingham)—Concrete lining of slope of Shannon mine completed to 1200-ft. depth. Permanent surface equipment being installed.

ARIZONA

Cochise County

LABOR TROUBLES, such as still exist in Warren district, will be settled by an agreement between operators and men to be effected by President's Mediation Commission, according to Bisbee reports The terms will be similar to the agreement effected in the Globe-Miami and other Arizona districts

COMMONWEALTH (Pearce) — Milling machinery sold to United Verde Copper Co being removed A T Smith recovering silver from old tailings Crosscut started on 300-ft level for continuation of orebody found on surface.

Gila County

MIAMI (Miami)—Output for October amounted to 2,673,775 lb compared with 1,900,000 lb in September and 4,859,413 in October, 1917

Mohave County

COPPER AGE (Chloride)—Operated by Arizona Ore Reduction Co. Will replace ball mill with rolls Steam plant for generating electric energy being installed E. E Northrop, superintendent

GOLDEN HAMMER (Chloride) — Installing hoist, compressor and full equipment Ore is gold-lead-zinc Adit 300 ft. long shows oreshoot of good average width. F C Smith, manager

DIANA (Chloride)—Oreshoot 6 ft wide After lateral extent of shoot known crosscutting will be continued for north vein, opened from 200-ft. level of shaft Vein cut 13 ft. from shaft is not principal vein.

KEYSTONE (Chloride)—Remodeled mill working silver ores on dump Water question solved. Believe mining will be resumed soon. F W Sherman, superintendent

Pima County

McANENY PLACER (Tucson)—Trustees of G B McAneny estate petitioned court to sell placer to A. J Taylor, of Denver

BLACK PRINCE (Tucson) — Leasers opened high-grade, lead-copper ore; preparing to ship Situated 80 miles southwest of Tucson, in Quijotoa district.

Pinal County

RAY LEAD (Ray) — Shipped 20 cars high-grade lead ore in September.

ARIZONA CORONADO (Price) — Situated two miles south of Reymert mine; is shipping to Wickenburg Two-compartment shaft being sunk, now 166 ft. deep.

PINAL CONSOLIDATED (Price)—Repairing road from mine to railroad for hauling and large force started at mine. Recently taken over by F. C Armstrong and associates

ARIZONA HERCULES (Kelvin)—Heavier parts of two McIntosh & Seymore Diesel engines arrived Forms for ore bins at mill completed and also power line from plant at mill to mine, six miles distant

Yavapai County

BIG LEDGE (Mayer)—Crosscut on the 425-ft. level cut 15 ft of ore Considered the extension of orebody encountered on 300-ft level

JEROME VERDE (Jerome)—According to company report no large orebodies yet developed but pay ore recently followed for 58 ft. above 900-ft. level and 140 tons shipped to smeltery.

ARKANSAS

Boone County

RESIN JACK (Zinc)—Formerly operated by D. G & B Mining Co recently purchased by Ire Doane. In steady operation.

HARRISON MINING AND MILLING CO. (Harrison)—Lease of 300 acres purchased by W O Krueger, of Harrison and E. H Mills, of Springfield, Mo Opened zinc ore; equipped with 100-ton mill New company known as Krueger-Mills Mining Co. Will improve mill and install new surface equipment

Marion County

COWAN BARRENS (Yellville)—Optioned by W E Layton, and Zimmerman & Scholield, will test deep ground for zinc ore, contracted for diamond drilling with Moore Bros., of Stone, Ark Situated between Rush and Hall Mountain camps.

CALIFORNIA

Amador County

PLYMOUTH CONSOLIDATED (Plymouth)—Report for September shows: Ore treated was 10,400 tons estimated to yield, including concentrates, $52,847, working expenses, $30,083, development expenditure, $4996, surplus, $17,768

ARGONAUT (Jackson)—Cable for hoist which lifts water from 3900-ft level recently parted about 60 ft from skip, dropping skip filled with water, 700 ft Cable had been recently examined, and no weakness found.

Butte County

NATOMAS CO (Oroville)—Reported result of redredging by Feather No. 1 dredge warrants continuance during life of dredge. Much gravel excavated is from ground untouched by former operations but some dredged ground said to yield a fair return. In the early days a good deal of low-grade gravel was passed over as being unprofitable.

SURCEASE (Oroville)—Being explored by Goldfield Consolidated Mines Co. Will develop for about six months before deciding upon permanent operation.

Contra Costa County

MOUNTAIN COPPER CO. (Martinez)—Smeltery labor strike ended quickly. Wages raised voluntarily to $3 for common labor, but 16 men demanded more. Upon threat of discharge they returned immediately.

BUTTERS ELECTROLYTIC ZINC SYNDICATE (Richmond)—Operating old Peyton Chemical Co. property. Employing 30 men in construction work and expect to start Jan. 1, 1918. Will make products other than zinc. R. W. French, of Oakland, manager.

PACIFIC POTASH PRODUCTS CO. (Richmond)—Permitted to issue to Henry Michel and eight associates, 600 shares at $100, for formulas for making bichromate of potash, caustic potash and permanganate, and equipment and operation of Richmond Chemical Co. plant to be leased. Shares in escrow.

Eldorado County

FOREST FIRES about Ham's Station on Alpine State highway extending into Amador County, burned 25,000 acres, including lands of Eldorado National forest. Timber damage in canyons large. Now under control. Bottle Hill fire in Georgetown district also under control. About 3000 acres of government and railroad lands damaged.

Inyo County

BUNKER HILL (Bishop)—Being developed by Base Metals Mining Co. composed of Los Angeles and Puente men. High-grade ore, from development, hauled 39 miles by motor trucks to Southern Pacific station at Zurich. Most of ore from old dumps. Situated on eastern slope of White Mountains. Aërial tramway of Salines Valley Salt Co. may be made a common carrier. Harold E. Robinson, superintendent.

Kern County

YELLOW ASTER (Randsburg)—Mill improvements completed.

Nevada County

SNOW POINT (Moore Flat)—Sinking shaft to tap gravel during winter. Expect to reach channel at 350-ft. depth. Whitney Construction Co. operating with 20 men. George Hagerty, manager.

Placer County

BALTIMORE (Forest Hill)—Guy Williams, former foreman, pleaded guilty of "high-grading" a total of $7500; granted probation upon agreement to pay back the amount.

PACIFIC GOLD DREDGES being removed from middle American River, east of Auburn, as dredging is completed, to north fork of American River, north of Auburn where several bars have been prospected.

Plumas County

GOLDEN EAGLE (Quincy)—Cleanup at placer mine at headwaters of Croquette Creek, east of Granite basin, amounted to 58 oz. in addition to $250 in specimen nuggets.

McCARTHY (Quincy)—Chrome mine idle at present, but large deposit said to have been opened. Pack animals will be used to carry ore to top of hill and wagons or trucks will haul to Quincy Junction.

BURCH (Greenville)—Noble Electric Steel Co. completed road from Dixon Canyon to this manganese mine, situated above Indian Falls. Ore will be shipped to the smeltery at Heroult, in Shasta County.

Shasta County

MOUNTAIN COPPER CO. (Keswick)—Labor situation improving; about 90% of normal force employed.

Siskiyou County

CONCRETE DAM across Elk Creek in Happy Camp district to be completed about middle of November by Harry Wilson, W. E. Bishop and Elmer Michaelson. Water to be stored for use in placer mining. Dam will be 70 ft. long and 28 ft. high, with 50-ft. width at base. Water will be 18 ft. deep at wall, and ¼ mile upstream about 10 ft. deep. Automatic gates designed by Harry Wilson will be installed; may be opened separately or all together.

Tuolumne County

STINCHFIELD VS. BUCKEYE (Sonora)—Suit commenced for $20,000 balance due from sale of property to Buckeye Mining Co. by Andrew W. Stinchfield and F. L. Mitchell; $5000 has been paid. Table Mountain Mining Co. included in suit.

MOHAWK (Sonora)—Two-compartment shaft 70 ft. deep; will crosscut at 200 ft. Situated near Gold Hill in Smith Flat district. Frank Raymond, owner.

COLORADO

Boulder County

NIL DESPERANDUM MINES (Box 298, Boulder)—Plant situated near Sunshine. Air compressors and electric power installed since Sept. 1. Sinking winzes about 300 ft. apart on two orebodies to be connected every 75 ft. by drifts. Drifting on lower tunnel and driving crosscuts to hanging wall vein. Acquired Inter-Ocean mine last summer, said to have 200,000 tons reserve of low-grade ore. Intend to erect 100-ton mill using flotation during 1918. Ore is telluride of gold.

Hinsdale County

HIDDEN TREASURE (Lake City)—Being overhauled; shipping lead-silver ore. Situated in Henson Creek section.

GOLDEN FLEECE (Lake City)—Operated under lease by Salt Lake company. Mill remodeled, using flotation.

Lake County

MATCHLESS (Leadville)—Fryer Hill property will be reopened. Retimbering shaft.

HARRISON REDUCTION CO. (Leadville)—Slag dump of Harrison Ave. smeltery will be retreated. Hoist and skip installed.

Ouray County

MOUNTAIN TOP (Ouray)—Tramway to Governor Basin will be built, bridging dangerous slide zone, and permitting winter operation. Mill is entirely underground to avoid snow-slide danger.

CALLIOPE (Ouray)—Development in upper quartzite opened ore; installing electric-driven compressor plant. Power line extension will be made from Western Colorado Power Co.'s line at Bachellor switch. C. W. Larsen, manager.

Park County

FIRE AT ALMA, on Oct. 17, destroyed major portion of business district including post office.

PRODUCTION OF ALMA DISTRICT, due to rise in silver, doubled during last year; new companies have started work.

LONDON (Alma)—Crosscut tunnel will be driven from site below South London, to cut veins at 500 ft. below lowest workings. Steam-driven compressor plant installed. Lessees on upper workings producing shipping-grade ore.

San Juan County

SEPTEMBER SHIPMENTS FROM SILVERTON district, 255 cars ore and concentrates.

IDAHO (Silverton)—Will be reopened by lessees.

COMING WONDER (Silverton)—Lead-silver ore opened recently by lessees.

LACKAWANNA (Silverton)—Will be worked until heavy snow falls. Shipping.

U. S. TREASURY (Silverton)—Lessees opened lead-copper ore in this Ruby Basin property.

ARIADNE (Silverton)—Crosscut being driven to cut vein. Development will be continued all winter.

San Miguel County

WATER SUPPLY OF TELLURIDE district sufficient for winter operation, although summer precipitation small. Smuggler Union draws water from Blue Lake, Tomboy from Lake Ptarmigan and Liberty Bell from springs on Mt. Ballard.

CARBONERO (Ophir)—Shipping ore from development.

MODENA (Telluride)—Final shipment being made for season before closing down.

BLACK BEAR (Telluride)—Compressor and hoist installed. Can produce more ore than Smuggler mill can handle.

Summit County

FIRE AT KOKOMO on Oct. 11, destroyed main hotel and six other buildings.

SQUARE DEAL (Frisco)—Repairing tunnel cave-in.

KING SOLOMON (Frisco)—Shipping from stope, on 200-ft. level. Developed considerable ore.

TONOPAH PLACERS (Breckenridge)—Camp No. 2, near dredge No. 2, completed. Modern houses built for 30 men.

MONTE CRISTO (Breckenridge)—Mill alterations nearing completion, and plant will be in operation soon. Considerable tonnage of broken ore available.

Teller County

JERRY JOHNSON (Cripple Creek)—Caley lease making regular shipments.

VINDICATOR (Cripple Creek)—Semi-monthly pay day adopted.

PORTLAND (Cripple Creek)—More high-grade ore in winze from No. 2 shaft at 2000-ft.

ELKTON (Cripple Creek)—Lessees working through main shaft. Three cars ore per week in addition to dump ore

AJAX (Cripple Creek)—Water level at 1973 ft. in shaft. Station will be cut and level driven at 1980 ft. Elevation of 8135 ft.

RAVEN & BEACON HILL CO. (Cripple Creek)—Lateral from Roosevelt tunnel completed, and development on vein under way. Owns 17 acres on Raven and Beacon hills.

IDAHO

Shoshone County

NATIONAL COPPER (Mullan)—Mill running at half capacity on Oct. 13; since shipped three carloads concentrates averaging about 20% copper, 55 oz. silver and small amount gold Expect to be running at full capacity of 500 tons per day shortly.

HECLA (Burke)—Management states that litigation between American Smelting and Refining Co. and Bunker Hill & Sullivan Co. would not interfere with contract with Bunker Hill smeltery. Building bin, with capacity equal to daily mine output, sorting plant, and change room for 500 men. Extending levels and increasing production; four years supply of ore, at present 1000-ton daily output.

MICHIGAN

Copper

HANCOCK (Hancock)—Has 372 men and need 125 more. Daily tonnage same as in October, 1100 tons.

SOUTH LAKE (Lake Mine)—Increasing daily tonnage from 150 in August to 222, making about 6000 tons for October.

MICHIGAN (Rockland)—Chicago, Milwaukee & St. Paul will lay track on spur extension soon; then rock will be shipped to mill.

BEAR LAKE "POOL" (Hancock)—Good core from second diamond-drill hole at 150 ft.; third down 23 ft. in overburden. Vice-President Murray acting as managing director.

CHEROKEE (Houghton)—Is in the usual small mass and heavy-stamp copper for 25 ft. in eastern drift with lean and broken ground west. Sinking from 420-ft. level awaiting new rope.

CALUMET & HECLA (Calumet)—According to report contracted with Minerals Separation company, to pay royalty of 1c. per lb. on copper recovered by flotation process. White Pine Copper Co., a subsidiary will use flotation extensively. Present daily tonnage, including 910 tons of Tamarack, 10,190, comparing with 9200 few weeks ago. Expect Goodman storage-battery locomotives at Osceola, making total of 12.

Iron

PIONEER IRON (Marquette)—Receiving bids on erection of steam-heated ore-drying shed at North Marquette plant for thawing frozen ore in cars to facilitate handling. Dimensions will be 200 x 40 ft., with capacity of 24 cars.

MINNESOTA

Mesabi Range

OLIVER (Virginia)—One man killed in milling pit at Alpena mine by falling rock; another killed and three injured at Deacon mine by cave-in.

MISSABE MOUNTAIN (Virginia)—Construction on 300-ton Marion shovel known as 225B proceeding slowly. Other Marion shovel at Hibbing further advanced.

MISSOURI

Joplin District

COOK & MITCHELL (Oklahoma City, Okla.)—Leased four 40-acre tracts east of Picher, Okla.

D. E. McDOWELL (Joplin)—Drilling tract south of Lincolnville, Okla. Region heretofore unexplored.

BOOTH & CO. (Joplin)—Seven holes on tract at Waco Mo. show ore. Will continue drilling.

NEFF & HARRINGTON (Joplin)—Started first shaft near Crestline, Kan., west of Badger, where drilling showed good ore.

DULUTH (Quapaw, Okla.)—Building 500-ton mill on lease near Quapaw Duluth, Minn., men interested. Also have lease north of Kansas line.

JACK RABBIT (Miami, Okla.)—Putting down two shafts on lease near Lincolnville. One in ore at 95 ft. Will build mill. G N. McBrian, Miami, one of principal owners.

BUFFALO (Miami, Okla.)—No. 1 mill, north of Quapaw, completed; rich ore at 180 ft. Will construct second mill, on lease west of Blue Mound, Kan., after Jan. 1; will build third mill later. F. R. Bouldin, Miami, president.

MONTANA

Lewis and Clark County

ROCK ROSE (Helena)—Shipping ore from stopes.

BLUE BIRD (Helena)—New gasoline hoist being installed. Copper-silver ore

HELENA MINE (Helena)—Shipped 20 carloads; orebody indicated at 300-ft. level.

PORPHYRY DIKE (Rimini)—New 300-ton ball mill ready for operation, replacing 20-stamp quartz mill. Electric power

ST LOUIS MINING CO (Marysville)—Output 80 tons a month with 25 stamps from old stopes in Drumlummon mine.

BALD BUTTE (Marysville)—Crosscut advanced 500 ft. on 400-ft. level from shaft to new lead. will drive 200 ft. further. Air compressor and electric power.

Mineral County

TARBOX (Saltese)—At office in Wallace, Idaho, announced shaft down 800 ft and crosscutting 8 to 10 ft per day. Should reach vein in 350 ft. Opened ore of milling grade on 400- and 600-ft. levels

Silver Bow County

BUTTE & SUPERIOR (Butte)—Output of zinc for October reported to be about 12,000,000 lb

EAST BUTTE (Butte)—October production amounted to 1,700,000 lb. which is about normal

NORTH BUTTE (Butte)—Lining of Granite Mountain shaft, destroyed by fire last June, completed; mining will be resumed shortly. Speculator shaft hoisted 100 tons per day during October besides carrying supplies.

TUOLUMNE (Butte) — Developing Colusa-Leonard Extension in eastern section. Shaft sunk from 800-ft. level, 10 ft. a day and will be carried to 1600-ft. level where exploration will be done by crosscuts north and south to property lines.

ANACONDA (Butte) — Production in October amounted to 22,336,460 lb. an increase of 19,500,000 lb. over the previous month and largest since May. Production of zinc was 3,878,675 lb. Mines reported to be operating at 80% normal output.

NEVADA

Clark County

IRONSIDES MINING CO. (Goodsprings)—Developing good ore and tonnage blocked out. W. H Gable, president; A J. Shumway, secretary. Main Office; Scottsbluff, Neb.

BOSS GOLD MINING (Goodsprings)—Working on fourth level; shipping copper ore. H K Riddall, manager One shipment of platinum ore made to Los Angeles, Calif. Pacific Platinum Works just completed leaching plant for treating this ore. Latter's office, 229 East Ninth St, Los Angeles, Calif.

Nye County

CHARLES KEELHOFER and Claude Marrin sinking shaft with force of men in Gold Reef district Down 75 ft; formation changed within last 20 ft, showing quartz, ore shows good gold content. Situated 10 miles from Tonopah, and one mile east of Tonopah & Goldfield road.

TONOPAH ORE PRODUCTION for week ended Oct 27, amounted to 10,578 tons valued at $185,115, comparing with 9341 tons, the previous week Principal producers were: Tonopah Belmont, 2491 tons; Tonopah Mining, 2850 tons, Tonopah Extension, 2380 tons; Jim Butler, 1050 tons; West End, 1118 tons, MacNamara, 406 tons Montana, 53 tons, Rescue 128 tons; Cash Boy, 55 tons

UNION AMALGAMATED MINING (Manhattan)—From 600-ft level, face of north crosscut in quartzite for last 10 ft, expect to encounter orebody within 15 ft. No. 11 north crosscut in low-grade ore extended through Earl shoot and proved ore for 30 ft. South crosscut continuation should cut hanging wall in about 20 ft.

NEW MEXICO

JUMBO MINING CO (Deming)—Present equipment is 80-hp boiler, 300-cu ft oil-burning compressor, three Jackhamer drills, 8 x 10-in geared steam hoist, No 7 sinker, 8 x 5 x 10-in Snow station pump for 250-ft level On 200-ft level, driving to strike No 2 silver-lead, also No. 3 vein about 125 ft westward Situated nine miles from Florida station using one-ton and two-ton trucks for hauling Charles W Lininger, in charge

OKLAHOMA

LABOR TROUBLES in Tulsa Okla oil fields, according to reports, resulted in dynamiting of home of J Edgar Pew, general manager of Carter Oil Co Guards have been increased around properties Many I W W members have departed from district because of police activity

OREGON

Josephine County

GOLD KING (Kerby)—Work suspended on this gold mine. T P Johnson, manager.

JACK AND TOM (Kerby)—Carload chrome shipped Working small crew on five claims J M Finch, manager.

QUARTZ LOAN (Grand Pass)—G W Finch developing quartz gold mine in Medford district

GRIMMETT CHROME (Kerby)—Several cars of chrome shipped Work suspended on account of poor grade of ore. Grover Grimmett, manager.

Jackson County

FRUIT RANCH MANGANESE (Gold Hill)—This manganese property on old Fruit Ranch, 20 miles northeast of here. leased to Herbert Brewitt, of Tacoma, Wash. C F Daugherty recently made examination for Noble Electric Steel Co., of San Francisco. Lessees ordered equipment for concentration plant and lumber for building. Consists of 280 acres

SOUTH DAKOTA

LITHIA MINES at Keystone continue regular production. O. M. Lane shipping spodumene and Rheinboldt Metallurgical Co. mining amblygonite. Shipping two cars weekly.

ELKHORN TUNGSTEN (Hill City)—Developing. Will sink shaft 100 ft. further. Plant to be remodeled and handle custom ore. Amil Anderson formerly with Homestake, in charge.

UTAH

Juab County

TINTIC SHIPMENTS during October amounted to 674 cars as compared to 634 in September. There were 34 shippers Properties showing increases during October over September were: Colorado Consolidated, which shipped 63 cars—about twice the normal output; Iron Blossom, which showed 21 cars more than in September. Eagle & Blue Bell, owing to embargoes in September, shipped only 5 cars. For week ended Oct 19 shipped 203 cars, an increase of 35 over previous week

EUREKA METALLURGICAL (Eureka)—Organized by local men; reported that custom mill will be built. Have been operating successfully small experimental mill. M. McChrystal, president.

IRON BLOSSOM (Silver City)—Rumors that dividends will be discontinued denied by officials. Reported $160,000 in treasury when dividend of $50,000 was paid Ore supply reduced in recent years, but stated to be sufficient for some time.

Salt Lake County

BOSTON DEVELOPMENT (Salt Lake)—Streaks of shipping ore reported in tunnel of Maxfield mine.

MONTANA - BINGHAM (Bingham) — Tunnel completed, and crosscutting for Mayflower and Fortuna veins, outcropping 2000 ft. above tunnel, on dip.

BINGHAM AMALGAMATED (Bingham)—Showings on 300-ft level of 600-ft. shaft are widening in raise. May be extension of fissure productive in adjoining Congor Two cars shipped week ended Oct. 13.

UTAH APEX (Bingham)—Net profits for June, July and August, $195,506. Receipts for last month of quarter, $215,932; disbursements, $110,013. Averaging 550 tons daily of shipping and mill ore, reserves increased.

SELLS (Alta) To build 2000-ft tramway from Lexington tunnel of Sells to portal of drainage tunnel of Wasatch mines Minimum capacity, 10 tons per hour Production about two cars weekly, and with new line will ship all winter

OHIO COPPER (Bingham) Annual production estimated at over 5,000,000 lb New 3000-ton flotation plant to increase production to 15,000,000 lb annually Present mill treating about 2300 tons daily, which is hauled through company's Mascotte tunnel

Piute County

FLORENCE MINING (Marysvale)—New mill working three eight-hour shifts, shipping up to six cars of calcined alunite weekly

Utah County

PACIFIC (American Fork) New mill of Fissures Exploration started operating. Treating 200 tons in three shifts

Summit County

PARK CITY SHIPMENTS during October were 11,536 tons as compared to 10,365 tons in September Value of October output estimated at $110,000 Production for first 10 months of year approximately 83,000 tons District has been affected by smelter embargoes, car shortages, and congestion at samplers. October output higher than normal, which has been between 7000 and 8000 tons.

Tooele County

WESTERN UTAH COPPER (Gold Hill)—September production was 21,000 oz silver and 326,000 lb. copper. May pay dividends soon. Building clubhouse for employees.

POLE STAR (Gold Hill)—Developing high-grade copper in inclined shaft and raise above No. 2 tunnel.

BIG CHIEF, in Ferber section of Deep Creek district, has about 500 tons on dump; hauling interrupted.

WESTERN UTAH EXTENSION (Gold Hill)—Installing hoist at Mogul shaft; rebuilding compressor plant. Developing.

WOODMAN MINING (Gold Hill)—High-grade streaks in main tunnel on Frankie claims reported to have widened to several feet and will ship first car in few days. Employing 15 men. Shipping from other properties.

CANADA

British Columbia

CONSOLIDATED MINING AND SMELTING CO.—Completed purchase of gold-quartz properties in Camp McKinney and Fairview districts, 20 miles apart. About 2000 acres in each camp; Camp McKinney includes Cariboo mines Siliceous fluxing ores also present. West Kootenay Power and Light Co. subsidiary of the Consolidated is constructing line from Cascade Station to Princeton, B. C., to supply power to these camps.

Ontario

MINAKER (Kirkland Lake)—Gold veins 4 ft. wide discovered.

NATIONAL (Cobalt) — Flotation mill, formerly King Edward, in full operation and satisfactory.

ELLIOTT-KIRKLAND (Kirkland Lake) Drifting on good orebody, 12 ft. wide, cut on 325-ft. level. Main shaft will be sunk to 500-ft level.

REEVES-DOBIE (Gowganda) — Being dewatered preparatory to development under direction of Mr Crowe of Porcupine Crown.

SCHUMACHER (Schumacher) — Mill treating 180 tons per day; mill heads reported averaging $7 per ton and costs about $4.

TEMISKAMING & HUDSON BAY (Cobalt)—Eighth annual report for the year ended Aug. 31 show total income of $190,902 Ore reserves estimated at 107,614 oz.

DOME (South Porcupine)—Semi-annual statement shows gross income of $701,810; operating and developing costs, $534,575; net earnings, $167,234 Total surplus was $864,285, against depreciation of $141,164; war tax on profits, $27,415 and dividends, $100,000, leaving net surplus of $595,706, a decrease of about $100,000

HOLLINGER CONSOLIDATED (Timmins) Mill equipment to increase present capacity of 1800 tons to 2800 completed. Expenditure, including installation of extra power and equipment of new central shaft, estimated at about $1,000,000 In trial runs only some units will be operated at one time, and, as each is found satisfactory, a similar old unit can be struck down Owing to labor shortage complete mill will not be operated to capacity for some time.

MEXICO

SILVER BULLION, amounting to $10,000, stolen by force of Villistas from northbound train on Mexican Central Ry at Armendariz station, 50 miles south of Chihuahua on Oct 4, according to reports from Juarez, the train was dynamited, and dispatches state that 125 passengers, including 60 federal guards and two women, were shot Reports from El Paso state General Felix Diaz with 600 soldiers has captured Puebla

PANUCO (Monclova, Coahuila)—Being operated by American Smelting and Refining Co Railroad to mine, 67 km. long repaired and ore shipments being made S F Shaw, superintendent

BOLIVIA

RAILWAY from Potosi to Sucre is being rapidly constructed Preliminary surveys for automobile roads are being made by engineers sent to Tarija by the government The Cia Consolidada in Colquechaca is completing installation of steam-power plant recently purchased from Guernica Mining Co in Uyuni The Austro-Bolivia, Ltd, is expecting arrival of dredging equipment shortly at Potosi Antimony veins reported discovered near Sucre are deposits of 68 to 69 sulphide without quartz Veins are not large.

The Market Report

SILVER AND STERLING EXCHANGE

Nov.	Sterling Exchange	Silver		Nov.	Sterling Exchange	Silver	
		New York, Cents	London, Pence			New York, Cents	London, Pence
1	4.7515	89⅜	45⅜	5	4 7515	87¾	44½
2	4.7515	88⅞	45⅜	6	4 7515	.	44¼
3	4.7515	88⅜	44⅞	7	4 7515	86⅝	44

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

DAILY PRICES OF METALS IN NEW YORK

Nov.	Copper	Tin	Lead		Zinc
	Electrolytic	Spot.	N. Y.	St. L.	St. L.
1	*23½	66	5½ @6	5.42½ @6 00	7.35 @7.40
2	*23½	66½	5½ @6	5 42½ @6 00	7⅜ @7½
3	*23½	66½	5½ @6	5 42½ @6 00	7⅜ @7½
5	*23½	68	6 @6¼	6 @6¼	7⅜ @7½
6	....	...	.	.	....
7	*23½	70	6¼ @6⅜	6 17½ 6 25	7½

* Price fixed by agreement between American copper producers and the U. S. Government, according to official statement for publication on Friday, September 21, 1917.

The above quotations (except as to copper, the price for which has been fixed by agreement between American copper producers and the U. S. Government, wherein there is no free market) are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

The quotations for electrolytic copper are for cakes, ingots and wirebars.

We quote electrolytic cathodes at 0.05 to 0.10c. below the price of wirebars, cakes and ingots.

Quotations for spelter are for ordinary Prime Western brands. We quote New York price at 17c. per 100 lb. above St. Louis.

Some current freight rates on metals per 100 lb. are: St. Louis-New York 17c.; St. Louis-Chicago, 6.3c.· St. Louis-Pittsburgh, 13.1 cents.

LONDON

Nov.	Copper			Tin		Lead	Zinc
	Standard		Electrolytic				
	Spot	3 Mos.		Spot	3 Mos.	Spot	Spot
1	110	110	125	257¾	257¾	30½	54
2	110	110	125	258	258	30½	54
3							
5	110	110	125	260	260	30½	54
6	110	110	125	260	260	30½	54
7	110	110	125	266	266¾	30½	54

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2,240 lb. For convenience in comparison of London prices, in pounds sterling per 2,240 lb., with American prices in cents per pound the following approximate ratios are given, reckoning exchange at $4.75½. £30½ = 6.474c.; £54 = 11.462c.; £120 = 25.473c.; £137 = 29.082c.; £240 = 50.946c. Variations, £1 = 0.212277c.

Metal Markets

NEW YORK—Nov. 7

The metal markets became decidedly more interesting this week, especially lead. Tin rose to the highest figure recorded since the beginning of the war. Zinc was dull, but a shade firmer. The copper market being now an arbitrary matter, nothing need be said of it.

Copper—There were no features of interest or importance that need to be reported.

Copper Sheets are quoted at 34c. per lb. for hot rolled, and 1c. higher for cold rolled. Wire quoted at 30c. per lb., f.o.b. mill.

Tin—This market rose sharply on very small business. The demand was sharp, and the only reason that the volume of business was small was the scarcity of the supply. Straits and Banka tins are almost unobtainable. On Wednesday afternoon Straits tin was sold at 70c. It will not be surprising later if it develops that sales were made at even higher figures. Banka tin was quoted at 68c., Chinese at 66c. or upward, but these quotations were largely nominal owing to the inability of anybody to get anything but stray lots.

The tin market has received a shock through the recent news that Great Britain will no longer grant permits for exportation until the name of the consumer who is going to use the tin is communicated, and inasmuch as it will grant permits only for 25-ton lots, traders are put out of business, while moreover the dealer who buys tin for distribution to consumers in lots of one to five tons is no longer able to do business.

Exports of tin from Bolivia for the four months ended April 30 were 9631 gross tons of barrilla or concentrates, equivalent to 5779 tons fine tin. For the six months ended June 30 the exports, reduced to terms of fine tin, were 8638 tons to Great Britain and 2238 to the United States; a total of 10,876 tons, showing an increase of 1179 tons over last year.

Lead—Following the enormous sales of last week there was some relaxation, but the business of this week was also large, having amounted probably to as much as 10,000 tons. There was one large sale to Canada, and there were many domestic sales in lots of 100 to 250 tons, but a multiplicity of small orders—50-ton lots and such—accounted for a large part of the total. An encouraging feature was that consumers figured so largely as buyers, there being demand from all kinds of consumers except corroders, who were rather conspicuous by their absence. However, corroders take care of themselves largely by average price contracts. The A. S. & R. Co. was a seller right through the week at its quoted prices, but it adhered to its terms of selling only for shipment within 30 days and turned away customers desiring to buy for December and January delivery, who then went to other people and paid for what they wanted at as much as a half a cent over the price of the A. S. & R. Co. Beginning with Monday the A. S. & R. Co. was no longer willing to sell at less than 6c., and on Monday afternoon it was announced that it had advanced its price to that figure. The demand continuing unabated, a further advance to 6¼c. was made on Wednesday morning. Outsiders accepted a little business during the day at that price, but generally they asked more, and the market closed strong.

As a result of representation made to the Canadian government by Premier Brewster of British Columbia as to the serious effect on the silver-lead mining industry of the Slocan district of the embargo recently placed on silver-lead ore by the Trail smeltery of the Consolidated Mining and Smelting Co., remedial measures have been adopted. S. G. Blaylock assistant general manager of the Consolidated states that the company's reason for refusing to accept ores carrying over 4% zinc is that the company has a great stock of lead ore accumulated and that the market for lead in Canada has decreased. The government, in order to relieve the situation, has undertaken to remove the embargo on exportation of lead and zinc to the United States, and the Imperial Munitions Board has placed an order with the Consolidated Mining and Smelting Co. for 6000 tons of lead for munition manufacture.

Zinc—This market was dull, but was a little stronger, statistics published during the week by the Government being regarded as favorable rather than the reverse. The sales of the week included some for export. At the close there were still sellers at 7½c., but they were not so eager as they had been, and there were indications that the price would move upward if any considerable demand should develop.

Zinc Sheets—Price of zinc sheets has not been changed. Market is still at $19 per 100 lb. f.o.b. Peru, Ill., less 8% discount.

Aluminum—This market continues dull with quotations nominal at 37@38c. per lb. for No. 1 ingots at New York

Antimony—Unchanged at 14@14½c. for spot, while futures are quoted at 13½c. c.i.f. in bond. Business was very light. The Chinese and Japanese producers were still out of the market.

Bismuth—Unchanged at $3.50 per pound.

Cadmium—This metal is quoted at $1.40 @1.60 per pound.

Nickel—Steady at 50c. per lb., premium of 5c. per lb. for electrolytic.

Quicksilver—Steady at $100. San Francisco reports, by telegraph, $100, firm.

Gold, Silver and Platinum

Gold—The embargo placed on gold exports some time ago appears to have reduced the outflow of gold. In the four weeks ended Oct. 21 the total was $18,500,000, or only about one-half of that for the previous four weeks; the shipments in both periods were mainly to Spain and Japan. The Federal Reserve Board at Washington has agreed to license a special export of $25,000,000 to Canada, where the banks at this time need reserves for currency furnished to move the crops. Most of this export will probably be returned later.

Silver—This metal has declined steadily throughout the week conforming to the weakness in London, where the market closed at 44d., and at 86⅝c. in New York.

Mexican dollars at New York: Nov. 1, 69c.; 2, 68½c.; 3, 68c.; 5, 67c.; 6, . . . 7, 66c.

Platinum—Steady at $103 to $105, demand fair.

Palladium—Advanced to $125@130 on brisk demand.

Zinc and Lead Ore Markets

Joplin, Mo., Nov. 3—Blende per ton, high, $73.40; basis 60% Zn, premium, $75@72.50; medium to low, $65@55; calamine, per ton, basis 40% Zn, $35; average selling price, all grades of zinc, $57.37 per ton.

Lead, high, $68.70; basis 80% Pb, $65; average selling price, all grades of lead, $64.95 per ton. Lead basis price was advanced $5 per ton.

Shipment the week: Blende 7440, calamine 744 tons, lead 935 tons. Value, all ores the week, $530,320.

Word was circulated in Joplin today that the smelting works of the Fort Smith Spelter Co., Ft. Smith, Ark., had been closed; lack of margin on the profit side is said to be the cause.

Platteville, Wis., Nov. 3—Blende, basis 60% Zn, $62.50 base for premium grade down to $57 base for medium grade. Lead ore, basis 80% Pb, $60 per ton quoted but no sales are reported on this base. Shipments reported for the week were: 2211 tons of zinc ore, 89 tons of lead ore, and 598 tons of sulphur ore. For the year to date the figures are: 122,479 tons of zinc ore, 6365 tons of lead ore, and 24,197 tons of sulphur ore. Shipped during week to separating plants, 3502 tons of zinc ore.

Other Ores

Manganese Ore — November schedules have advanced the price to $1.20 per unit for high-grade metallurgical ore, averaging 48% or better.

Molybdenum Ore — Unchanged at $2.20 per lb. on the basis of 90% molybdenum sulphide.

Pyrites—Spanish lump quoted at 15c. per unit, on basis of 10s. ocean freight, buyer to pay war risk, less 2%; this concession on the war risk was made on a recent contract for 10,000 tons of Spanish lump Ocean rates remain at 35s. for Northern, 40s. for Southern and 42s. 6d. for Gulf ports.

Tungsten Ore — Prices have stiffened. High-grade wolframite was sold at $25 per unit but $26 is now being asked. Scheelite was handled at $26 for spot ore but sellers want $27.50 for future deliveries. Low-grade ores were not in much demand, a lot carrying 63 to 65% WO_3, 2% Sn and

0.1% Cu, being offered at $21 without sale. Considerable business was done in high-grade ore for forward deliveries, several contracts being reported for requirements up to June, 1918, and farther.

Iron Trade Review

PITTSBURGH—Nov. 6

Last night the Washington authorities announced a third batch of steel prices: Blue annealed sheets, 10 gage, 4.25c.; black sheets, 28 gage, 5.00c.; galvanized sheets, 28 gage, 6.25c.; tin plate, $7.75; merchant steel pipe, a 51% list, equal to 52, 5 and 2½%; plain wire, 3.25c.; cold rolled shafting, 17% off list. These prices are approximately what was expected, and practically complete the price fixing operation as relates to the iron and steel producing industry. Details are to be arranged by the manufacturers, who have shown a strong spirit of coöperation with the Government. The American Iron and Steel Institute, which has charge of much of the detail work, has announced a full set of pig iron differentials and analyses.

Set prices previously announced were: Iron, ore, same as 1917 season; pig iron, $33; billets, 4 x 4 and larger, $47.50; small billets, $51; slabs, $50; sheet bars, $51; wire rods, $57; bars, 2.90c.; shales, 3.00c.; plates, 3.25c.; grooved skelp, 2.90c.; universal skelp, 3.15c.; sheared skelp, 3.25c.

The set prices average slightly more than double the 10-year average ended 1913. They are low compared with the market of a few months ago, but they do not look so low as they would have at that time, for the passing of time has emphasized the fact that owing to the war the consumption of steel is decreasing, particularly in the non-essential industries, and steel may be distinctly plentiful a few months hence. The Government will use all the steel it can find means to employ, but the total of steel for the Government and its Allies can hardly amount to more than 40%, figured on the present rate of production.

The prices announced this week bear various relations to previous market prices. The black sheet price of 5c. compares with 8@9c. ruling last June and July, but the market has been declining rapidly in the last few weeks and yesterday, before the Government prices were announced, there were sheets available in the open market at 5c. The 51% list for pipe compares with the 55% list the National Tube Co. has adhered to since last March, but with lists of 49% and 42% held by various independents. The 3.25c. basis for wire coincides with the advanced price made a fortnight ago by the American Steel and Wire Co., an advance from 3.15c., while the independents had been holding to 3.95c.

Pig Iron—A full schedule of differentials and analyses to govern transactions in the pig-iron markets, based on the $33 agreement announced Sept. 24, has just been promulgated by the American Iron and Steel Institute, at the request of the War Industries Board. The $33 price covers No. 2 foundry and basic iron, at furnace, in all districts. Malleable is set at $33.50 and the $36.30 tentative price on bessemer, set by the trade immediately after the original price fixing, is confirmed. Iron containing 1.75 to 2.25% silicon is classed as foundry iron. A sale of 10,000 tons of basic is reported, at $33, a sale of 150 tons of off basic, at $32.50, the producer paying a commission of 1% to the broker making the sale, and a sale of 1500 tons of special bessemer, at $38.30, $1 being added for the phosphorous being 0.09% instead of 0.10% and $1 for the sulphur being 0.025% instead of 0.05% Messrs. W. P. Snyder & Co.'s computations show average prices obtaining in October sales of $36.30 for bessemer and $33 for basic, precisely the set prices. The tonnage included was fully 100,000 tons, the largest amount since June.

Ferroalloys

Ferromanganese—The market continues quotable at about $275 for prompt and $250 for first half, with very little demand, consumers evidently counting upon the Government taking care of them and being indisposed to maintain large stocks

Coke

Connellsville—Conditions are unsatisfactory, production and shipments being lighter while some operators seem indisposed to sell what coke they can ship. Consumers are complaining at Washington. The report comes again that the Fuel Administration will reduce the set price of $6. In some quarters it is thought the Government may be forced to make an example of one or two coke operators in order to bring out more coke at the set price.

STOCK QUOTATIONS

N. Y. EXCH.†	Nov. 5
Alaska Gold M	3¼
Alaska Juneau	3
Am.Sm.& Ref.,com	71½
Am. Sm. & Ref., pf	102½
Am. Sm. Sec., pf., A	94
Am. Sm. Sec., pf. B	96
Am. Zinc.	12½
Am. Zinc, pf	43
Anaconda	54
Batopilas Min	1
Bethlehem Steel.	‡79½
Bethlehem Steel, pf.	90
Butte & Superior.	16½
Cerro de Pasco	30½
Chile Cop	12¾
Chino	38¾
Colo.Fuel & Iron.	31½
Crucible Steel.	51½
Dome Mines	7½
Federal M. & S	11
Federal M. & S., pf	31
Great Nor., ore ctf.	23½
Greene Cananea	35½
Gulf States Steel	81
Homestake	96
Inspiration Con	39
International Nickel	26
Kennecott.	28½
Lackawanna Steel	‡77½
Miami Copper	26
Nat'l Lead, com.	38½
National Lead, pf	‡101
Nev. Consol.	16½
Ontario Min	4½
Quicksilver	1¼
Quicksilver, pf	1¾
Ray Con	20
RepublicI.&S.,com.	70½
Republic I. & S., pf	‡98½
Sloss-Sheffield	34½
Tennessee C. & C.	12
U. S. Steel, com	92½
U. S. Steel, pf	109½
Utah Copper	73½
Va. Iron C. & C.	50

N. Y. CURB†	Nov. 5
Big Ledge.	1½
Butte & N. Y.	75
Butte C. & Z	6
Butte Detroit	
Caledonia	.52
Calumet & Jerome.	1 1/16
Can. Cop. Corpn	1 11/16
Carlisle	4½
Cashboy	04
Con. Ariz. Sm.	1 5/16
Con. Coppermines	7½
Con. Nev.-Utah	3/16
Emma Con	½
First Nat. Cop	2½
Goldfield Con.	.40
Goldfield Merger.	.04½
Greenmonster.	3/16
Hecla Min	3½
Howe Sound	4
Jerome Verde.	.93½
Kerr Lake.	5
Louisiana	½
Magma	35
Majestic	‡ 35
McKinley-Dar-Sa	62
Milford	1
Mohican	‡ 25
Mother Lode	.28½
N. Y. & Hond	11
Nipissing Mines	7½
Ohio Cop	75
Ray Hercules	3
Richmond.	‡ 56
Rochester Mines	39
St. Joseph Lead.	‡15½
Standard S. L.	‡ 1/16
Stewart	25
Success	12
Tonopah	4 3/16
Tonopah Ex	1
Tribullion	
Troy Arizona	15
United Cop	50
United Verde Ext	‡34½
United Zinc	1½
Utica Mines	13
Yukon Gold	1½

SAN FRAN.*	Nov. 6
Alta	02
Andes	13
Best & Belcher	03
Bullion	1 01
Caledonia	00
Challenge Con	05
Confidence	00
Con. Virginia	12
Gould & Curry	02
Hale & Norcross	04
Jacket-Cr. Pt	04
Mexican	23
Occidental	60
Ophir	19
Overman	04
Savage	01
Seg Belcher	1 02
Sierra Nevada	16
Union Con	1 20
Utah Con	01
Belmont	‡3 75
Jim Butler	70
MacNamara	21
Midway	10
Mont.-Tonopah	10
North Star	06
Rescue Eula	11
West End Con.	67
Atlanta	09
Booth	03
Comb. Frac	‡ 03
D'field Daisy	‡ 02
Florence.	10
Jumbo Extension	15
Kewanas	07
Nevada Hills	05
Nevada Packard	25
Round Mountain	22
Silver Pick	10
White Caps	07
Big Jim	‡ 50
United Eastern	3 50

BOSTON EXCH.*	Nov. 5
Adventure	1
Ahmeek	83
Algomah	25
Allouez	50½
Ariz. Com., ctfs	8¼
Arnold	25
Bonanza	21
Butte-Balaklava.	25
Calumet & Ariz	62
Calumet & Hecla	430
Centennial	13
Copper Range	43
Daly West	1½
Davis-Daly	3½
East Butte	9
Franklin.	4½
Granby	63
Hancock	9
Hedley	‡16½
Helvetia	25
Indiana.	1¼
Isle Royale	21
Keweenaw.	1½
Lake	5½
La Salle	2¾
Mason Valley	3¾
Mass	5½
Mayflower.	1¼
Michigan	1½
Mohawk	60
New Arcadian	2
New Idria	10½
North Butte	12½
North Lake	60
Ojibway.	1½
Old Dominion	33
Osceola	57
Quincy	61
St. Mary's M. L.	53
Santa Fe.	75
Seneca	6
Shannon	5½
Shattuck-Ariz.	18½
So. Lake	1½
So. Utah	.10
Superior	4½
Superior & Bost.	2¾
Trinity	3¾
Tuolumne	1½
U. S. Smelting	43
U. S. Smelt'g, pf	45½
Utah Apex	2¾
Utah Con	10¼
Utah Metal.	3
Victoria.	2
Winona	‡2
Wolverine	32½
Wyandot.	.50

BOSTON CURB*	Nov. 5
Alaska Mines Corp.	.25
Bingham Mines	9½
Boston Ely	.45
Boston & Mont	.50
Butte & Lon'n Dev.	.10
Calaveras	2
Calumet-Corbin.	‡ 01
Chief Con	2
Cortez	10
Crown Reserve.	23
Crystal Cop	.60
Eagle & Blue Bell.	2
Gila Copper	17
Houghton Copper	70
Intermountain	1½
Iron Cap. Com	14
Iron Cap Cop., pf	14
Mexican Metals	.26
Mines of America	1½
Mojave Tungsten	30
Nat. Zinc & Lead.	27
Nevada-Douglas	1½
New Baltic	.75
New Cornelia.	13½
Oneco.	25
Pacific Mines	35
Rex Cons	.10

SALT LAKE*	Nov. 5
Bannack	26
Big Four	01
Cardiff	2 65
Colorado Mining	13
Daly.	1 40
Daly-Judge	8 25
Empire Copper.	1 27½
Gold Chain	16½
Grand Central	54
Iron Blossom	55
Lower Mammoth.	‡ 03
May Day	04
Moscow	11
Prince Con	80
Rico Wellington	.18
Silver-King Coal'n	2 90
Silver King Con	3 50
Sioux Con	04
So. Hecla	94
Tintic Standard	1 45
Uncle Sam	02
Wilbert	21
Yankee	03

TORONTO*	Nov. 5
Adanac	11
Bailey	05
Beaver Con	33
Chambers Ferland	12
Coniagas	2 90
Hargraves	08
La Rose	37½
Peterson Lake	08
Temiskaming	26
Wettlaufer-Lor	05½
Davidson	34
Dome Exten.	10
Dome Lake	15
Hollinger	4 60
McIntyre	1 33
Newray	43
Porcu. Crown	30
Teck-Hughes	10
Vipond	20½
West Dome	17

STOCK QUOTATIONS—Continued

COLO. SPRINGS	Nov. 5
Cresson Con.	4.50
Doctor Jack Pot.	.03½
Elkton Con.	.02
El Paso	.15
Gold Sovereign.	.02½
Golden Cycle	1 70
Granite	30
Isabella	.07½
Mary McKinney	06
Portland	1 00
United Gold M	.15
Vindicator	.27

LONDON	Oct. 22		
Alaska Mexican	‡£0	5s	0d
Alaska Tre'dwell	‡ 1	0	0
Burma Corp.	4	1	3
Cam & Motor.	0	12	6
Camp Bird.	0	8	6
El Oro.	0	10	6
Esperanza.	0	9	0
Mexican Mines	5	18	9
Nechi, pfd.	0	13	0
Oroville.	0	18	3
Santa Gert'dis.	0	14	6
Tomboy.	0	18	6

* Bid prices. † Closing prices. ‡ Last Quotations.

MONTHLY AVERAGE PRICES OF METALS

Silver	New York			London		
	1915	1916	1917	1915	1916	1917
Jan.	48.855	56.775	75.630	22.731	26.960	36.682
Feb	48.477	56.755	77.585	22.753	26.975	37.742
Mar	50.241	57.935	73.861	23.708	27.597	36.410
April	50.250	64.415	73.875	23.709	30.662	36.963
May	49.915	74.269	74.745	23.570	35.477	37.940
June	49.034	65.024	76.971	23.267	31.060	39.065
July	47.519	62.940	79.010	22.597	30.000	40.110
Aug	47.163	66.083	85.407	22.780	31.498	43.418
Sept	48.680	68.515	100.740	23.591	32.584	50.920
Oct.	49.385	67.855	87.332	23.925	32.361	44.324
Nov.	51.714	71.604	. .	25.094	34.192	.
Dec	54.971	75.765		26.373	36.410	.
Year	49.684	65.661		23.675	31.315	

New York quotations cents per ounce troy, fine silver. London, pence per ounce, sterling silver, 0.925 fine.

Copper	New York		London			
	Electrolytic		Standard		Electrolytic	
	1916	1917	1916	1917	1916	1917
Jan.	24.008	28.673	88.083	131.921	116.167	142.895
Feb.	26.440	31.750	102.667	137.895	133.167	148.100
Mar.	26.310	31.481	107.714	136.750	136.000	151.000
April	27.895	27.935	124.319	133.842	137.389	147.158
May	28.625	28.788	135.457	130.000	152.522	142.000
June	26.601	29.962	112.432	130.000	137.455	142.000
July	23.865	26.620	95.119	128.409	125.500	140.409
Aug	26.120	25.380	110.283	122.391	126.304	137.000
Sept.	26.855	25.073	113.905	117.500	134.071	135.250
Oct.	27.193	23.500	122.750	110.000	142.523	125.000
Nov.	30.625	. .	134.659	.	155.432	.
Dec	31.890	. .	145.316		162.842	.
Year	27.202		116.059	.	138.281	.

Tin	New York		London	
	1916	1917	1916	1917
January	41.825	44.175	175.548	185.813
February	42.717	51.420	181.107	198.974
March	50.741	54.388	193.609	207.443
April	51.230	55.910	199.736	220.171
May	49.125	63.173	196.511	245.114
June	42.231	62.053	179.466	242.083
July	38.510	62.570	168.357	242.181
August	38.565	62.681	169.870	243.97
September	38.830	61.542	171.345	244.03
October	41.241	61.851	179.307	247.467
November	44.109		186.932	
December	42.635		183.368	
Av. year	43.480		182.096	

Lead	New York		St. Louis		London	
	1916	1917	1916	1917	1916	1917
January	5.921	7.626	5.826	7.530	31.167	30.500
February	6.246	8.636	6.164	8.595	31.988	30.500
March	7.136	9.199	7.375	9.120	34.440	30.500
April	7.630	9.288	7.655	9.158	34.368	30.500
May	7.463	10.207	7.332	10.202	32.967	30.500
June	6.936	11.171	6.749	11.123	31.011	30.500
July	6.352	10.710	6.185	10.644	28.137	30.500
August	6.244	10.594	6.088	10.518	29.734	30.500
September	6.810	8.680	6.699	8.611	30.786	30.500
October	7.000	6.710	6.898	6.650	30.716	30.500
November	7.042		6.945		30.500	. . . .
December	7.513		7.405		30.500	. .
Year	6.853		6.777		31.359	.

Spelter	New York		St. Louis		London	
	1916	1917	1916	1917	1916	1917
Jan.	16.915	9.619	16.745	9.449	89.810	48.329
Feb.	18.420	10.045	18.260	9.875	97.762	47.000
Mar.	16.846	10.300	16.676	10.130	95.048	47.000
April	16.695	9.459	16.525	9.289	99.056	54.632
May	14.276	9.362	14.106	9.192	94.217	54.000
June	11.752	9.371	11.582	9.201	68.591	54.000
July	8.925	8.643	8.755	8.473	50.750	54.000
Aug	8.730	8.360	8.560	8.190	51.587	54.000
Sept	8.990	8.136	8.820	7.966	52.095	54.000
Oct	9.829	7.983	9.659	7.813	54.159	54.000
Nov	11.692	. .	11.422		56.023	.
Dec	10.665		10.495		55.842	
Year.	12.804		12.634		72.071	

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton

Pig Iron, Pgh	Bessemer‡		Basic‡		No. 2 Foundry	
	1916	1917	1916	1917	1916	1917
January	$21.60	$35.95	$18.78	$30.95	$19.70	$30.95
February	21.16	36.37	18.93	30.95	19.51	30.95
March	21.81	37.37	19.20	33.49	19.45	35.91
April	21.65	42.23	18.95	38.90	19.45	40.06
May	21.78	46.94	19.11	42.84	19.58	41.60
June	21.95	54.22	18.95	50.05	19.34	50.14
July	21.95	57.45	18.95	53.90	19.20	53.95
August	21.95	54.17	18.95	50.37	19.22	53.95
September	22.88	46.40	19.58	42.24	19.53	48.58
October	24.61	37.25	21.26	33.95	21.61	33.95
November	30.07		28.18		26.55	
December	35.16		30.95		30.79	
Year	$23.88		$20.98		$21.15	

‡ As reported by W. P. Snyder & Co.

Current Prices—Materials and Supplies

IRON AND STEEL

SHEETS—Quotations are in cents per pound in various cities from warehouse, also the base quotations from mill:

Blue Annealed	Large Lots, Pittsburgh	St. Louis	Chicago	San Francisco	New York Nov. 5, 1917	New York One Yr. Ago
No. 10	6.00	8.05	8.00	11.00	10.00	4.25
No. 12	6.05	8.10	8.05	11.05	10.05	4.30
No. 14	6.10	8.15	8.10	11.10	10.10	4.35
Black						
Nos. 18 and 20	5.80	9.35	8.30	10.30	9.30	3.80
Nos. 22 and 24	5.85	9.40	8.35	10.85	9.35	3.85
No. 26	5.90	9.45	8.40	10.90	9.40	3.90
No. 27	5.95	9.50	8.45	10.95	9.45	3.95
No. 28	6.00	9.55	8.50	11.00	9.50	4.00
Galvanized						
No. 10	6.50	8.35	8.70	....	10.80	....
No. 12	6.60	8.50	8.70	11.40	10.90	4.50
No. 14	6.60	8.65	8.70	11.40	10.90	4.50
Nos. 18 and 20	6.90	8.95	9.00	11.70	11.25	4.90
Nos. 22 and 24	7.05	9.10	9.15	11.85	10.55	5.30
No. 26	7.20	9.25	9.20	12.00	10.70	5.45
No. 28	7.50	9.55	9.50	12.30	11.00	5.75

STEEL RAILS—The following quotations are per 100 lb. f.o.b. Pittsburgh and Chicago for carload or larger lots. For less than carload lots 5c. per 100 lb. is charged extra:

	Pittsburgh Nov. 5, 1917	Pittsburgh One Year Ago	Chicago* Nov. 5, 1917	Chicago* One Year Ago
Standard bessemer rails	$38.00	$33.00	$38.00	$33.00
Standard openhearth rails	40.00	35.00	40.00	35.00
Light rails, 8 to 10 lb.	83.00	50.00	83.00	43.00
Light rails, 12 to 14 lb.	82.00	49.00	82.00	42.00
Light rails, 25 to 45 lb.	75.00	47.00	75.00	40.00

TRACK SUPPLIES—The following prices are base per 100 lb. f.o.b. Pittsburgh for carload lots, together with the warehouse prices at the places named:

	Pittsburgh Nov. 5, 1917	Pittsburgh One Year Ago	Chicago	St. Louis	San Francisco
Standard railroad spikes, $\frac{9}{16}$-in. and larger	$5.00 to 7.00	$2.65	$5.00	$6.45	$7.25*
Track bolts	7.00 to 8.00	3.25	6.25	Premium	8.80*
Standard section angle bars	3.50	2.00	4.50	Premium	4.65*

*Per 100 lb.

STRUCTURAL MATERIAL—The following are the base prices f.o.b. mill, Pittsburgh, together with the quotations per 100 lb. from warehouses at the places named:

	Pittsburgh	New York Nov. 5, 1917	New York 1 Yr. Ago	St. Louis	Chicago	San Francisco	Dallas
Beams, 3 to 15 in.	$3.00	$5.25	$3.85	$5.05	$5.00	$7.75	$6.00
Channels, 3 to 15 in.	3.00	5.25	3.25	5.05	5.00	7.75	6.00
Angles, 3 to 6 in., ¼ in. thick	3.00	5.25	3.25	5.05	5.00	7.75	6.00
Tees, 3 in. and larger	3.00	5.30	3.40	5.05	5.05	7.75	6.00
Plates	3.25	10.00	4.00	7.05	7.00	10.50	9.00

RIVETS—The following quotations are per 100 lb.:

	Mill, Pittsburgh	Warehouse New York Nov. 5, 1917	Warehouse New York One Year Ago	Warehouse Chicago	Warehouse St. Louis	Warehouse San Francisco	Warehouse Dallas
STRUCTURAL							
¾ in. and larger	$5.25	$7.00	$5.25	$5.50	$5.55	$7.15	$8.40
CONE HEAD BOILER							
¾ in. and larger	5.35	7.10	5.35	5.60	5.65	7.25	8.50
⅝ and $\frac{11}{16}$	5.50	7.25	5.50	5.75	5.80	7.40	8.65
½ and $\frac{9}{16}$	5.85	7.60	5.85	6.10	6.15	7.75	9.00

Lengths shorter than 1 in. take an extra of 50c. Lengths between 1 in. and 2 in. take an extra of 25c.

HORSE AND MULE SHOES—Warehouse prices per 100 lb. in cities named:

	Mill, Pittsburgh	Chicago	St. Louis	Denver	Birmingham
Straight	$4.75	$7.00	$5.50	$7.75	$6.25
Assorted	4.90	7.00–7.50	5.75	8.00	6.50

STEEL SHEET PILING—The following price is base per 100 lb. f.o.b. Pittsburgh with a comparison of a month and a year ago:

Nov. 1, 1917	One Month Ago	One Year Ago
$4.00 to $5.00	$4.50 to $5.00	$2.60 to $2.70

WIRE ROPE—Discounts from list price on regular grades of bright and galvanized are as follows:

	New York	St. Louis	Chicago	San Francisco
Galvanized	10—2½%	10—2½%	10—2½%	List
Bright	20—2½%	20—2½%	20—2½%	15%

SWEDISH (NORWAY) IRON—This material per 100 lb. sells as follows:

	Nov. 5, 1917	One Year Ago
New York	$14.00	$6.00
Cleveland	15.00	6.30
Chicago	13.50	5.50

In coils an advance of 50c. usually is charged:
Note—Stock scarce generally.

PIPE—The following discounts are for carload lots f.o.b. Pittsburgh, basing card in effect July 2, 1917, for iron, and May 1 for steel:

Steel Inches	Steel Black	Steel Galvanized	Iron Inches	Iron Black	Iron Galvanized
BUTT WELD					
¾ to 3	49%	35½%	¾ to 1½	33%	17%
LAP WELD					
2	42%	29½%	2	26%	12%
2½ to 6	45%	32½%	2½ to 4	28%	15%
7 to 12	42%	28½%	4½ to 6	28%	15%
13 and 14	32½%	....	7 to 12	25%	12%
15	30%	....			
BUTT WELD. EXTRA STRONG PLAIN ENDS					
¾ to 1½	47%	34½%	¾ to 1½	33%	18%
2 to 3	48%	35½%			
LAP WELD. EXTRA STRONG PLAIN ENDS					
2	40%	28½%	2	27%	14%
2¼ to 4	43%	31½%	2½ to 4	29%	17%
4½ to 6	42%	30½%	4½ to 6	28%	16%
7 to 8	38%	24½%	7 to 8	20%	8%
9 to 12	33%	19½%	9 to 12	15%	3%

From warehouses at the places named the following discounts hold for steel pipe:

	Black New York	Black Chicago	Black St. Louis
¾ to 3 in. butt welded	38%	42%	34.27%
3½ to 6 in. lap welded	18%	38%	21.27%
7 to 12 in. lap welded	10%	35%	21.27%

	Galvanized New York	Galvanized Chicago	Galvanized St. Louis
¾ to 3 in. butt welded	22%	22%	19.27%
3½ to 6 in. lap welded	List	18%	13.27%
7 to 12 in. lap welded	List+20%	20%	6.27%

Malleable fittings, Class B and C, from New York stock sell at 5 and 5% from list prices. Cast iron, standard sizes, 34 and 5%.

MISCELLANEOUS

FLOTATION OILS—Prices of oils for flotation, in cents per gallon, in barrels:

	New York	Chicago	Denver In Bbl. Lots	Denver In Carload Lots
Pure steam-distilled pine oil	$0.50½	$0.45	$0.30	$0.27
Pure destructively distilled pine oil	.40	.43	.30	....
Pine tar oil	.28½	.30	.24½	.19
Crude turpentine	.37	.47	.44	.38
Hardwood creosote	.19½*	.....	.34½	.31

*F.o.b. Cadillac, Mich.

SODIUM CYANIDE—New York price is 37c. per lb.; Denver, 44c.; in Chicago, 65c.

SODIUM SULPHIDE—In New York the price per pound is 4c. to 4¼c. for concentrated, 2¼c. to 2½c. for crystals. The Denver price for concentrated is quoted at 3½c. The Chicago price is 3½c. Concentrated comes in 500-lb. drums, the crystals in 400-lb. barrels.

ZINC DUST—New York price is 18c. per lb. in 1600-lb. barrel; Chicago, 18c.; in Denver, 18c.; in Chicago, 20c.

CALCIUM CARBIDE—Price f.o.b. cars at warehouse points east of Mississippi River (except in Alabama, Georgia and Florida) is $97.50 for Cameo, $102.50 for Union miners' carbide. In territory between Mississippi River and the Rockies and in Alabama, Georgia and Florida, add $5; west of Rockies, add $10 to $15.

LINOLEUM—In 50-sq.yd. rolls in carload lots the price is 88c. per square yard, for concentrating tables.

HOSE—

Fire	50-Ft. Lengths
Underwriters' 2⅝-in.	70c. per ft.
Common, 2½-in.	40–10%

Air	First Grade	Second Grade	Third Grade
¾-in. per ft.	$0.55	$0.30	$0.25

Steam—Discounts from list

First grade... 30% Second grade... 30-5% Third grade... 40-10%

RUBBER BELTING—The following discounts from list apply to transmission rubber and duck belting:

Competition	50–10%	Best grade	25%
Standard	40%		

LEATHER BELTING—Present discounts from list in the following cities are as follows:

	Medium Grade	Heavy Grade
New York	40%	35%
St. Louis	45%	40%
Chicago	30+10%	40+5%
Birmingham	35%	35%
Denver	40%	35%

RAWHIDE LACING—40%.

MANILA ROPE—For rope smaller than ⅝-in. the price is ½ to 2c. extra; while for quantities amounting to less than 600 ft. there is an extra charge of 1c. The number of feet per pound for the various sizes is as follows: ⅝-in., 8 ft.; ¾-in., 6; ⅞-in., 4½; 1-in., 3½; 1⅛-in., 2 ft. 10 in.; 1¼-in., 2 ft. 4 in. Following is price per pound for ⅝-in. and larger, in 1200-ft. coils:

Boston	$0.35½	Kansas City	$0.33½
New York	.34	Los Angeles	.33½
Chicago	.32½	Seattle	.33½
Denver	.35½	San Francisco	.31

PACKING—Prices per pound:

Rubber and duck for low-pressure steam	$0.77
Asbestos for high-pressure steam	1.54
Duck and rubber for piston packing	.88
Flax, regular	.60
Flax, waterproofed	09
Compressed asbestos sheet	.90
Wire insertion asbestos sheet	1.21
Rubber sheet	.55
Rubber sheet, wire insertion	.88
Rubber sheet, duck insertion	.44
Rubber sheet, cloth insertion	.25
Asbestos packing, twisted or braided, and graphited, for valve stems and stuffing boxes	1.10
Asbestos wick, ½- and 1-lb. balls	.65 to .70

FIRE BRICK—Quotations on the different kinds in the cities named are as follows, f.o.b. works:

	New York	Chicago
Silica brick, per 1000	$50.00 to 55.00	$55.00 to 60.00
Fire clay brick, per 1000, No. 1	45.00 to 55.00	....
Magnesite brick, per net ton	135.00 to 145.00	....
Chrome brick, per net ton	135.00	....
Deadburned magnesite brick per net ton	85.00 to 90.00	....
Special furnace chrome brick, per net ton	60.00 to 70.00	60.00 to 80.00

Standard size fire brick, 9 x 4½ x 2½ in. The second quality is $4 to $5 cheaper per 1000.

St. Louis—High grade, $55 to $65; St Louis grade, $40 to $50.

Birmingham—Fire clay, $25 to $30; Denver, $23, per 1000

RAILWAY TIES—For fair-size orders, the following prices per tie hold:

	Material	7 in. x 9 in. by 8 Ft 6 In.	6 in. x 8 in. by 8 Ft.
New York	Yellow Pine	$1.30	$1.06 to 1.11
St Louis	Plain No. 1 White Oak	1.00	.75
Chicago	White Oak	.97	.82
Chicago	Creosoted	1.30	1.15
San Francisco	Green	1.08	.77
San Francisco	Creosoted	1.97	1.49

GREASES—Prices are as follows in the following cities in cents per pound for barrel lots:

	New York	Denver	Chicago	Birmingham	St Louis
Cup	5 to 7	9½	7½	5½	5.6
Fiber or sponge	5 to 7	12	7¾	12½	5.9
Transmission	5 to 7	13	6¼	12½	5.9
Axle	3 to 7	5	5	4½	3.3
Gear	4 to 5	4½	6½	10½	6
Car journal	5½ to 7¼	4	6	9	3.75

COTTON WASTE—The following prices are in cents per pound:

	New York		Cleveland	Chicago
	Nov. 5, 1917	One Year Ago		
White	11.00 to 13.00	10.00 to 12.00	16.00	14.00 to 15.00
Colored mixed	8.50 to 12.00	7.00 to 9.00	14.00	10.00 to 12.00

WIPING CLOTHS—In Cleveland the jobbers' price per 1000 is as follows:

13¼ x 13¼	$35.00	13¼ x 20½	$45.00

In Chicago they sell at $30 to $33 per 1000.

LINSEED OIL—These prices are per gallon:

	New York		Cleveland		Chicago	
	Nov. 5, 1917	One Year Ago	Nov. 5, 1917	One Year Ago	Nov. 5, 1917	One Year Ago
Raw in barrels	$1.10	$0.88	$1.15	$0.97	$1.17	$0.92
5 gal. cans	1.26	.98	1.25	1.07	1.27	1.02

WHITE AND RED LEAD in 500-lb. lots sell as follows in cents per pound:

	Red				White	
	Nov. 5, 1917		1 Year Ago		Nov. 5, 1917	1 Yr Ago
	Dry	In Oil	Dry	In Oil	Dry and In Oil	Dry and In Oil
100-lb keg	12.25	12.50	10.50	11.00	12.00	10.50
25- and 50-lb. kegs	12.50	12.75	10.75	11.25	12.25	10.75
12½-lb. keg	12.75	13.00	11.00	11.50	12.50	11.00
1- to 5-lb. cans	14.25	14.50	12.50	12.50	14.50	12.50

NUTS—From warehouse at the places named, on fair-sized orders, the following amount is deducted from list:

	New York		Cleveland		Chicago		
	Nov. 5, 1917	One Year Ago	Nov. 5, 1917	One Year Ago	Nov. 5, 1917	One Year Ago	St. Louis, Nov. 5, 1917
Hot pressed square	List	$1.50	$1.30	$3.00	$2.00	$3.00	$1.00
Hot pressed hexagon	List	1.50	1.20	3.00	2.00	3.00	1.00
Cold punched square	List	1.00	List	2.00	1.50	2.00	1.00
Cold punched hexagon	List	1.50	List	2.75	1.50	2.75	1.00

Semifinished nuts sell at the following discounts from list price

	Nov 5, 1917	One Year Ago
New York	50%	50—10%
Cleveland	45%	50—10%
Chicago	50%	50—10%
St Louis	40%	....

MACHINE BOLTS—Warehouse discounts in the following cities

	New York	Cleveland	Chicago	St Louis
⅝ by 4 in. and smaller	30%	35–5%	40–10%	35
Larger and longer up to 1 in. by 30 in.	15%	25–5%	35–5%	25–5%

WROUGHT WASHERS—From warehouses at the places named the following amount is deducted from list price:

New York $1.00 Cleveland $3.50 Chicago $4.00 St Louis $3.25

For cast iron washers the base price per 100 lb. is as follows

New York $5.00 Cleveland $5.50 Chicago $3.50 St. Louis $2.75

EXPLOSIVES—Price per pound in small lots at cities named:

	Low Freezing 20%	Gelatin 40%	Gelatin 60%	Gelatin 80%	Black Powder
New York	......	$0.27½	$0.34½	......	$2.50*
Boston	......	......	.36¼	$0.43¾	....
Kansas City	$0.20	.26¼	.33¼	.43¼	....
Los Angeles	.20	.27	.35	......	....
Seattle	.18½	.24¾	.31¾	.41¾	....
Chicago	.19¾	.23¾	.33	.43	2.45*
St. Paul	.20	.26¼	.33¼	......	2.55*
St Louis	.16½	.20½	.29½	.39½	2.15*
Denver	.19	.25¼	.32¼	.42¼	....
Dallas	.25	.29	.39	.49	....

*25-lb. bags.

FUEL OIL—Price variable, depending upon stock. New York quotations not available owing to this fact. In Chicago and St. Louis the following prices are quoted:

	Chicago	St. Louis
Domestic light, 22-26 Baumé	5¼c.	4½–4¾c.
Mexican heavy, 12-14 Baumé	7c.	3½c.

Note—There is practically no fuel oil in Chicago at present time.

OIL—Price per 50-gal. bbl. is as follows:

City	Fuel	Black	Red Engine	Steam Cylinder	Gasoline
Seattle	$1.60	$6.25	$11.00	$21.00	$10.25
Los Angeles	1.45	6.50	12.00	26.00	10.00
Denver	3.25	8.75	17.00	24.00	12.00
*St. Paul	3.00	5.50	11.00	17.50	10.05
Boston	5.50	10.50	15.00	20.00	12.50
Kansas City	7.20	5.20	10.50	17.85	10.15

Note—Standard prices of oil are necessarily difficult to give. Those above are for average grades.

*These are last month's quotations; current prices not available.

CONSTRUCTION MATERIALS

ROOFING MATERIALS—Prices per ton f.o.b. New York or Chicago:

	Carload Lots	Less Than Carload Lots
Tar felt (14 lb. per square of 100 sq.ft.)	$61.00	$62.00
Tar pitch (in 400-lb. bbl.)	15.00	16.50
Asphalt pitch (in barrels)	29.00	30.50
Asphalt felt	60.00	62.00

PREPARED ROOFINGS—Standard grade rubbered surface complete with nails and cement costs per square as follows in New York and Chicago:

	1-Ply		2-Ply		3-Ply	
	c.l.	l.c.l.	c.l.	l.c.l.	c.l.	l.c.l.
No. 1 grade	$1.15	$1.40	$1.45	$1.60	$1.75	$1.90
No. 2 grade	1.10	1.25	1.25	1.40	1.50	1.65

Asbestos asphalt saturated felt (14 lb. per square) costs $5.35 per 100 lb.

Slate-surfaced roofing (red and green) in rolls of 108 sq.ft. costs $1.85 per roll in carload lots and $2.10 for smaller quantities

Shingles, red and green slate finish, cost $4.75 per square in carloads, $5 in smaller quantities, in Philadelphia.

HOLLOW TILE—

	4x12x12	8x12x12	12x12x12
Boston	$0.0957	$0.171	$0.2266
Kansas City*	.0595	.1125	.1575
Denver	.09	.17	.25
New Orleans	.0892	.1417	.1863
Los Angeles*	.05	.10	.165
Chicago	.07	.135	...

*In quantities of 1000.

LUMBER—Price per M in carload lots:

	8 x 8-In. x 20 Ft. and Under				12 x 12-In., 20 Ft. and Under	
	Y P	Fir	Hemlock	Spruce	Y.P.	Fir
Kansas City	$11.00	$33.00	$33.00	....	$17.00	$33.00
Seattle	21.00	21.00	21.00	$21.00	21.00	21.00
Denver	....	30.00	..	27.50	....	32.00
San Francisco	...	24.00	24.00	....	....	24.00
St. Paul	....	38.00	31.50	....	....	43.00

Note—Boston lumber market demoralized

	1-In. Rough, 10 In. x 16 Ft. and Under			2-In. T. and G. 10 In. x 16 Ft.	
	Y P	Fir	Hemlock	Y P	Fir
Kansas City	$42.00	$42.50	$41.00	$50.00	..
Seattle	21.00	21.00	21.00	21.00	$21.00
Los Angeles		30.00	30.00	.	..
Denver	.	30.00	30.00	....	30.00
San Francisco	...	24.00	24.00	....	24.00
St. Paul	.	51.00	34.00	50.00	37.50

PORTLAND CEMENT—These prices are for barrels in carload lots, including bags:

	Nov 5, 1917	One Month Ago	One Year Ago
New York	$2.22	$2.22	$1.72
Jersey City	2.10	2.10	1.60
Boston	2.77	2.77	1.92
Chicago	2.21	2.31	1.80
Pittsburgh	2.31	2.31	1.81
Cleveland	2.44	2.44	1.94
Denver	3.20	3.20	...
Los Angeles	2.30	2.40	...

LIME—Warehouse prices:

	Hydrated per Ton		Lump per 300-Lb. Barrel	
	Finished	Common	Finished	Common
New York	$10.50	$13.25	$2.10	$1.90
Chicago	15.00	12.00	1.90	....
St Louis	12.00	10.75	....	....
Dallas	20.00	15.00	....	....
San Francisco	18.00	...	1.65	....

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Drift Mining in California

By J. D. HUBBARD*

Decadence of mining in the lava-covered Tertiary gravels of California is due to lack of enterprise in applying modern methods and machinery. Extensive deposits of low-grade gravels await development. The varied working conditions are discussed, and the application of more advanced methods is advocated. Some average working costs are given.

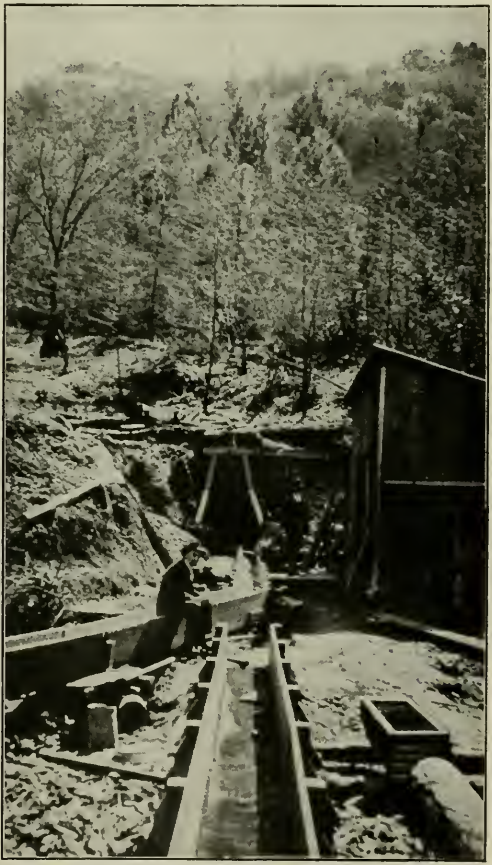
Mining of the lava-covered gold-bearing gravels in California was not affected by the passage of the Anti-Débris Law, which threw hundreds of hydraulic miners out of work. Nevertheless, there has been a gradual decline in drift mining. Only the richest and most accessible of the lava-buried gravels have been exploited and these by methods often crude and wasteful. About three hundred miles of ancient-river channels have been worked out with an average production of nearly a million dollars in gold per mile. As natural conditions became more difficult and the lack of modern equipment more acutely felt, this class of mining declined to a degree that has hardly been overcome to date.

That drift mining presented strong attraction to the mining man is obvious, for it afforded many opportunities for rich "strikes." The chance of a "find," however, has little place in modern business practice. The main thing now is to adopt modern and efficient methods and to calculate profit from the "run-of-mine" gravel, discounting strikes and regarding them merely as velvet. In this day of drilling and mucking machines and improved metallurgy, drift mines deserve more attention.

The drift mines of the state have an excellent record of production. In this connection I will refer to Waldemar Lindgren's report[1] on the "Tertiary Gravels of the Sierra Nevada of California," in which the following appears:

> As shown in detail in the following tables, the counties of the Sierra Nevada north of and including Mariposa have produced approximately $57,500,000 in placer gold during the period (1897-1909) for which accurate statistics are available. Of this not more than $15,000,000 came from the gravels of the pre-Tertiary channels. What the total production may have been is impossible to estimate, for the reason that in the earlier years the yield of the placers was not subdivided according to source. The total output of gold in California is estimated at $1,200,000,000 to $1,500,000,000, but about one-fifth of it was derived from quartz veins. The great bulk of this came from the Quaternary deposits, and about $300,000,000 is a conservative estimate for the amount obtained from the Tertiary gravels.

I direct attention to the last sentence, which is significant. The Tertiary or Neocene gravels make up the ancient-river beds of California, which still have three thousand miles or more of unworked channels.



MINERAL SLIDE DRIFT MINE, PARADISE, CALIF.

The formation of the ancient-river beds was the result of a great period of erosion. The contour line of that period was just the reverse of what it is at present, for the lava-capped channels are now the ridge tops, while in that past age they were the bottoms of the ravines or rivers in which the gold was concentrated. The Sierra Nevada, during this period, was a range with comparatively low relief. The drainage system during the Neocene era had its sources near the modern crest of the range, but the channels did not coincide with those of the present. Erosion gradually decreased in intensity, and auriferous gravels accumulated in the lower reaches of these Neocene rivers, the gold being derived from the eroded croppings of the veins. During the latter part of the Neocene period, volcanic activity, long dormant, began again. When the lavas burst forth they flowed down the river channels. The earlier flows were not sufficient to fill the streams and became interbedded with gravels. They are now represented by layers of rhyolite, andesite and rhyolite tuffs, sometimes altered to pipe clay. The later andesite and basalt eruptions were of great volume and, for the most part, completely choked the channels into which they flowed. The rivers were thus obliged to seek new outlets—substantially those in which they now flow.

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*Formerly manager of the Lucky John mine, Paradise, Calif.; now general superintendent for the Holden Mining and Milling Co., Tuscarora, Nev.

[1] Professional Paper 73, U. S. Geol. Surv., Washington, D. C.

Working Conditions and Methods

Mines are seldom alike, and a study of each must be made in order to work it in the best manner possible. The drift mines vary greatly. In some places the gravel is shallow and in others deep. The bedrock also varies considerably, but the ancient rivers were formed in a country of low relief and are less broken up and generally wider than the present streams. Some of the ancient streams were deeply cut, almost to the present base line, and deposits in these have to be worked through shafts, but by far the larger number of the channel deposits can be worked through tunnels and by gravity methods.

The prospecting work always aims to find the center of the stream bed and its lowest point. A main tunnel should then be driven on a working grade as close to the center line of the stream bed as possible. Crosscuts to the "rim" or shore line on either side at right angles to the main tunnel may be driven, 50, 100 or 200 ft. apart, to develop the gravel and find the extent of the "pay" laterally. Then, as shown in Fig. 1, the gravel can be stoped out from the rim side, working toward the center. A solid pillar of gravel should be left to protect the main tunnel, and when the channel has been worked out, this pillar may be removed, as shown in Fig. 2, by starting at the far end of the property and working toward the mouth of the tunnel. As one rim or the other is often exposed on the side hill, the crosscuts may be driven through to daylight, affording extra exits and better ventilation to the mine. The larger rocks may be thrown back for filling and so require one handling only.

Care must be taken in blasting not to throw the gravel on the rock pile. A little experience teaches the miner the right amount of powder to use to "kick" the ground just enough to cause it to roll from the face. It has been my experience that it is an excellent plan to pick men that really understand dynamite and have them do the shooting exclusively, paying them a little more money for the exercise of this superior skill. The same rule applies in other branches of the work and the practice is an economy in the end. Where a man displays aptitude along any particular line, even on the "muck-stick," it is profitable to give him higher pay—particularly in the case of American labor.

Where "low-ground" is found and the lava cap is not too far from bedrock, heavy T-sets, as shown in Fig. 3, may be used to good advantage. When the gravel bed is thicker, cribs or "cogs" of timber can be set up, as shown in Fig. 4. The cribs should be filled with rocks or boulders and when full are of great strength, second only to a solid pillar. In all cases the larger rocks and boulders may be thrown back for walls and filling. Where the gravel is still deeper, as shown in Fig. 5, methods of timbering or filling must be used to suit the case. Often a caving system, working from the rim toward the center, is best.

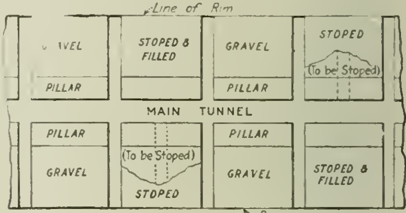

FIG. 1

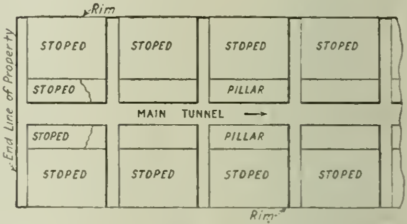

FIG. 2

METHOD OF STOPING IN CALIFORNIA DRIFT MINES

Fig. 1 shows stoping from the rim side toward the center of the deposit, leaving pillars to protect tunnel. Fig. 2 shows method of removing pillars from end of property toward mouth of tunnel

Machine drills and mucking machines should be used wherever possible, for they will greatly reduce the cost of mining under certain conditions. The old methods of hand-moiling are obsolete, besides being wasteful of powder. I consider the decadence of drift mining due more to the persistence of hand-moiling methods than to any other cause. To make drift mining successful is just a matter of keeping up with the times, and drift miners seem to have been asleep in this regard. Heavy machines are not required in most gravels, the one-man type, such as the mountable plugger machines, being best. More gravel can be broken with a given amount of powder in a machine hole than in a moil hole, which becomes funnel-shaped and therefore does not confine the powder as it should. Where there is plenty of water and sluice-grade methods may be used underground to get rid of the muck, operating cost may be greately reduced. It takes work to get a drift mine or any other mine in shape, but once opened properly it becomes a first cousin to the check book, to be drawn on at will up to the limit of the account.

It is remarkable how much ground was worked out by the oldtimers before powder was used. The method then was to pick and gad out close to bedrock and then break down to the cut. The best miner was the one who could practically put his right hand in his left-hand pants pocket, for he had to lie on his side while working his cut. Only the better grade of ground could be worked that way. Nowadays it is not uncommon for one man with a good machine to break down 50 cu.yd. of gravel in his shift. The method of working must be carefully considered for each mine and the system best adapted under the conditions selected.

The costs of drift mining vary from 60c. per cu.yd. under favorable conditions and where sluicing can be done, to $4 per cu.yd. where a shaft is necessary and hoisting and pumping are items of cost. Where a good-sized channel occurs and gravity workings are possible, by operating on a large scale the costs should not exceed $1 per yd. when prices for material are normal. Labor is the greatest cost in nearly all cases, and mucking the largest item, except where mucking machines can be used to advantage. The items of timbering, filling, power, water, powder and supplies, overhead, and the unexpected, must be carefully considered. Depreciation is generally low in drift mining, as only the simplest kind of plant is required.

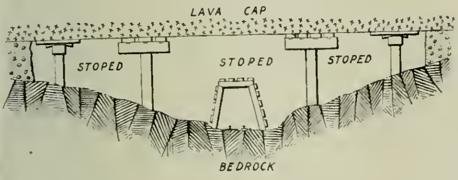

FIG. 3

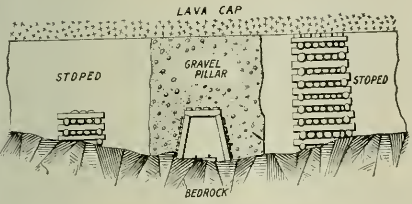

FIG. 4

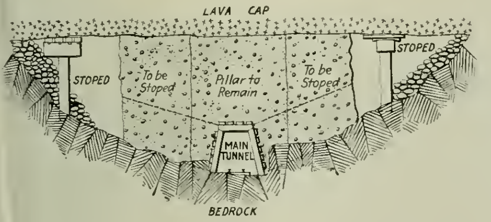

FIG. 5

TIMBERING IN CALIFORNIA DRIFT MINES

Fig. 3 shows use of T-sets when lava capping is not too far from bedrock. Fig. 4 shows use of cribs where gravel bed is thicker. Deeper gravel beds such as in Fig. 5 require methods of timbering or filling

The source of supply and cost of water should be given particular attention, as water is absolutely necessary to this class of mining. The time-honored plan is to appropriate water from a neighboring stream and bring t to the required point at the mine by ditch and flume. The first cost of the ditch and flume, even with labor at normal figures, is always a big item, as the ditch, on account of the necessary grade, is seldom less than a mile long. The water must arrive at the tunnel mouth with sufficient head to be effective. Where a ditch is practicable and the conditions are right it should be built, for it will run without gasoline. I wish to emphasize, however, the practicability of pumping water by power. Few realize the low first cost of good pumps, their mobility and dependability. A pump and an electric motor, for delivery of 300 gal. per min. (about 34 miner's inches) under 500 ft. head, will cost, say, $2500. The cost for power and upkeep should not exceed $10 per day for 16 hours work. And there is generally a stream nearby with sufficient water.

Drift mines generally make more water as the ground is developed. In some cases there is an abundance of water, sufficient for sluicing operations, and when these conditions exist the cost of water is practically nil.

TIMBER REQUIREMENTS VARIABLE

Timbering is an uncertain item. In many drift mines considerable timber must be used and in others only a small quantity, but all need some. Where a bedrock tunnel is run in fairly good ground little timber is needed. Only when stoping commences will it be used in any large amount, and then it will depend entirely on the character of ground worked. In the Hidden Treasure drift mine in Placer County, from 1,500,000 to 2,000,000 ft., b.m., of timber was used underground each year. In the Mineral Slide drift mine, in Butte County, not over 5000 ft. per year went underground It depends on the mine, and what is under your hat.

In the following estimate of working costs, labor and supplies are at normal prices, the usual slate bedrock and the gravel of ordinary compactness—not cemented. In mentioning "cement" let me state that I have found it to be the great "bugaboo" of drift mining. What cemented material there is forms a very small part of the whole and I have known several drift mines that prepared to work this much feared "cement" by erecting mills and crushing devices which afterward did not turn a wheel. In the accompanying table of costs, one-man machine drills are used and in the remainder of the work ordinary hand methods. If mucking machines can be used, or sluicing, or electric haulage, shoveling and transportation costs may be much reduced. It will be noted that the cost of powder per foot or cubic yard is the largest item. This cost is practically a fixed charge and takes no account of the size of the operations.

COST OF DRIFT GRAVEL MINING

	Stoping[1] Per Cu.Yd.	Drifting[2] Per Ft	Tunneling[3] Per Ft
Drilling	$0 14	$0 35	$0 70
Mucking and tramming	26	1 00	80
Powder, caps and fuse	33	1 65	1 85
Power	03		.30
Timber and filling	06	..	
Tools and sharpening	.02	. .	
Superintendence	03		..
Lights and miscellaneous	04	.46*a*	26*b*
Depreciation	02		
Total	$0 93	$3 46	$3 91

[1] Breast at least 30 ft. wide and output 500 cu.yd. per day. Supplies and labor. $3 to $4 per shift, at normal costs and all material delivered to the sluices.

[2] Drifting in gravel; 6x7-ft. cut; same conditions and methods.

[3] Averaging 5 ft. per shift in slate bedrock; 6x7-ft tunnel; same conditions No timber costs allowed, as drift stands without timber. If it had been necessary to use timber the additional cost would not exceed $1 per ft.

a Costs include power, track and ties, miscellaneous.

b Costs include track and ties, miscellaneous.

The washing plant is a factor in drift mining that for low first cost and cheapness of operation cannot be beat. In many cases the simplest system of riffles may be used. It is well to give two or three drops of a few feet each to the material to be washed, taking out the coarser material with grizzlies at each drop. This helps to disintegrate the mass and thereby free the gold. Different sluice grades are used, decreasing as the material gets finer. There is no advantage in a multiplicity of riffles. Pole and Hungarian riffles fit all cases. The fine material containing the black sands and fine gold is discharged into a tank with taper bottom where the sands are settled and the surplus water is allowed to run to waste. The thickened sands are then fed to a concentrator, preferably of the end-shake type which finally collects the gold. In Fig. 6 a typical gravel washing plant is shown. The concentrator is an important part of the plant and allows considerable latitude in the matter of the regulation of grade and water, which have to be particularly watched when the sluices are depended on to make the whole saving.

By neglecting the use of concentrators in the past large amounts of gold, platinum, and valuable byproducts have been lost. I have found the following minerals and metals in the drift gravel sands of California: Platinum, chromite, osmium-iridium, ilimenite, spinel, zircon, epidote, magnetite, garnet, tourmaline, pyroxine, monazite, amphibole, rutile, olivine, corundum and small diamonds and sapphires. Often these minerals are of sufficient quantity to warrant reclamation. The black sands of the Klamath Mountains and Butte County usually contain a considerable amount of chromite, and it will be a simple matter to save this valuable material by the use of a good type of magnetic separator. Nearly all the chromiferous serpentine areas in this state have sufficient chromite to make the recovery worth while. The percentage of black sand in the ancient channels varies from 1% to 3 or 4%, but rarely over 4%. So one concentrating table is generally sufficient for each plant, unless a large tonnage is worked.

In case tightly packed or slightly cemented material occurs in the mine, a different plant becomes necessary. This, however, is the exception. In Fig. 7 I show the flow sheet of a good type of plant to treat the more refractory material. Owing to the favorable conditions—slightly greater fall, ample water, and a natural classification—the gravels of California have an advantage over those of many other districts, as the bulk of the fine material which causes cementing and hardening has been washed away in the making of the channels.

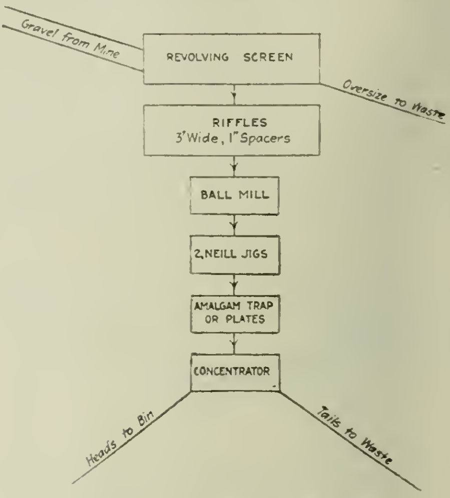

FIG. 7. TYPICAL MILL FLOW SHEET

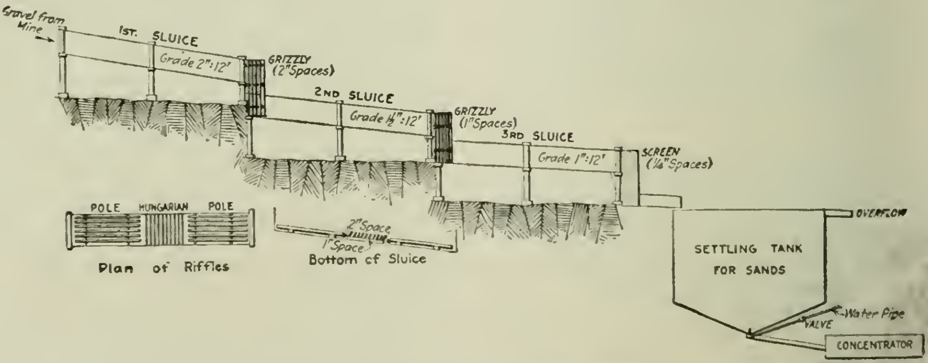

FIG. 6. TYPICAL GRAVEL-WASHING PLANT

In favorable places in these ancient channels there is a concentration of gold, and when one of these spots is found it is Fourth-of-July every day for a while. In the old Perschbaker drift, near Magalia, it is a tradition that the shovelers often picked up from $80 to $100 in a good shovelful of "dirt" from one of these favored spots. Many large nuggets have been found. It is characteristic of the ancient-channel gold that its average fineness is greater than the gold of later concentrations. In the Mineral Slide and Lucky John drift mines, in Butte County, gold running $19.85 per oz. in its natural state has been found, and, so far as I know, this was the finest mined in the state.

The importance of a decided change from old-time methods in drift mining is so great that it is difficult to put sufficient emphasis on it. The pumps and machine drills of today are so far superior to the old types that comparisons are indeed odious. With careful and intelligent exploitation—fair terms between owner and operator and a modern system of operation—California drift mines could again operate extensively, and be placed upon a profitable basis.

Power Plant of the St. Joseph Lead Co.[*]

BY E. L. BROOME

Steam Engineer, Viele, Blackwell & Buck

Description of a new central power plant serving several mining properties in southeastern Missouri. Among the unusual features of the plant is the handling of the coal and the feed water.

PRIOR to March, 1917, the St. Joseph Lead Co. and its allied companies, operating lead mines and mills in southeastern Missouri, generated their power at three separate points, each roughly at the apex of an equilateral triangle whose sides measure about six miles.

At Leadwood, which is at the western apex, there are one 1000-kw. high-pressure turbo-generator and one 1000-kw. mixed-pressure turbo-generator, the latter operating on exhaust steam from several steam-driven compressors and two horizontal noncondensing steam engines. Each turbine is served by a jet condenser with a spray cooling pond for the circulating water.

THE ST. JOSEPH PLANT AT RIVERMINES, MO., SHOWING POWER HOUSE, COAL BUNKER AND CONVEYOR

At Bonne Terre, the northern apex, there are three gas-engine driven, direct-connected generators with a total nominal capacity of 1620 kw., and at Rivermines, the southern apex, there are four gas-engine driven units of total capacity of 2160 kw. These plants are connected in parallel by tie lines between Rivermines and Leadwood, and Leadwood and Bonne Terre, but with no direct tie between Rivermines and Bonne Terre.

A gradual increase in the electric load, due to changes from steam to electrically driven machinery and the increase of production during the last three years, created a demand for power which rapidly outgrew the existing capacity and made necessary the installation of a new power plant.

The site of the new plants at Rivermines was determined largely by the situation of the center of gravity of the load and by the consideration of railroad facilities, space for coal storage and an available supply of circulating water. Ground was broken early in April, 1916, and in spite of the congested freight conditions and manufacturing delays, the first unit was started Mar. 22, 1917, and the second about a week later. While not a record performance, in view of the fact that the main equipment orders were placed during March, 1916, it compares well with similar installations even in less active periods.

In general plan the plant follows the established practice for an installation of its size, but the unique treatment of several important details justifies a rather extended description.

The foundations are carried down to rock, which lies fairly level about 12 ft. below grade. The basement walls of the turbine room and the walls of the cold well are also carried down to rock, which is below river-water level; but in the boiler room the columns are carried on piers founded on rock, as are also the main loads of the boilers. Between the piers reinforced-concrete gird-

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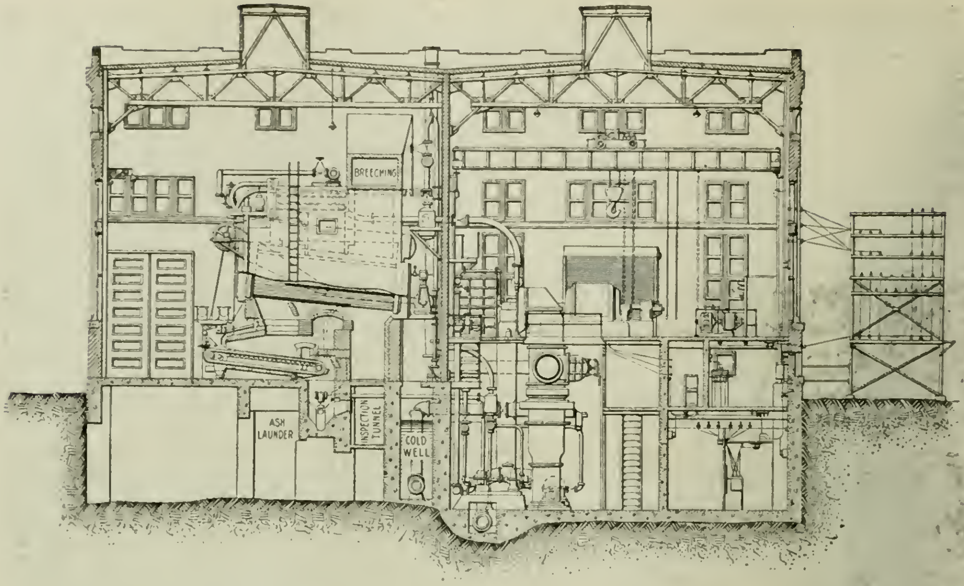
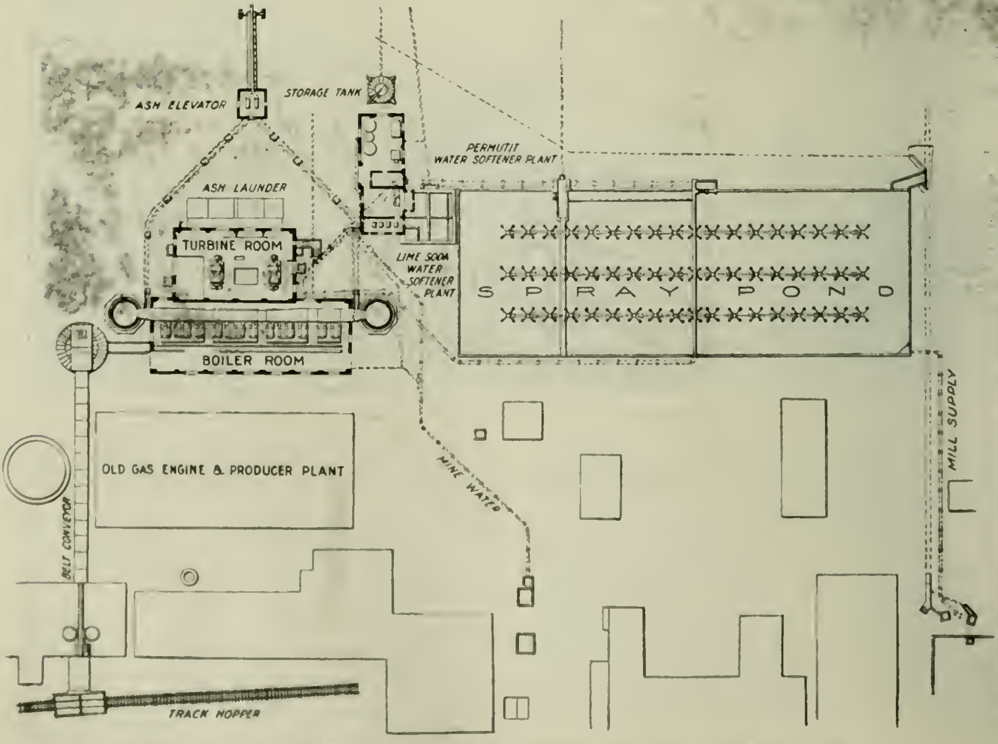
[*] Reprinted from "Power," Oct. 30, 1917.

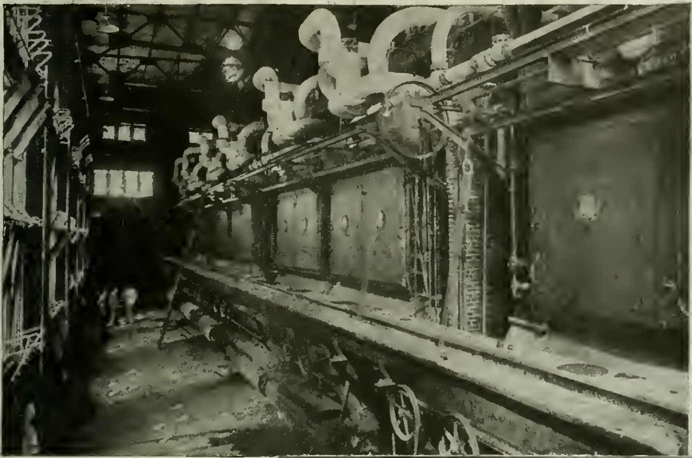


CROSS-SECTION THROUGH POWER HOUSE OF ST. JOSEPH LEAD CO.



LAYOUT OF ST. JOSEPH LEAD CO.'S POWER PLANT AT RIVERMINES, MISSOURI ers are used, and as the overlay is largely compact hardpan and clay, it was possible to avoid considerable expensive excavation and to pour the girders without forms by trenching to the exact dimensions of the cross-section.

The boiler room is 119 x 43 ft. in the clear and accommodates seven Heine boilers, each of 518 nominal boiler horsepower with superheaters, located above the setting, the superheater flues being built into the side walls of the setting. The stokers are the chain-grate type and have an area of 124 sq.ft. each, or about ¼ sq.ft. per boiler horsepower. Coal is received from an elevated track discharging into a 30-ton steel track hopper underneath, and by means of an opposed pair of reciprocating trough-shaped grizzlies the smaller sizes fall into chutes at each side of the crusher, and thence are fed directly to the belt, and the larger pieces roll over the ends of the grizzlies and fall into the center of a crusher hopper, from which they are delivered on a 20-in. inclined belt conveyor driven from the upper end and provided with a magnetic pulley for the removal of foreign pieces of iron. The belt conveyor discharges into a circular steel bunker, 30 ft. in diameter, lined with 4 in. of reinforced concrete and having a capacity of 400 tons. Under the bunker is an 8-ton weighing hopper provided with an automatic registering scale-beam, and discharging into duplicate horizontal helical conveyors, 12-in. diameter, extending the full length of the boiler room over the stoker hoppers, the trough being provided with a rack-and-pinion operated sliding gate over each stoker. The solution of the fuel-supply problem is rather unusual and results in a light, well-ventilated boiler room, and the spiral conveyors insure a very homogeneous condition of fuel at the stoker hopper and permit a uniform moistening of the fuel, a practice which the lead-company operators have adopted to prevent coking and at the same time avoid quantities of dust.



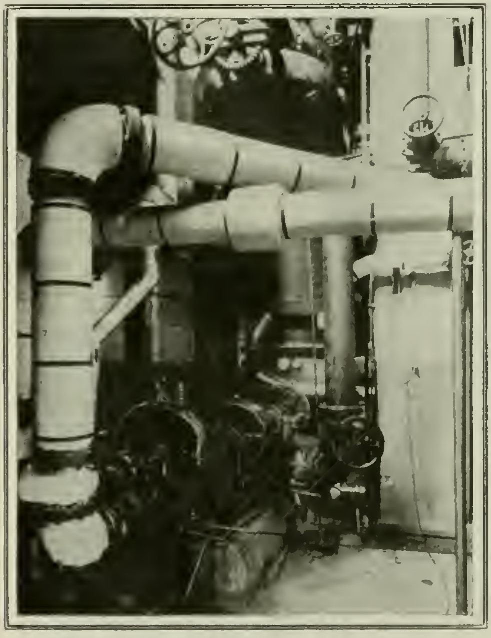
DISTRIBUTING CONVEYOR IN BOILER ROOM

The stokers are driven in the usual way from an overhead lineshaft. Two stoker engines are installed, each of a capacity for driving the whole stoker plant, supported behind the boilers on overhead platforms. The stoker lineshaft is extended at one end through the boiler-room wall, and is provided with an additional drive by an alternating-current motor through reducing gears. The breeching, which is of steel plate, unlined but covered by 2 in. of magnesia, is carried directly upon the boiler settings at the rear, terminating at each end outside the boiler-room wall in a radial-brick chimney 255 ft. high and 9-ft. diameter at the top. As there is considerable surplus mine water, the ashes are disposed of by the launder or flushing method. The water is supplied either directly from the mine-water discharge system or from the outboard circulating-water pipe. The launder troughs, which are lined at the bottom with cast iron, slope each way from the center of the boiler room and meet outside the building in a large concrete sump on the bank of the river. The sump is surmounted by a brick tower in which the ashes and water are elevated by rigid buckets attached to two independent rubber belts and discharged

TURBINE ROOM OF ST. JOSEPH POWER PLANT, RIVERMINES, MISSOURI at the top into an extended radial trough from which they can be distributed to the flats adjacent to the river.

The turbine room is 45 x 72 ft. in the clear, and is served by a 20-ton overhead crane. The racking and trolley movements are hand-operated, and the hoist motor is operated with control from the floor.

There are two 3000-kw. Curtis turbo-generators, with direct-connected exciter, each served by a LeBlanc jet condenser placed in the basement. Circulating water is pumped from a cold well between the boiler- and turbine-room basements, and is discharged through 270 spray nozzles into concrete ponds, having a total surface of 27,600 sq.ft. At the corner of one spray pond an overflow is provided to supply water to the mill. The spray ponds return the circulating water by gravity to the cold well, and at an intermediate point in the return pipe a constant supply of about 1500 gal. per min. of cold, fresh mine water is connected. Each generator is supplied through spray washers with 15,000 cu.ft. of air per minute.



CONDENSING EQUIPMENT AT RIVERMINES PLANT

Water for boiler feed is drawn from the mine, and the experience of the company was such as to lead to insistence on the maximum of softening. The mine water runs practically continuously at 18 grains per gallon total hardness, equally divided between carbonates of calcium and magnesia. Two complete water-softening treatments have been installed. The lime-soda treatment of the continuous type takes the raw water at 18 grains per gallon hardness and turns it out at 5 grains per gallon hardness. This lime-soda treated water is then passed through a pressure sand filter into a Permutit softening filter. From the Permutit softeners the water, reduced to zero hardness, is led to the feed-water heater.

The desire for an absolutely continuous supply of softened water for the boilers led to duplication of pumps and to an arrangement of piping which would allow great flexibility in operation, of which the following are some of the features:

Continuous Supply of Softened Water Assured By Arrangement of Pumps and Piping

1. Raw water is normally drawn from the mine sump, but may be drawn from the spray pond.
2. Water softened by the lime-soda process may be taken directly into the feed-water heater, or into the 12,000-gal. steel standpipe which floats on the feed water-supply line.
3. The raw water may be taken directly through the Permutit plant and thence into the standpipe or feed-water heater.
4. Water may be passed through both plants.
5. In case of emergency, raw water may be sent directly to the standpipe or feed-water heater.

The use of separators as junction boxes is a novelty permitting the most elemental simplicity consistent with reliability in the arrangement of the main steam piping. From the outlet of Foster automatic stop valves each boiler is connected by easy bends to group piping, each group discharging into the side of one of two receiver separators, and from each separator the turbine connection is led direct, the two separators being connected at their top outlets with an 8-in. loop, at about the center of which the auxiliary steam connection is tapped off.

The boiler-feed piping follows the usual lines, but between the pump-discharge header in the turbine-room basement and the header overhead in the boiler room, there are two independent vertical connections, each containing a venturi-meter tube, each tube connected by capillary pipes to a recording and integrating board in the turbine room, so arranged that either tube may be connected separately to the recorder.

Use of "Constant-Pressure" Valve with Turbine

The auxiliaries are steam-driven, with the exception of one motor-driven feed pump. The auxiliary exhaust is discharged to an open Cochrane heater. A so-called "constant-pressure" valve is connected to each turbine to discharge surplus auxiliary steam into the low-pressure stage. In order to prevent overspeed from the auxiliary steam supply when the automatic throttle trip operates, a pipe to connect to the under side of the operating piston of the constant-pressure valve is led to the front of the turbine and there automatically opened to the atmosphere by a tripping device operated by the drop of the main throttle.

The electrical equipment consists of the two 3000-kw. generators, with direct-connected exciters, a motor-generator exciter set and station transformers. The current is threephase alternating 60-cycle, generated at 6600 volts and distributed at the same voltage. The switching system consists of duplicate busses with remote-controlled solenoid-operated oil switches mounted on pipe framework. The feeder circuits are equipped with three-phase aluminum-cell lightning arresters.

The whole installation was designed and constructed by Viele, Blackwell & Buck, engineers, of New York.

State Operation of Mines in South Africa[*]

By A. COOPER KEY[†]

Operation of mines in South Africa by the state has been declared to be ill-advised by those familiar with conditions there. The diamond-mining industry alone, from the peculiar circumstances surrounding it, might most easily be taken over by the government. Private enterprise is more efficient than public. By leasing, the state gets its share of direct profits and indirect advantages without danger or risk. The labor party in South Africa has tried, without success, to show that mining on the Rand is devoid of financial risk. Entry into mining would injure the state's credit.

THE Commission on State Mining of South Africa has issued an adverse majority report on the question of state operation of mines. The inquiry was largely confined to the Far Eastern Rand. It has been stated by the government mining engineer, Mr. Kotze, that the need of opening up this area, without delay, is urgent; if there is no prospect of areas favorably situated being worked by private enterprise on acceptable terms, then state mining may become imperative.

Mine Operation by South African Republic

During the Anglo-Boer War the late South African Republic worked certain of the best Rand mines which were already equipped and in running order. "The best stopes were worked, no development was carried on, stores found on the properties were used but not charged out against working costs; consequently it did not cause the commissioners any great surprise to learn that these mines were run with very successful financial results. It is, however, quite unlikely that the Union government will enjoy the same favorable conditions that the late republic created for itself."

The general manager of the South African Railways and Harbors, which are state-owned and managed, said with reference to government operation of collieries that as long as coal is available at a reasonable price he saw no reason for the inauguration of state colleries. A state-controlled mine might afford protection against inflation of the price of coal for local consumption; but, if not so economically worked, would strengthen the position of private companies in raising prices. The coal-bearing ground owned by the administration should not be worked departmentally; the administration should arrange, in consultation with the Mines Department, a price at which coal should be supplied to the railways, a royalty being received on coal sold to the public. In other respects the mine should be worked and controlled as a private concern.

The diamond industry is in a peculiar position. Since he conquest of German Southwest Africa the Union practically holds a monopoly of the production of diamonds, other sources of supply being practically negligible. The diamond has neither an intrinsic nor a standard value. Apart from its beauty, the demand for it depends upon its rarity and expensiveness. Its output must be restricted to maintain and increase its price. This can only be done effectively by monopolistic ownerships and from this point of view the state is in the best position to hold the monopoly. Competition among mine owners to supply the demand, now a constant danger, would cease or would be transferred to the buyers. The state would be able to regulate the production to insure an increase in price, indefinitely to extend the life of the mines, and preserve to itself a lucrative source of revenue. It is established that working costs increase and yield diminishes with depth.

Conditions Favor State Diamond Monopoly

Such a monopoly would mean the state expropriating on fair terms all the diamond mines in the Union, but most witnesses seemed to be appalled at the magnitude of the sum required and consequently hesitated to recommend that the state engage in diamond mining. Another advantage would be that the state could prohibit the opening up of new mines almost without exception, a menace that has always caused nervous apprehension. But for the chance and danger of a payable mine (as distinguished from an alluvial field) being opened up in Brazil or the Congo, the commissioners would have no hesitation in recommending state acquisition of all diamond mines. Partial control is not of much assistance, as was proved in the case of the German Southwest African fields. The government had power to limit the output but it would have been folly to have done so while the mines and alluvial fields in the Union were free to market an unlimited quantity of diamonds.

The price of diamonds is as good now as it has ever been; there are no accumulated stocks and the output is being restricted by the larger mine owners in their own interests. No agreement exists as to the quantity which may be produced by each, so there is a danger that any one of them may break away from the present wholesome practice, with consequences disastrous to the whole industry and the revenue of the Union. It would be almost impossible, not to say unfair, to restrict the output of river diggers, but the control of production would maintain and increase the price of diamonds to the great advantage of the state, the industry, and incidentally of the river digger. "In short it seems that never have circumstances and conditions been so favorable for intervention without disturbing the industry as at the present time." Under existing conditions, the burden of maintaining practically a monopoly in diamonds and safeguarding the industry by acquiring any new sources of production falls upon the shoulders of the large mine owners.

Private Enterprise More Efficient

As for state-control in general, however, it has not been proved to the satisfaction of the commissioners that the state is able to carry on any industrial occupation as efficiently as private enterprise. Witnesses who pointed out what was being done in munitions work in England today spoke superficially without either definite knowledge or information. Circumstances in England are obviously abnormal. The present activities of the British government are being conducted on democratic lines, and we have no knowledge of the cost.

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[*] Excerpts from the majority report of the Commission on State Mining of South Africa.

[†] Box 3621, Johannesburg, Union of South Africa.

It has been urged that state-mining would remove suspicion from the public mind occasioned by leasing. But this is, at most, a doubtful advantage, because it is likely that greater suspicion would be occasioned by the many appointments that the state would have to make. It is also urged that for the sake of indirect profits, such as the benefits of increased population and markets, the state can afford to work at a small loss because the richer parts will keep the poorer going within limits. This harmless, even attractive, proposition at the first glance requires further examination.

EXTRACTION OF UNPROFITABLE ORE

Mining companies do, of course, work a large amount of unpayable ore for well defined reasons. Rock which yields sufficient returns to cover working costs, exclusive of development, is treated, because it helps to reduce the average working cost and prolongs the life of the mine. By persevering with an unpayable stope it may become payable deeper in. Stopes are not as a rule abandoned when the assay value drops below working costs. Were this the case, many mines would soon have little besides unpayable stopes left. If, however, the argument, that for the sake of indirect profits mines could be worked by the state even at a small loss, were followed in all cases, it would be extremely difficult to condemn even the most wasteful of state enterprises.

Unless conducted on sound business and technical lines, state mining will be a good thing only for those employed therein, but possibly a disaster to the country and the taxpayer. Under the leasing system the state will at least get its share of direct profits and reap the indirect advantages of working the payable areas and exploiting the unpayable ores, without itself running either danger or risk. If relief has to be provided for the poor, or work for the unemployed, this can best be done by irrigation schemes, that would be reproductive and of great advantage to the state.

MINING RISK ON THE RAND

As far as mining risk is concerned, while the Main Reef is probably the most persistent gold-carrier known, even Rand mining has its ups and downs. One of the particular risks in the district, according to Dr. Mellow, the geologist, is the irregular distribution of mineral deposits or payable areas. These are frequently separated by large areas of country and it would be by no means impossible to locate a mine on a totally unpayable area. These extensive blanks involve the taking up of large tracts. The idea that rich shoots continue on the same line is fallacious. Witnesses agree that the factor of risk varies inversely as the size of the area adopted as a mining venture. The factor varies in each particular case both as to the continuity of the orebody and its gold content.

To emphasize the absence of financial risk in mining in the Far East Rand, as an incentive to state operation, the representatives of the South African labor party tabulated certain information concerning eight selected companies. Seven are gold-mining companies, and the eighth is a land and financial company largely interested in mining. They are shown to have a capital of £7,442,652, while the market price in September, 1916, was £30,591,877. "The profit of 23 millions on these eight companies is very alluring," runs their statement. "Would it cause any surprise that financiers strive, by every possible means, to possess themselves of all new and payable areas to the permanent loss of the people?"

The majority commissioners find it difficult to understand why the results of only eight companies were taken into consideration when there are no fewer than 21 concerns either operating or closed down, the latter because individual or neighboring results were such as to discourage the provision of further capital or the raising of fresh capital. Two companies (the Benoni and Apex gold section) had such doubtful prospects that they found it advisable to amalgamate with the New Kleinfontein; eight have made large appropriations out of profits; in addition a large amount has been spent by companies that have combined, which sum has disappeared after amalgamation. The report gives instances of eight companies that shut down, owing to poor development.

SUCCESS OF LEADING PRODUCING COMPANIES

The Modder B, once it started after some years of dormancy, has been remarkably successful. The total capital, including accrued interest, was just over a million, against which £1,855,000 has already been paid in dividends. Brakpan, which is much deeper, has, in 11½ years since sinking started, not quite repaid the £1,461,850 of capital accrued. New Modder, the premier mine of the Rand, with its £4 shares standing at £21, and above that sum in profit in sight (undiscounted) and a large undeveloped area, does not show up so well, owing to hesitancy in the pioneering days of the district. Though sinking started in June, 1895, and crushing in May, 1896, it was not until Christmas, 1906, that the first dividend was paid. While £1,481,362 was received for shares, an even greater sum, £1,661,590, has been appropriated from profits, a policy which is still in force. With accrued interest, the total capital supplied is put down at £3,515,612, compared with £3,207,500 paid in dividends.

New Kleinfontein has not repaid its capital and accrued interest by £182,000. Modder Deep spent £922,826, was 4½ years developing and has paid £512,500 to fortunate shareholders, the shares (£1) now standing at nearly £7. But the position of Geduld is far less pleasing, it having spent £1,117,458 capital provided by shares, and £501,382 provided out of profits. Accrued interest is put down at the huge sum of £770,465. Against a total of £2,389,305 for these items the dividends paid have been only £240,125. Van Ryn Estate, an outcrop mine with a satisfactory grade and with £620,000 capital and costs on a moderate scale, has distributed a total of £2,407,000 in dividends. In the Van Ryn Deep the cash supplied was nearly £1,600,000, while accrued interest is put at £418,500, dividend distributed £1,256,736. The Nigel, an outcrop mine, regained £237,600 capital and has paid £864,500 in dividends in its career of 30 years, which is apparently now approaching termination. Sub-Nigel has spent over a million, if allowance be made for accrued interest, while only £118,600 has been paid in dividends.

The record truly reflects the good and bad luck of the Far East Rand, and no doubt the history of its future mining ventures will be much the same. The mine owner is by no means sure of his reward. The risks are many, but, on the other hand, the outstanding successes from time to time encourage and reward the enterprising financier for his boldness and perseverance, to attract others with fresh capital into a new country, and even to create a longing in the hearts of some citizens to possess some of this wealth for themselves by clamoring for state mining.

Scattered Responsibility of State Control

The financial risks and difficulties of mining on the Far East Rand are highly technical matters and the commissioners have relied upon the opinion of the government mining engineer. The state has neither the necessary experience nor organization to carry on such a highly specialized occupation as mining. Moreover, scattered responsibility is fatal to any enterprise. In time it degenerates into an almost total absence of responsibility. It is an evil in state organization that economy is invariably practiced in the remuneration of chief executive officers on a scale which compares very unfavorably with what is considered adequate under private enterprise. The state system creates inefficiency, inertia and lack of expedition that hampers the most capable officers. Although promotion by seniority aims at abolishing favoritism, this puts a premium on mediocrity.

The entry of the state into so speculative an undertaking as mining would tarnish the state's credit, it is agreed. The most serious and far-reaching disadvantage would be the effect on the activities of its large financial and mining concerns. If the state were to select the most promising areas, the mining houses would have to search outside the Union for fresh fields suitable to their peculiar ability, experience and enterprise.

What the mining companies have done for the industrial development of South Africa can scarcely be overestimated. They have become such valuable assets to the state that they cannot now be dispensed with except for very strong reasons. When they refuse to develop the mineral resources on acceptable terms, it will be time to dispense with their services, but this position is not likely to arise.

Urge Active Operation of New Gold Areas by Private Enterprise

Only 33 of the 58 mines producing gold in 1914 will be producing in 1924, it is calculated, but "in all probability the number of companies which will drop out of the producing stage within the next seven years will be considerably less than 25. The likelihood is also hat among the first to drop out will be those now producing on a small, almost insignificant scale." Neverheless, no time should be lost in dealing with the state's ssets. They can be more expeditiously worked by private enterprise than by the state. The majority report, moreover, expresses the opinion that the rise in world prices is due rather to world trade, prosperity nd competition than to an overabundance of gold, the rop in purchasing power not necessarily indicating uch overproduction. The opening up of new mines is a matter of urgency.

Recent Industrial Uses of Aluminum*

The following aluminum products have practically all reached stages of commercial importance during comparatively recent years: Aluminum foil; aluminum bottle caps and jar closures; manufactures involving autogenous welding; die and pressed castings; tubing for store service; rolled rod for machining purposes; aluminum conductors, steel reinforced. The aluminum-foil industry has grown from practically nothing to a volume of business involving many tons of aluminum annually. Aluminum bottle caps and jar closures on the market have, like foil, advanced from a meager beginning to a business of substantial proportions in a few years.

The development of a process of welding aluminum by means of the oxyhydrogen and oxyacetylene flame has opened an almost limitless field for the outlet of aluminum. Sheet aluminum of all gages heavier than about $\frac{1}{32}$ in. can be readily welded and the seam dressed off so that it is difficult to find the joint. Consequently it is possible to build up an aluminum tank or container of almost any size and shape which, when welded together, is practically a one-piece job. This class of material finds a place wherever seamless metallic non-rusting containers are wanted. The one-piece feature is of marked advantage over the riveted tank which is always liable to spring a leak.

For a long time it has been considered difficult to die-cast aluminum. This problem seems to have been solved as there are several companies that claim to be doing it successfully.

Sand Castings Improved by Pressure

Another recent development is the subjecting of sand castings to high pressures in order to render the metal more dense and to increase the strength. Such castings not only possess extra strength, but also machine exceptionally well. Aluminum tubing for pneumatic store service is not a new field, strictly speaking. However, the last few years have seen the volume of aluminum consumed for this purpose reach a tonnage of great importance. The natural characteristics of the metal itself principally recommend it for this use.

One of the most interesting developments in the industry in recent years is the rolling of high-alloy rods in practically all commercial sizes. In the past, commercial aluminum rod has been largely a drawn product. This has prevented the use of aluminum alloyed with any appreciable percentage of other metal because in the drawing operation principally the surface of the rod is worked. The result is that the surface becomes hard while the body of the rod is left comparatively soft. Therefore only the smaller sizes of drawn rod are suitable for machining.

Rolling Process Gives Uniform Rod

By the rolled method of manufacture, however, not only is it possible to use highly alloyed metal, but the process also tends to work the entire mass of the rod so that the finished product is a uniform, homogeneous material which machines well throughout its entire substance. This process, therefore, makes available a good rod in all commercial sizes for automatic machine and turret lathe products.

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*Excerpted from an article by F. G. Schull, of the Aluminum Co. of America, printed in the "Journal" of the American Institute of Metals, Vol. XI, No. 1.

One of the first uses for which this rolled rod was tried was for the machining of the fuse-timing parts for shrapnel. While it worked perfectly for this purpose, it so happened that the principal timing parts were of such a shape that in making them from rod it was necessary to cut away a great deal of the metal, resulting in high scrap loss. It was found that sand castings of the general shape of the parts to be made could be subjected to a compression process and rendered highly satisfactory for this purpose, with a minimum of scrap loss. Consequently, as a commercial proposition the rolled rod could not compete with the compressed castings for this particular article. It will without doubt, however, find wide usage for automatic machine products.

REINFORCED ALUMINUM CABLE LITTLE UNDERSTOOD

Aluminum cable, steel-reinforced, is not a particularly recent aluminum product, having been in commercial use on an extensive scale for the last few years. It is, however, so little understood as to warrant reference to it in this paper. The excuse for the existence of such a product as this lies in certain inherent characteristics of aluminum which needed improving in order to recommend its use for long-span, high-voltage work. The coefficient of expansion of aluminum is approximately one-third greater than that of copper. Due to this greater expansion the aluminum line lengthens a little more with temperature rise, and shortens a little more with temperature fall, than copper. The result is that it is necessary to string aluminum wire with greater sags than copper wire in order that its strength may not be overtaxed at low temperatures.

This was a condition of comparatively little importance in the early days of low voltages and short spans, but with the advent of higher voltages and long-span, steel-tower construction these characteristics of aluminum cable became a serious menace to its commercial existence. What aluminum cable lacked was high tensile strength and low coefficient of expansion. In order to impart these characteristics it was proposed to make the center strand of a seven-strand cable of steel, and the six outer strands of aluminum, the steel to furnish the strength, and the aluminum the electrical conductivity. A high-grade plow-steel wire was selected, which was triple-galvanized to prevent corrosion, and the practical tests that followed proved that the theory was correct and that the composite cable took on characteristics different from either of the component metals and proved highly satisfactory for long-span work.

It is feasible to construct these cables with any standard number of strands, varying the proportion of steel and aluminum to meet the particular strength and sag conditions required. This steel-reinforced cable has grown in favor from the start, so that today many of the modern transmission lines on the American continent are built with this cable.

While the automobile industry is, of course, the big factor in the aluminum business today, the relative importance of some of the other fields for the metal seems to be greatly increasing.

Use of Cartridge Scrap[*]

BY H. W. BROWNSDON

From the strip to the cartridge case the engineer and the metallurgist must work in close coöperation, the former to design and produce the tools and machines with which to work the metal stage by stage to the desired finished form, and the latter to see that the metal is in no operation over-strained and that between operations strains are sufficiently removed by correct annealing conditions. Of subtle and not thoroughly understood difficulties there is none. Success lies in never-flagging, close attention to detail and continual intelligent application of scientific control.

The interest that the ammunition manufacturer has in cartridge brass does not cease with the production of the finished cartridge case, for of the components of a cartridge the case alone is left undestroyed, the propellant and the shell or bullet being completely consumed so far as further useful recovery is concerned. Cases other than those of small arms, if not damaged mechanically, may be re-formed to size and used again. Small-arms cases, however, after once being fired, suffer a deterioration which not only prevents their being used a second time, but which also makes impossible their utilization as scrap for casting cartridge brass. The causes of this deterioration are metallic mercury and antimony salts, products from the explosion of the ingredients of the percussion cap. A part of these products is retained on the interior surface of the case. From the point of view of re-using the case as a case, it is the weakening effect of the mercury on the strength of the brass that gives the trouble. From the point of view of using the fired cases as scrap for remelting, antimony is the bugbear. Much may be done by washing the fired cases in suitable solutions, but even after repeated treatment in this way, when put into a heat for best cartridge metal, antimony will be found in harmful quantities in the ingot.

The economical utilization of scrap forms such an integral part of the brass maker's business, that this question of the use of fired small-arms cases as scrap is one of considerable magnitude when the demand for cartridge brass of high purity is urgent.

Personal Liability of Mine Superintendent

BY A. L. H. STREET[†]

A mining company's superintendent, in general charge of the work of constructing a tunnel, is not personally liable for injury to an employee, caused by an explosion of dynamite in the process of the work, if the injured man was under the immediate supervision of a foreman and if the accident would not have occurred had the general instructions of the superintendent been observed, according to a recent decision of the Washington Supreme Court, handed down in the case of Macari vs. Alaska Gastineau Mining Co., 165 Pacific Reporter, 73.

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[*] Excerpt from a paper in "Journ. Soc. Chem. Ind.," July 31 1917

[†] Attorney at law, 329 Security Bldg., Minneapolis, Minn.

Notes on Vacuum Filtration of Flotation Concentrates

By RALF R. WOOLLEY*

Dewatering of flotation concentrates is best accomplished with vacuum filters. Dryness of cake depends largely upon volume of air that passes through it, but amount of air required varies with nature of pulp. With piston displacement constant, volume of air bears inverse ratio to degree of vacuum. Power consumption proportional to quantity of free air handled.

Concentration by flotation has added a number of new problems to the metallurgical field, and one of no little consequence among these is the drying of the concentrates. This step is necessary before the smelter will accept the material, and also from a point of economy in freight charges where there is much railroad haul. Usually the ores treated by this process are of low-mineral content and this of course prohibits any expensive means of treating them. Consequently the dewatering part of the process must be done cheaply to be commercially successful. Thus far various methods have been tried, the most successful one being the use of filters of one type or another, the best results having been obtained from the continuous-vacuum type.

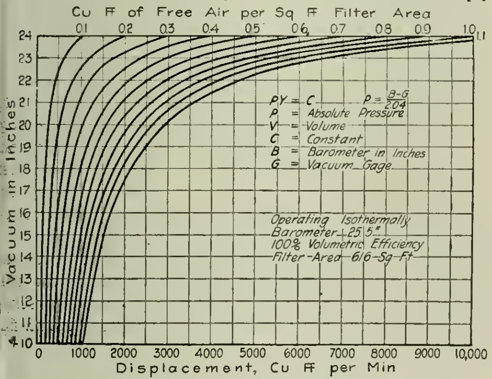

CHART 1. CUBIC FEET DISPLACEMENT FOR 14 x 14-FT. FILTER

The data given herewith were obtained from an installation of two 14 x 14-ft. vacuum filters of the Portland make. The pulp is settled in Dorr thickeners and piped from these to an elevator lifting it into the filter troughs. The average moisture in the feed is about 50% and that in the cake about 20%. Of the solids in the feed 80% pass through 200-mesh screen and form a dense cake of high resistance to the flow of air. The average barometer at this plant is about 25.76 in. and the elevation is 4350 ft. above sea level. The vacuum maintained was from 17 to 19 in. average.

To produce a relatively dry cake it is obvious that much depends upon the volume of air that passes through it, as the air is the medium which carries the moisture away. To make any assertion as to how much air is required for vacuum filters would be folly, because each material presents its individual difficulties. In general we may say that for most filter installations the vacuum pumps are so specified as to allow from 0.5 to 1 cu.ft. per min. piston displacement for each square foot of filter area. However, this does not satisfy in all cases. For example, a certain chemical company filtering precipitated bicarbonate of sodium met with no success until it used a filter capable of handling 30 cu.ft. per min. per sq.ft. of filter area. These machines were not operated at full 30 cu.ft. capacity, but used an average of 15 to 20 cu.ft. per min. per sq.ft. of filter area. The results were good. The cake contained only 7 to 8% moisture, where it had been too wet to handle before.

With a constant piston displacement, the volume of free air passing through any filter cake bears an inverse ratio to the number of inches of vacuum, and a direct ratio to the imperviability of the cake. This relation is expressed by the formula:

$$PV = C,$$

where

P = Absolute pressure;
V = Volume, and
C = Constant.

The absolute pressure is indicated by the formula:

$$P = \frac{B - G}{2.04}$$

where

P = Pressure expressed in inches of vacuum;
B = Barometric pressure in inches, and
G = Vacuum-gage reading in inches.

Thus, with a given quantity of free air, the piston displacement necessary to handle it will increase as the absolute pressure decreases, or as the barometric pressure in inches increases. Chart No. 1 is a graphic of the above formula based on a filter area of 616 sq.ft., or one measuring 14 x 14 ft. For example, if it is necessary to pass 0.6 cu.ft. of free air through each square foot of filter area per minute, and maintain 21 in. of vacuum, it will require a piston displacement of 1900 cu.ft. per min. Likewise if the piston displacement is constant, the amount of free air being drawn through the cake can be determined for any vacuum.

High Moisture Not Necessarily Due to Low Vacuum

A common excuse given for high moisture in filter cakes is "low vacuum." This is not necessarily the case. As was pointed out above, the quantity of air passing through the cake is the important factor, and with a constant piston displacement this decreases as the number of inches of vacuum increases. This would seem to justify the conclusion that the greatest vacuum is not the most effective in filtering. There is undoubtedly an economic point of vacuum for every individual case, and this can only be determined by experiment.

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*Mining engineer, Salt Lake City, Utah.

It will be noted from Chart No. 1 that when the vacuum is more than 19 to 20 in., the required piston displacement increases rapidly for a slight increase in the amount of free air. Consequently, in working out the most efficient installation, the economic factors must be balanced against the mechanical factors. In doing this the increased costs, necessary to handle greater volumes of free air through high vacuum, must not be as great as the additional benefits derived from such an installation. In general, it may be stated that the amount of vacuum to use in any case is that which will build a cake and permit the most free air through the cake at the least cost. To determine this necessarily requires experimental work in each individual case.

POWER CONSUMPTION

The power consumption is proportional to the quantity of free air handled. If the pump is operating isothermally the work done is indicated by the formula:

$$W = P_1 V_1 \log_e \frac{V_1}{V_2} - P_2 V_2 - P_1 V_1$$

where

P_1 = Initial pressure in lb. per sq.ft. (absolute);
P_2 = Final pressure in lb. per sq.ft. (absolute);
V_1 = Initial volume in cu.ft.;
V_2 = Final volume in cu.ft., and
W = Foot-pounds.

Then the horsepower required is:

$$HP = \frac{WV}{33{,}000}$$

where V = volume of air, in cubic feet per min., entering the pump. If the pumps are operating adiabatically,

$$W = 3.463 P_1 V_1 \left[\left(\frac{P_2}{P_1} \right)^{0.29} - 1 \right]$$

The power required for handling 1000 cu.ft. of air per minute at different degrees of vacuum is shown by Chart No. 2 for both isothermal and adiabatic operation. An interesting thing in connection with the power requirements for vacuum pumps is the fact that the curves are hyperbolic. The power begins at a minimum with no vacuum, increases to a maximum at 60 to 70% vacuum and decreases to a minimum again with perfect vacuum. An examination of these power curves shows the isothermal operation to require less power, and it is possible even to decrease these requirements by preheating the pulp and keeping the exhaust at a constant temperature. This procedure, however, involves additional costs, and the problem resolves itself into one of economy, as a question whether the additional benefits more than offset the increased expense.

From these curves it is very easy to determine the amount of vacuum to be carried for the least power consumption, and thus avoid operating at the most expensive point, which in the case at hand is 17.6 in. on the one and 15.5 in. on the other. Any vacuum above or below these points requires less power to maintain.

SELECTION OF FILTER CLOTH

The filter covering is important from the standpoint of efficient operation of the machine. These coverings are made of duck or twills of various weights. The kind to be used on any filter depends largely upon the character of the material to be filtered. Generally speaking, with a fine, compact material the best results are obtained with a light twill of as loose weave as can be used without having the material go through it. By doing this the cloth offers a minimum amount of resistance to the flow of air into the vacuum, and the cake gets the full benefit of all the air. The tendency to clog the pores of the cloth is much less than with a close-woven duck.

With a cake of loose, granular material a duck cloth will generally give good results. The cake may not offer enough resistance to form an economic vacuum of itself, and this can be adjusted by using the proper cloth. The cloth to use for any given material to get the best results is one which, one might say, balances the economic vacuum against the moisture in the cake. This, of course, involves such factors as the character of material, vacuum, power, etc., and is not a matter of definite knowledge until it has been determined by experiment. For the material mentioned in this paper a light twill cloth, known as No. 3 Oakdale, has proved much better than the heavier and more compact grades.

The operating speed for a filter depends upon the quantity and quality of cake desired. In general, this varies from 5 to 15 min. per revolution of the drum. With a material easily filtered the machine can be operated faster and will handle a larger tonnage. On the other hand, a material difficult to filter must be exposed to the vacuum longer. Hence the speed of the machine is less and usually the tonnage treated is less.

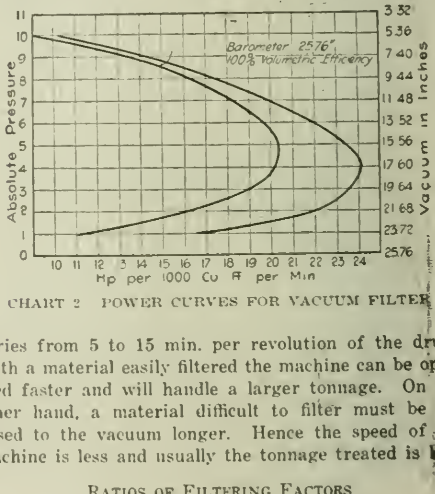


CHART 2 POWER CURVES FOR VACUUM FILTER

RATIOS OF FILTERING FACTORS

Thus far the important factors connected with the operation and work of vacuum filters have been considered only in an individual way. The relation that these factors bear to one another is problematical in some cases, but the data given herewith show some distinct tendencies which may develop into definite ratios with further experimental work. From the fact that the amount of free air passing through the cake is so important in the moisture extraction, it is interesting to know what relation exists between this factor and some of the others. With a given piston displacement the amount of free air passing through the filter per unit area is a maximum when there is no vacuum, or when there is no cake on the filter. It is then equal to the piston displacement divided by the area of filter surface. As the cake forms the vacuum is created, and the quantity of air then varies with the amount of vacuum, as shown above.

Results obtained over a period of 30 days with an average vacuum of 19 in. show a range from 15.6 t

24.7% moisture in the cake. Even with a wide range in the inches of vacuum a lack of definite relation was shown by the plotting of results on charts. The fact that these charts show no tendencies toward a definite ratio may be due to a lack of uniformity of other conditions. It is believed that with careful work, through a greater range of vacuum, definite tendencies would be established. It will be observed from Chart No. 1 that with a vacuum between 15 and 20 in. the amount of free air for each inch of vacuum is small, so that the relative effects can only be determined by careful work. Again the material may vary somewhat in character, and may be subject to cracking more at one time than another on this account. A cracked cake offers lines of least resistance which the air invariably takes, and as a result the full benefits from the amount of air used are not obtained.

Other charts, plotted to show what part the character of the feed plays in the filtering of it, indicate that the amount of water extracted decreases as the area exposed increases. In other words, the smaller the particles the greater the exposed area and the higher the per cent. of moisture remaining in the cake. This is true because of the increased force necessary to separate the moisture from small particles, the force of adhesion increasing within the pulp as the particles decrease in size. It is quite obvious that in working out the best filter installations for any given material all of these factors must be given due consideration, not separately, but collectively. There is undoubtedly a stage in the operation where the power, vacuum, speed and moisture extraction are at a point of maximum economy, so that the maximum extraction and capacity are possible with the minimum expense. This stage cannot be specified without working out a series of experiments.

Molybdenum at Star Lake, Manitoba

J. S. De Lury, lecturer in geology at the University of Manitoba, has made a report to the Public Utilities Commission of Manitoba on the molybdenite prospects in the Star Lake district of that province, where a number of molybdenite claims have been taken up. In a full description of the geology of the district he states that there are at least two separate intrusions of granite, and an ancient lava, now altered into chloritic and hornblendic schists and tilted almost vertically. These schists may be classed as Keewatin, and the later red granite is thought to be responsible for the presence of molybdenum in the pegmatite dykes. The dykes vary from coarse pegmatite to fine aplite and contain a variety of minerals in addition to the molybdenite—bismuth and beryl being the more noteworthy because usually absent in such formations. The molybdenite occurs in a variety of forms, including six-sided prisms, fine-grained, massive, radiating lamellar, lamellæ and small flakes. The first two types are the more abundant. In summing up, Mr. De Lury states that molybdenite has been found over a considerable area and seems to be fairly persistent through a certain type of pegmatite vein, which is prominently developed in the schists for some distance from the contact with the granite. It is almost impossible to judge of the mineral contents of the ore as seen on the dumps or in the excavations, but it can be said that molybdenite occurs fairly generally distributed through the pegmatites, and as far as can be judged from the excavations already made in quantities sufficient to encourage further development and prospecting.

Manganese in Central Kansas

Manganiferous specimens running about 9% Mn were discovered some time ago on the surface of the uplands about three miles northeast of Raymond, in central Kansas, according to W. A. Whitaker and W. H. Twenhofel, in *Economic Geology* for August, 1917. The soil of the farm on which the rock was found is a sandy loam, apparently fertile and seemingly produced through the weathering of Dakota sandstone. The region which produced the specimens consists, for the most part, of a flat basin-like area at the head of a small valley. The owner of the farm stated that bedrock of similar character occurred in many places less than a foot beneath the surface. This was not verified, though believed to be true.

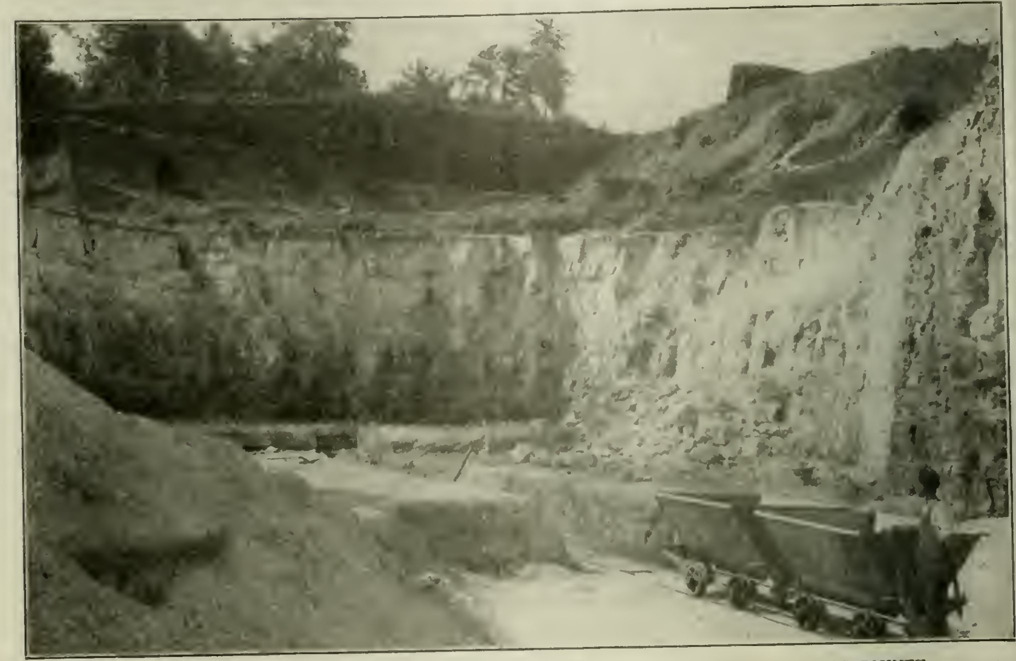
The specimens scattered on the surface are dark-brown to black in color and are friable and soft. They resemble partly weathered fragments of Dakota sandstone, but differ therefrom in being more friable, less porous and of a darker color. Since Dakota sandstone is known to underlie the region, it is probable that a local variety lies beneath the field. The following is a representative analysis of the substance: Moisture and volatile, 4.24%; SiO_2 and insoluble, 71.75; Fe_2O_3, 4.74; CaO, 1.43; MgO, 0.80; SO_3, 4.86; Mn_3O_4, 12.08%. The manganese appears to be present as "wad," an impure mixture of manganese oxides.

The source of manganese is not known, but is assumed to have been in the sandstone, whence it was probably concentrated through ground water and perhaps bacterial action, in the basin-like area where found, through subtraction of substances other than manganese and enrichment of what remained through precipitation of manganese from solution. The water probably obtained it from the sandstones which underlie the higher fields surrounding the area. It is considered improbable that the manganese content will increase in the deeper lying strata.

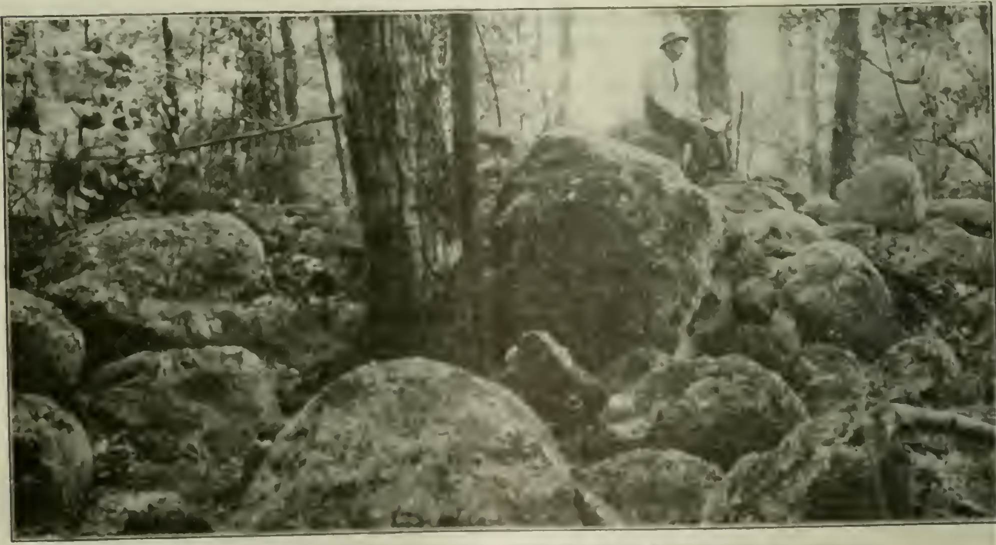
Phosphate Production Curtailed

The phosphate mines of the American Agricultural Chemical Co. have not been operated to full capacity during the past three years, owing to the war's elimination of export shipments, according to the annual report of the company. A heavy demand for phosphates by European countries is anticipated, however, with the return of peace. Kelpweed, alunite, feldspar and other materials are present sources of limited amounts of potash but do not promise an adequate normal supply. The company's potash fields in Spain have not yet been explored because of difficulties presented by the war. Exploration work on near-by properties is encouraging. The most satisfactory statement that can be made as to potash is that fertilizers containing none of it have generally given satisfactory results in the last two years, as they did in the early years of the industry, before potash salts were discovered in Germany.

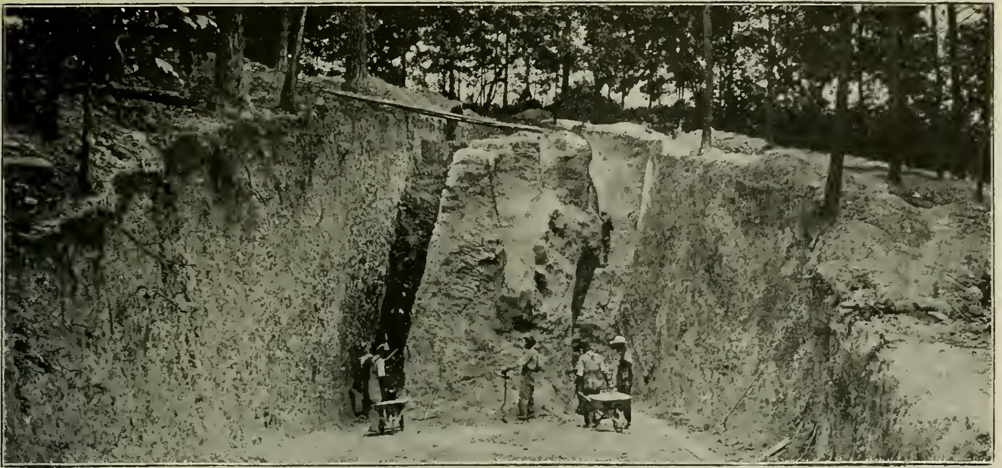
Economic Mineral Deposits in Georgia



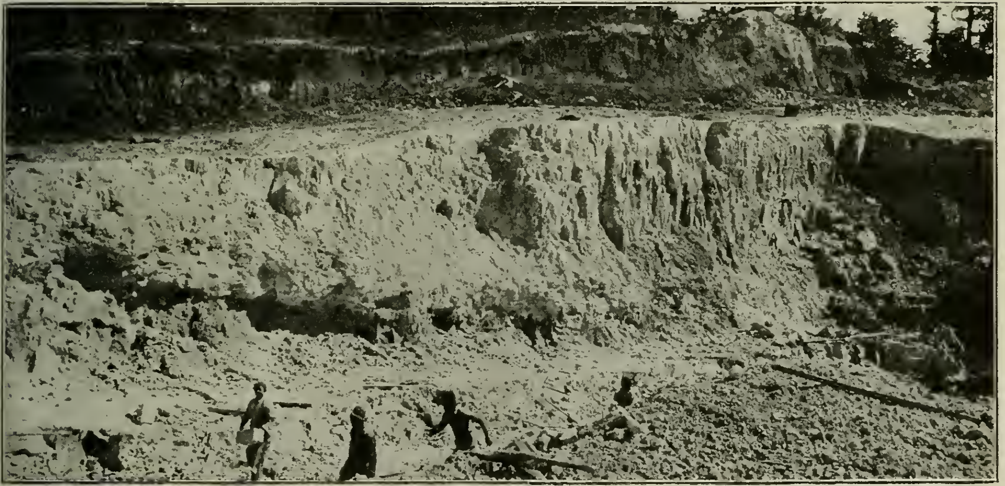
FULLERS EARTH MINE OF THE GENERAL REDUCTION CO., AT DRY BRANCH, TWIGGS COUNTY



EXPOSURE OF RED BAUXITE NEAR WARM SPRINGS, MERIWETHER COUNTY, GEORGIA



BAUXITE MINE OF THE REPUBLIC COMPANY AT WARM SPRINGS, MERIWETHER COUNTY



KAOLIN MINE AT CLAYMONT, WILKINSON COUNTY

MINE AND MILL OF LESTER CLAY CO., ATTAPULGUS, DECATUR COUNTY, GEORGIA

Belgian Coal and Coke Industry in the War[*]

A Belgian engineer writes anonymously in "Coal Age" regarding coal and coke production in Belgium, giving interesting details concerning conditions at the mines and coking establishments.

MY ATTENTION was recently directed to Mr. Shurick's article in your issue of June 16, under the heading "The Foreign Coal Markets." I want to offer some remarks concerning the few lines devoted to Belgium in that article. Being unknown to you, I also want to tell you how it is that I am acquainted with conditions in the Belgian coal fields during the German occupation.

I do not want my name to appear in print for the good reason that I have left behind me in Belgium parents and relatives who would certainly be made to suffer for my revealing conditions under which Belgian industries are being systematically crushed and destroyed by the Germans. When the apostles of Kultur are unable to reach a party who has offended them, they never fail to make his friends and relatives suffer in his place, after having first destroyed what property the offending party may have in Belgium or in any other hapless country under German rule.

THE WRITER INTRODUCES HIMSELF

This being understood, I will introduce myself. I am a byproduct coke-oven specialist, having followed that line of occupation for the last 29 years. I have spent all those years in designing, erecting and operating byproduct plants in Belgium, France, Great Britain and Italy. My residence was in Mons, my business office in Brussels.

There is not a coal or coke plant in Belgium or northern France that is unknown to me. With all the more important, I am thoroughly familiar. I am on friendly terms with 90 per cent. of the chiefs of industries of those countries. With the other 10 per cent. I am at least on speaking terms. At some time or other I have been consulted by nearly all of them. As far as permitted by the restrictions put by the enemy on the free moving of Belgian engineers about the country, I remained in close touch with Belgian industry and its managers until last August, when I succeeded in escaping two full years after the battle of Mons.

During the years that immediately preceded the war, Belgium produced in round figures 24,000,000 metric tons of coal a year. About 1,350,000 tons of this was coked, yielding a trifle more than 1,000,000 tons of commercial coke, including breeze (or braise), sold for domestic use. All coke was of course byproduct coke, as none other has been made in Belgium since 1892 or 1893.

Belgium was a pioneer in the byproduct industry. The oldest byproduct company now in existence is the Société Anonyme du Charbonnage des Produits, at Flénu, Belgium, which was incorporated in 1856 for the mining of coal and the manufacture of byproducts. This company may have become better known abroad as a coal company than a byproduct concern, but this was due to the extraordinarily fine natural condition of its coal deposits, which enabled the company to pay big dividends earned in mining and selling coal while weathering the difficult times it had in developing the byproduct end of its business. But no matter how hard the times, the Produits company never ceased for a single day, since 1856, to make byproducts; and the first aniline colors ever put on the market were made at Flénu by this company at a time when its coke and byproduct department was managed by the noted Belgian chemist Neyrincks.

GERMANS NOT FIRST TO USE BYPRODUCT OVENS

With the advent of the Coppée vertical-flue coke oven, the Produits company became quite a factor in the byproduct industry. That was about 1870, at a time when Germany had only beehive coke ovens and when all coke made in Belgium was produced in retort ovens of the original Coppée style. Not only was Germany behind Belgium in getting rid of its beehive ovens, but even to this day there is not in Germany a single coke oven which is not of the vertical-flue kind first invented by Coppée, a Belgian, or the horizontal-flue style developed by Solvay and Semet, the former a Belgian, the latter a Frenchman, both living today. There are many people in this country, even among those in the byproduct industry, who believe that the byproduct oven is of German origin and development. To this day, Belgian coke ovens have always kept at least one step ahead of all others.

At the rate mentioned in Mr. Shurick's article, Belgium in the year 1916 produced roughly 17,000,000 tons. As a matter of fact, the output cannot have been one-half that figure.[1] The tonnage mined up to the time I left the country—that is, during the first eight months, minus two weeks, was less than 4,000,000 tons. The official figure as given out at Brussels for the first six months of 1916 was less than 3,000,000 tons. Having made my escape from the country with only the clothes I had on my back, without either baggage or a scrap of paper, I am unable to give figures except from memory, but I am perfectly sure the half-yearly output in 1916 was not quite 3,000,000 tons. That is 5,500,000 tons less than reported in the article written by Mr. Shurick. How could it have been otherwise, when the mines worked only, on the average, 1½ days a week?

The output would have been even less, had it not been for the very large amount of coal used in coke ovens and gas producers to make gas for the blast furnaces and openhearth furnaces in which were cremated the countless thousands of German corpses brought from the Verdun slaughter that lasted nearly five months. That was the only work our miners ever did cheerfully for the enemy—that is, to go into the mines and dig coal to burn the dead Germans.

It was not because there was no work for them to do that the miners did not work. It was because they did not want to produce coal that would be used either to keep the enemy's gun factories running or to take the place of coal which the Germans had sold to neutral countries in exchange for provisions, clothing and supplies of which the German armies were in such great need. Many of our miners literally allowed themselves to starve to death rather than do a stroke of work that would be useful to the enemy.

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[*] Reprinted from *Coal Age* of Oct. 27, 1917

[1] The figures mentioned in Mr Shurick's article were expressly designated as "emanating from German sources." They were, further, published broadcast in British technical and trade journals, by which they were apparently accepted as authentic—Editor

I am not talking by hearsay, as I have seen these things myself. My close association with all those people for nearly 30 years had made me one of them; consequently, I suffered with them, and I know whereof I speak. The deportations of Belgians to Germany (which, by the way, commenced long before reported in America) were made to break the men's refusal to work for their oppressors. It is not necessary to be a profoundly wise economist to understand that the Germans thought that, by removing the Belgians from their homes and the zones in which the American Relief Commission was allowed to operate, the Belgians would be willing to work at anything to save themselves from starvation. Numerous notices were posted notifying the workingmen that they would be sent to the German mines if they persisted in staying away from the Belgian mines. The Germans thought they would thus break what they called the "bad spirit" of those miners.

BELGIAN PATRIOTISM PERSISTS

The Germans, however, were mistaken in their calculations, as the bad spirit was not broken. It is a matter of record that only 2 per cent. of the men sent to the mines of Westphalia consented to do some work, and very little at that. How many of those unfortunates died of hunger in a foreign land will be known some day; I am sure the figures will be appalling.

As to the coke output, counting the ovens that kept working more or less spasmodically in 1916, the output could not have been more than a paltry 85,000 or 90,000 tons. Practically all the coke plants which thus remained at work were operated by German labor, or rather by all kinds of men of all ages and descriptions, brought from all kinds of countries, some of them as far as Syria and Sinai Peninsula. But even with the few coke ovens that were kept going, they could not be charged regularly, due to the scarcity of coal. It happened (and this was the rule, not the exception) that ovens which ought to have been pushed once a day were pushed only, on the average, once a week.

Since there were more coke ovens in the country than the enemy could keep in operation and since all the Belgian coke ovens are byproduct ovens, of what use would it have been to the Germans to build new byproduct ovens? I know for a fact that not a new oven was built in either Belgium or the invaded part of France after the Germans entered these countries.

Several plants were nearing completion in the Province of Hainaut when the war began. We thought the war would not last over the winter and kept on working to finish the installations. But as soon as it became evident that the war would be long, we stopped all work on these ovens. The enemy took possession of them, announcing his intention to complete them. All they did, however, was to search for the plans of the ovens, which were of a new design. Not finding the plans, they tore the constructions down, brick by brick, measuring everything with the greatest care and reconstructing the ovens on paper.

The plans thus made were sent to the competent authorities in the "Vaterland"; and where the several expensive and nearly completed installations had previously stood, there remained only piles of useless materials. I say "useless," because besides the oven's plans, all the special and expensive brick shapes had been also shipped to the land of Kultur. News of a most reliable character, emanating from a competent authority who succeeded in escaping from the country recently, has reached me, according to which the nearly new batteries of ovens at Hourpes, Genly, Strépy and Bracquegnies have been also razed to the ground, all serviceable material being sent to Westphalia. This was done in the winter and early spring of this year.

PROVINCE OF LIMBURG SUFFERER FROM WAR

As will be seen, this does not tally with the information (evidently supplied by the Teutonic propaganda) that the Germans have constructed byproduct ovens in the hapless country of Belgium. Mr. Shurick mentions[2] the Province of Limburg as the location of these new ovens of German construction. As a matter of fact, the Limburg Province has probably suffered more, comparatively, from German barbarity than any other part of Belgium. The Coppée family—that is, the descendants of the coke-oven inventor—have for a long time contemplated the erection of large byproduct plants in Limburg. It is probable that, had it not been for the war, they would have commenced construction about the end of the present year, in order to have the plants completed early in the spring of 1919.

I have several times discussed the matter with Evence Coppée, the present head of the Coppée family. The idea was to have the ovens ready for the time when the first coal from the new coal field of Limburg would be available. There is a vast new coal basin now in the process of development in Limburg, but the Germans have had nothing to do with this development except possibly to retard it and even to destroy much of what had been accomplished by the ceaseless labor of nearly 20 years. Mine shafts, some of which had reached depths of more than 2000 ft., were being sunk through quicksands by the freezing process. Only a few of the shafts had passed the quicksands, some of them having safely traversed nearly 700 ft. of this dangerous ground.

During the early summer of 1916, the men at all the shafts were corralled by German soldiers at the same time, on the same day, at all the shafts scattered in an area of 31 by 18 miles. Stokers, enginemen, electricians, blacksmiths, carpenters, were packed into waiting trains and sent to Germany without being given time to pick up their dinner buckets. They were told they would not need the pails any more. The refrigerating machines have not made a revolution since then, and all shafts that were not safely past the quicksands have been destroyed forever. Two of these shafts, the property of the Coppée family, had been commenced in March, 1900; they had cost millions and were expected to be finished for coal hoisting at the beginning of 1919. They also had four other shafts that had just reached a depth of 1730 ft. where the head of the quicksand formation was encountered, when the war began. Evence Coppée decided to wait better times to sink these shafts.

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[2] These data were obtained directly from the British technical papers, by which they were apparently accepted as authentic.—Editor.

As to the six new mines opened during the German régime in the Province of Hainaut, this is another story of the same kind as that of the Limburg coalfield development. It does not take as long to sink a shaft in Hainaut as it does in Limburg. The record for fast sinking of a shaft in Hainaut is held by the old Belle et Bonne Co., which sank its No. 28 shaft to a depth of 1900 ft. in 5½ years. The favorable conditions encountered at this shaft will probably never present themselves again anywhere else in that region.

The six new mines that, evidently, form the basis of the German story are well known to all Belgian mining men. Work on them was started in 1909 (one shaft), in 1910 (three shafts) and 1912 (two shafts). As the shafts were not producing mines when the war broke out, no coal could be taken out of them; and consequently, the miners had no scruples about working in these shafts.

Work went on uninterruptedly until the German authorities (in December, 1915, or January, 1916) served notice on the different companies owning the shafts that, unless work could be prosecuted uninterruptedly in their producing shafts, the shafts that were sinking would be taken possession of by the military authorities. The miners refused to mine coal for the benefit of their masters, and the six shafts have been stopped ever since. All the machinery was dismantled and shipped to the land beyond the Rhine. The shafts in question are at Monceau-Fontaine, Sacré Madame, Anderlues and Trazegnies.

Nelchina-Susitna Region of Alaska

WASHINGTON CORRESPONDENCE

"Gold occurs from grass roots to bedrock in the Nelchina-Susitna region of Alaska and fine gold occurs in the glacial gravel which covers that region," says Theodore Chapin, of the U. S. Geological Survey. Colors may be found even on the hilltops where no concentration has taken place. Despite the fact that the gold is widely distributed and may be washed in nearly any stream in the region, Mr. Chapin expresses doubt as to its being concentrated sufficiently to justify mining. The only place where any encouragement has come to the limited prospecting that has been done is on Albert Creek, and even there the results have not been such as to attract many miners.

"Even the stream gravels show no definite pay streaks," says Mr. Chapin, "as though there had been but little lateral or vertical concentration since their deposition, which indicates glacial origin for most of the gold. The widespread distribution of the gold through the gravels, and its lack of concentration, show also that it was glacially transported. Its bedrock source is not known. The glacially transported débris was derived from many sources and contained an abundance of rocks foreign to this district, which evidently were moved a great distance. The stream gravels are largely of glacial, fluvial origin and, except for a narrow strip along each stream course, have not been reworked. These conditions account, in part, for the failure to find workable deposits in a region where gold is so widely distributed."

Report of Copper Production

This table is compiled from reports received from the respective companies (except in the cases noted by asterisk as estimated), together with the reports of the United States Department of Commerce as to imported material, and in the main represents the crude-copper content of blister copper, in pounds.

	July	Aug	Sept.	Oct.
Alaska shipments ..	8,116,518	3,891,621	8,501,806	
Arizona				
Arizona Copper	nil	nil	nil	
Cons. Ariz Smelting .	1,550,000	1,450,000	1,450,000	1,910,000
Inspiration	nil	nil	2,250,000	2,400,000
Miami	nil	260,000	1,900,000	2,673,775
New Cornelia	2,178,619	1,996,587	1,460,936	
Old Dominion	nil	875,000	1,225,000	
Ray	7,808,766	7,749,509	7,413,881	7,700,000
Shannon	nil	nil	nil	nil
Other Arizona.	20,032,410	22,829,806	24,085,753	25,223,854
California.				
Mammoth.	1,750,000	1,725,000	1,280,000	1,590,000
Michigan:				
Calumet & Hecla .	11,933,433	12,338,735	11,550,438	..
Other Lake Superior *	8,000,000	8,000,000	7,000,000	...
Montana				
Anaconda ...	12,400,000	11,175,000	2,800,000	22,336,460
East Butte	nil	1,676,360	2,203,300	1,691,008
Nevada:				
Mason Valley	1,316,725	1,417,717	1,267,532	
Nevada Cons..	7,253,337	6,439,984	6,524,352	7,000,000
New Mexico:				
Chino ..	7,343,757	6,824,127	7,719,496	6,333,000
Utah:				
Utah Copper	18,127,154	18,796,012	17,839,378	18,100,000
Eastern smelters *	2,000,000	2,000,000	2,000,000	2,000,000
Total reported	109,810,739	109,445,458	108,477,872	
Others, estimated.	20,000,000	20,000,000	20,000,000	
Total United States	129,810,739	129,445,458	128,477,872	...
Imports, ore and concentrates, etc	9,484,116	13,447,348		.....
Imports in blister, etc .	10,179,095	34,546,504		....
Grand total ..	149,473,950	177,439,310	....	.....
British Columbia:				
Canada Copper Corpn. .	nil	212,772	537,229	......
Granby Cons .	3,147,886	3,836,770	3,321,754	......
Mexico.				
Boleo	1,411,290	1,433,040	1,454,880	
Cananea	nil	nil	nil	nil
Other Foreign:				
Braden	6,015,000	4,512,000	5,348,000	5,414,000
Cerro de Pasco	6,262,000	6,036,000	7,041,000	7,325,032
Chile	6,250,000	8,036,000	3,294,000	9,050,000
Cape Copper ...	363,759	178,573	nil	
Kyshtim	752,640	902,700		
Katanga	4,850,120	5,445,360	4,960,350	5,092,625

* Estimated.

The total production of the United States for the first nine months of 1917 was as follows:

January	174,658,603
February	183,859,588
March	192,211,648
April	188,685,898
May	187,750,810
June	173,341,047
July	129,810,739
August	129,445,458
September	128,477,872
Total	1,483,241,663

The grand total, which in the case of July was 149,473,950 lb., includes, under "Imports in ore and blister copper" the production of such companies as Canada Copper, Granby, Cananea, Braden, Cerro de Pasco and Chile. As a matter of record, however, the individual figures are given after the total. We also report the production of the Boleo, Cape Copper, Kyshtim and Katanga companies, whose copper does not come here.

The item "Alaska shipments" gives the official figure of the United States Department of Commerce. Kennecott production June to October was 5,848,000; 3,580,000; 7,048,000; 7,100,000 and 7,116,000 lb., respectively.

Correspondence and Discussion

War Taxes on Mining Companies

An editorial bearing the above title, in the *Journal* of Oct. 27, dealt with the question of depletion allowance as defined by the Commissioner of Internal Revenue, as follows:

> In the case of mines, a reasonable amount for the depletion thereof not to exceed the market value in the mines of the product thereof which has been mined and sold during the year for which the return and computation was made.

The question arises: What is the market value in the mine of the product mined and sold during the year? Apparently there can be only one interpretation of this clause; namely, the difference between the cost of extraction and the selling price of the product, or the net operating profit earned.

To illustrate: If I should make an agreement with a mine owner to take over his mine for one year's operation and should pay him at the end of the year the market value in the mine of the product mined and sold during the year's operation, less a certain percentage for the use of my money, I certainly would pay him the difference between what it cost me to extract the product and the price at which I sold the product, or the net profit, less my commission.

Now, according to a literal interpretation one may deplete an amount equal to his yearly operating profit, and no more. However, if the *Journal* had gone a little further into this ruling it would have found something interesting. For instance, as to the total amount of depletion allowable, the same ruling states: "Provided, that when the sum of the annual allowances for depletion equals the original capital invested, *or in case of purchase prior to Mar. 1, 1913, the fair market value as of that date of the mineral in place*, no further allowance on this account shall be made." The italics are mine.

Apparently not only may one exempt from taxation an amount equal to his total operating earnings for each year, but if the property were acquired prior to Mar. 1, 1913, he may continue to deplete his earnings for each year until he has exempted an amount equal to the "fair market value of the mineral in place on Mar. 1, 1913."

What is the fair market value of mineral in place in a mine on Mar. 1, 1913? If my interpretation of the clause defining the amount of yearly depletion allowable is correct, then the fair market value of the mineral in place on Mar. 1, 1913, would be the difference between the operating cost of extraction and the market price of metals on that date or the net value of the ore in the mine according to operating cost and ruling market prices.

Therefore, in the case of a mining company which had on Mar. 1, 1913, one million tons of 5% copper ore in place, and whose net operating cost per pound was 10c., if the market price of copper was 15c., a fair market value of the mineral in place on that date would have been 5c. per lb. of copper, $5 per ton of ore, or $5,000,000 for the mineral in place, and such a company would be permitted, if it desired so to do, to deplete its total operating earnings for each year until $5,000,000 had been allowed.

Thus it can readily be seen that the only possibility of a company, whose property had been purchased prior to Mar. 1, 1913, paying any income- or war-profit taxes whatsoever during its life, would be (a) that conditions should change so as to make the mineral in place of greater value as taken out than it was on Mar. 1, 1913; (b) metals holding at figures higher than the price of Mar. 1, 1913; (c) the operating costs being reduced below the cost used in the estimate; (d) the grade of ore proving to be better than estimated; or (e) that more tonnage should be developed after Mar. 1, 1913, than was estimated to be in place on that date. However, against these possibilities of a company's paying taxes at some remote period would be (a) the chance that the value of the mineral in place, as taken out, might fall below the estimated value of Mar. 1, 1913, caused by prices of metals being lower than those on that date; (b) by operating cost increasing above that shown in the estimate; (c) by the grade of ore proving lower; or (d) the tonnage in place less. One or all of these causes might result in lowering the net value of the mineral in place as estimated on Mar. 1, 1913, and no taxes would be paid.

If the interpretations of the Internal Revenue Department's rulings above set forth are correct, and the department sees fit to stand by them, then, other things being equal, the stocks of those mining companies whose properties were acquired prior to Mar. 1, 1913, should sell at a premium. The Internal Revenue Department has recognized reserves for depletion and depreciation set aside out of earnings as capital returned. If the reserve for depletion, when the property was acquired prior to Mar. 1, 1913, is to be based upon the net value of the mineral as of that date, instead of the actual investment in the property, how can such depletion reserve be a return of capital? T. O. McGRATH.

Bisbee, Ariz., Nov. 3, 1917.

Formation of Quicklime in Roasting

I am reminded of early troubles at Kalgoorlie, Western Australia, by the article by Walter S. Palmer on "Formation of Quicklime in Roasting Ores from Manhattan, Nevada," in the *Journal* of Sept. 22. The average ore of the "Golden Mile" contained over 70% silica, 6 to 15% lime as calcite, and 2 to 4% sulphur in pyrite. Sulphide ore carried little free gold. Little was known of this ore when the large plants were erected in or about 1900. Long, single-hearth roasting furnaces were built, but they were unsuitable and rarely gave a sweet roast. The ore had a tendency to "run" through the furnaces, and the unwieldy rabble trucks carried raw ore through from the feed to the discharge end, there dropping it among the roasted ore. From the furnaces the ore passed through revolving coolers and was then banked upon a cooling floor, where it was sprayed with weak solution. The next process was to charge this damp mass into large vats for leaching with cyanide in the ordinary way. This is where the trouble commenced.

During roasting, the lime was changed to the sulphate, and as soon as solution was added and drained off from the vats, there was the finest lot of gypsum imaginable. Percolation was hindered, and the residue, high in gold, had to be "mined" from the vats. Added to this, the solutions deposited $CaSO_4$ everywhere. Introduction of the Edwards and Merton furnaces, and alterations in treatment changed this. These roasters gave excellent results at a cost of 60c. per ton. The trouble with lime was avoided by mixing the hot, roasted ore with solution, which was followed by fine grinding in pans to save the gold freed during roasting, and by agitation and filtration by presses or vacuum machines. The hot solutions deposit gypsum everywhere—on the sides of mixers, pans, agitators, etc.—but this is easily scaled off at the regular monthly overhaul. I have seen White Caps ore from Manhattan, and hope that those in charge will soon give details of their roasting experiences. M. W. VON BERNEWITZ.

New York, Oct. 5, 1917.

Manganese from Low-Grade Ores

The necessity of stimulating the production of manganese, urged at the October meeting of the American Institute of Mining Engineers at St. Louis, was certainly to the point. There is plenty of manganese in the United States for all war purposes, provided low-grade ores are utilized instead of wasted in favor of high-grade ore for the sake of quick cash returns.

I refer to manganese ores that are refused by manganese-ore buyers, and which assay from 13 to 35% manganese. An immense tonnage of such ores is to be had in Nevada and adjoining states. They sometimes occur in union with silver, zinc, lead, tin, tungsten and other metals, which in most cases are wasted partly or wholly through the operation of present methods of "metal finance." I submit herewith results attained in the extraction and recovery of such ores by methods evolved and patented by myself, wherein the manganese recovery may be as high as 99.9%, and is in no case less than 90%. An analysis of the product follows: Manganese peroxide, 99.53%, containing 63% metallic manganese; iron, a trace; lead, none; lime, 0.15%; moisture and loss, 0.32%.

The recovery of the various metals in the ore by my method is shown in the description of a typical case. The ore selected was analyzed with the following results: Mn, 12.20%; Fe, 33.94; CaO, 2.95; Zn, 3.43; Pb, 3.15; Insoluble, 13.65; Ag, 2.35 oz. per ton; Au, 30c. per ton. Analysis of the tailings showed: Mn, 1.2%; Zn, 0.65%; Pb, 0.2%; Ag, 0.3 oz. per ton; Au, 20c. per ton. The following extractions were made: Mn, 90.92%; Zn, 81.17; Pb, 93.65; Ag, 87.24%. The zinc oxide recovered assayed 75.79% Zn; the lead assayed 93% Pb; and the manganese oxide contained 63% Mn, equivalent to a purity of 99.53%.

The solvent used was sulphurous fumes, either those generated by calcining sulphide ores or raw sulphur or eliminated as waste gases. Deposits of ore ranging in manganese content from 5 to 35% occur in various localities, and the manganese, with the other metals such as silver, zinc, etc., can readily be recovered by means of sulphurous acid generated from roasting sulphide ores usually to be found near-by. Sulphurous acid will, in the case of manganese, make a better and cleaner extraction than sulphuric acid, which is more expensive and indispensable for other purposes.

Manganese-silver ores readily yield their metallic contents to this treatment although it is hard to interest capital. The erection of a 5- to 10-ton experimental plant by the Government, to treat low-grade manganese ores by this process, would establish the efficacy of the method and might induce mining men and capital to develop this heretofore neglected branch of our mineral industry. C. S. VADNER.

Reno, Nev., Nov. 3, 1917.

Mill Check on Mine Sampling

The sampling work as conducted by a certain copper company in Morenci, Ariz., is of considerable interest. For some months previous to the labor strike in 1915 this company was milling several thousand tons of ore per day assaying about 2% copper and was taking about 2000 samples per month, consisting of channel cuts, rough grooves and grab samples. The channel cuts were taken horizontally on each side of all drifts and crosscuts in the low-grade porphyry orebodies, the rough grooves at 5- or 10-ft. intervals in the stoping-width veins and irregular limestone deposits, and the grabs were taken daily in every drift, raise and stope working in ore. A shovel grab was also taken from the top of every 10-ton mine car dumped into the main shaft pocket tributary to the concentrator; all carloads were weighed and periodic moisture determinations made. A continuous sample of the crushed mill feed was also taken at the concentrator by an intermittent whole-feed automatic sampler. All samples were assayed for copper by the slop-copper method except the mill sample, which was determined by the electrolytic method. The former determinations were reported only to the nearest tenth part of 1% and the latter to the nearest hundredth. All mine samples were cement-sack size.

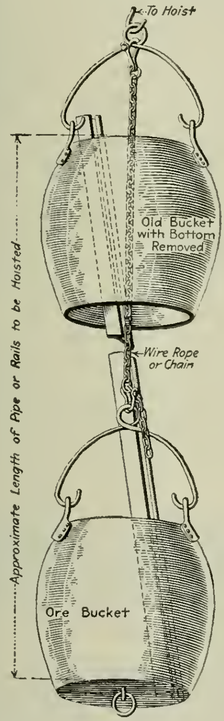
At the end of each month the daily mill-feed samples were weighted and the average was carried to three decimal points. The grabs taken at the loading pocket were weighted according to the dry tonnage hauled underground and checked against the mill feed. A third check was made by averaging the daily grabs from each working face, weighting the samples according to the shiftbosses' corrected car reports from all workings. Averages of the last two series were carried to the nearest hundredth. Month after month the variation in the above three averages would be under 0.05% and many months it was as close as 0.02%. The degree of accuracy implied by these averages is almost uncanny and is probably largely due to the size and great number of samples taken of a grade seldom varying more than 1% from a mill feed averaging 2%, which in itself is low grade. An experimental "pilot mill," treating all development ore, should give a good sample of a disseminated low-grade orebody. J. W. MAXWELL.

New York, Sept. 23, 1917.

Details of Practical Mining

Method of Hoisting Rails and Pipe

A safe method of hoisting and lowering rails and pipe without the trouble of lashing the upper ends to the hoisting cable is used in Gilpin County, Colo., and is shown in the accompanying illustration. The device consists of two buckets. The upper, preferably an old one with the bottom removed, is suspended from the hoisting cable in the usual manner and an ore bucket is hung at the desired distance below. The space between the bottom of the lower bucket and the rim of the upper one should be approximately the length of the pieces being hoisted. In loading, the pipes or rails are shoved up through the upper bucket far enough to permit the lower ends to be dropped into the lower one. When loaded the material may be hoisted without any lashing and without danger of accident. Lengths of rail or pipe that can be handled at the shaft stations may be hoisted or lowered safely in this manner, and the method is especially convenient when a large number of pieces are to be handled at one time.


To Hoist
Old Bucket with Bottom Removed
Wire Rope or Chain
Ore Bucket
Approximate Length of Pipe or Rails to be Hoisted

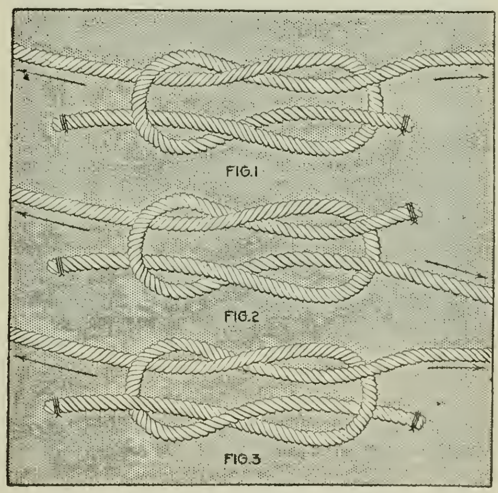
HOISTING RAILS OR PIPES

The method should be applicable at Joplin, Mo., where buckets are extensively used and are made easily detachable.

Deceptive Similarity in Knots

A description of an unusual knot called the "thief" is given in a small handbook on military work, and that is the only place I have been able to find it mentioned, writes O. R. McBride in *Power*. While it is likely to be tied by chance only, the fact that it is possible to do so and if it is trusted to hold will cause somebody grief seems sufficient reason for calling attention to it.

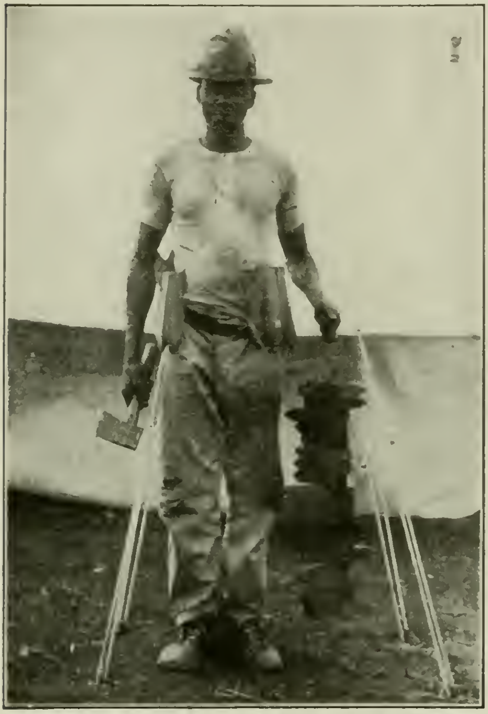
Fig. 1 shows the ordinary square or reef knot. Fig. 2 shows the "thief"—presumably so called because it looks so much like the square knot, so well-known and reliable. I have called the attention of more than a dozen engineers, structural men and riggers to the "thief" and failed to find one who had ever seen it described; most of them thought it would hold, but a trial soon showed that it would slip. The difference is entirely in the point of pull, which is on the same side or half of the knot in one and on the opposite sides in the other. The way in which the "thief" is most likely to be tied is when one bend or bight is made and the other end threaded through it. Fig. 3 is the "granny" or rolling knot and, like the "thief," will not hold. The difference between this and the square knot is that when the ends are brought back for the second half of the knot, they are crossed over. All that needs to be remembered in tying a square knot is to bend the ends back on the same side as they occur after the first half of the knot is made, so that the rope and the end lie on the same side of the loops. To avoid the "thief," see that the pull comes on the lines on the same side or half of the knot.



ONE GOOD AND TWO BAD KNOTS
Fig. 1—The square knot. Fig. 2—The "thief." Fig. 3—The granny or rolling knot

String Line Stakes To Prevent Mix-up

The numbered line stakes carried by the South African axman shown in the photograph, says G. T. Ritchie, in *Engineering News-Record*, are strung on thin wire. Not only are they convenient to carry in this way, but by threading them consecutively on the wires with the numbers in the inverse order in which they are to be driven, the selection of the correctly numbered stake is rendered foolproof.

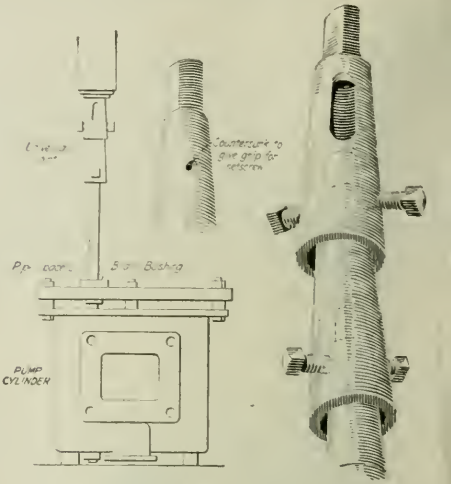


SOUTH AFRICAN AXMAN CARRIES LINE STAKES STRUNG IN ORDER ON WIRE

Reboring Pump Cylinder on a Drill Press

In an isolated plant the steam cylinders of a 7 x 10 water pump became badly scored, and the question arose how to make a quick repair with comparatively small resources. The double-cylinder casting was too big for the lathe, and a portable boring tool could not be had earlier than 12 days. Anyway, the owners would not go to such an expense for the comparatively small job. How the reboring was successfully done on a drill press is told by L. V. Lauther in *Power*. A heavy cast-iron plate was securely fastened, with bolts through pipe spacers, on the head end of the cylinder, and a bushing was fitted into the stuffing-box and centered, forming a neat sliding fit for the boring bar, which was driven by the drill-press spindle and the feed adjusted to suit the cut.

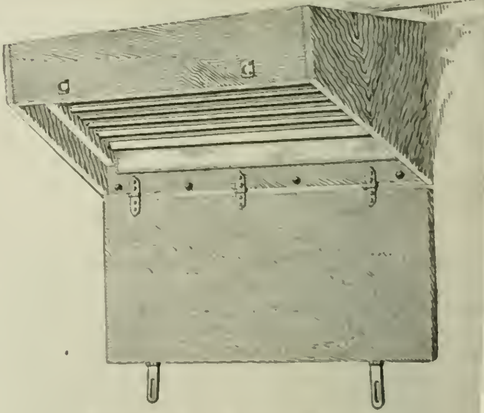
The two loose-fitting sockets driven by setscrews formed a universal 2-joint coupling. When one cylinder was done, the plate was reversed and the other one bored in the same way. The job took 19 hours, but with practically no expense for material, the only particularly difficult or tedious operation being the setting of the boring bar true, as it had to be centered from the counterbore.



BORING BAR DRIVEN WITH DRILL PRESS

Exhibition Case for Large Maps

An adaptation of library or school practice may be found in the accompanying sketch, designed to show a serviceable exhibition case for large maps or drawings. These are mounted on shade rollers of the proper length and hung in a wooden case, as shown in the perspective sketch. Hinges and locks may be provided if a doo is wanted on the front of the case and the contents ar not for the public view. The height of the case fro the floor is determined by the length of the maps.



EXHIBITION CASE FOR LARGE MAPS

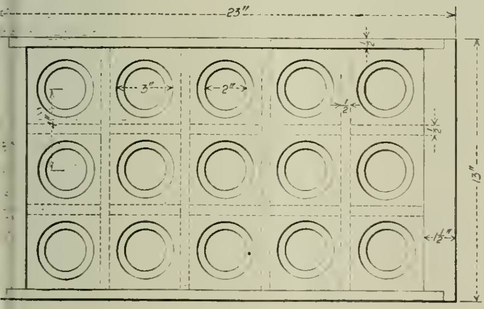
The Assayer and Chemist

Racks for "Slop Copper" Flasks

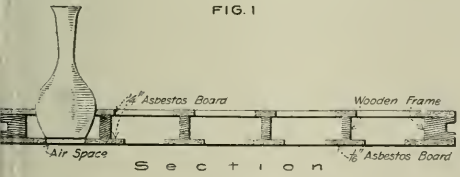
By H. D. Hunt*

A handy "kink" in the manipulation of the cyanide method was developed in the Miami copper laboratory some time ago by F. C. O'Brien. It consists of sets of decomposing trays and drying racks for the flasks by the use of which handling of individual flasks is almost entirely eliminated and much time is saved. The decomposing tray (Figs. 1 and 2) consists of a wooden frame covered both top and bottom with ¼-in. asbestos board. Circular holes are cut in the top to allow the flasks to pass through the asbestos but still to fit snugly. In the bottom strip of asbestos, smaller holes are cut on the edges of which the flasks rest, having air space between them and the hot plate. If the temperature of the hot plate is high, the entire bottom of the tray is covered with $\frac{1}{16}$-in. asbestos as shown.

The drying rack is made entirely of wood with holes corresponding exactly to those in the decomposing tray.



Plan
FIG. 1

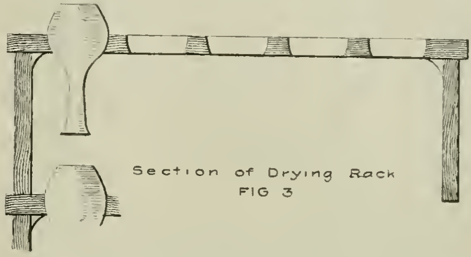


Section
FIG. 2

DECOMPOSING TRAY USED IN MIAMI LABORATORY

The supports are long enough to allow several racks to be stacked one upon the other. A convenient place to dry and store the flasks and racks is in a closet under the hot plate. This can be fitted with guides and the racks placed on these guides. The flasks are then out of sight and out of the way when not in use.

Manipulations with racks and trays are few and simple. After washing, the flasks are inverted in the racks and allowed to drain. When needed, a tray is placed over the flasks in the rack so that the bottoms of the flasks enter the holes in the tray. The rack and tray are then inverted together and the rack lifted off leaving the flasks upright in the tray. The samples are then weighed into the flasks, acid added and the tray placed upon the hot plate. After decomposition, water and ammonia are added to the flasks while still in the tray. The only handling of individual flasks is in transferring them to the burette rack, in titrating and in washing and placing the flasks in the drying racks. In this laboratory the trays are made to fit the 14 x 24-in. hot plates. Each tray holds 15 flasks and all samples are run in sets of 15. A standard ore is run in the middle flask (No. 8) of each set and the factor so determined is used for the entire set.



Section of Drying Rack
FIG 3

DETAILS OF TRAYS AND RACKS FOR FLASKS

Assay Conversion Tables

By A. W. Allen*

The following table will be found convenient in the case where assay results are reported to the home office in troy ounces per ton (of 2000 lb.) and where separate records must be kept, for official inspection, in grams per 1000 kg. Most English-speaking mining companies operating in Latin America use the short ton in metallurgical calculations, especially where contents are reported in ounces per ton; and as bullion is usually ultimately sold by the troy ounce, it is only natural that the assay-ton system should be used in calculating.

TROY OUNCES PER TON AND GRAMS PER 1,000 KILOGRAMS[1]

Oz.	Grams	Oz.	Grams	Oz.	Grams	Oz.	Grams	Oz.	Grams
1	34.2859	21	720.0039	41	1405.7219	61	2091.4399	81	2777.1579
2	68.5718	22	754.2898	42	1440.0078	62	2125.7258	82	2811.4438
3	102.8577	23	788.5757	43	1474.2937	63	2160.0117	83	2845.7297
4	137.1463	24	822.8616	44	1508.5796	64	2194.2976	84	2880.0156
5	171.4295	25	857.1475	45	1542.8655	65	2228.5835	85	2914.3015
6	205.7154	26	891.4334	46	1577.1514	66	2262.8694	86	2948.5874
7	240.0013	27	925.7193	47	1611.4373	67	2297.1553	87	2982.8733
8	274.2872	28	960.0052	48	1645.7232	68	2331.4412	88	3017.1592
9	308.5731	29	994.2911	49	1680.0091	69	2365.7271	89	3051.4451
10	342.8590	30	1028.5770	50	1714.2950	70	2400.0130	90	3085.7310
11	377.1449	31	1062.8629	51	1748.5809	71	2434.2989	91	3120.0169
12	411.4308	32	1097.1488	52	1782.8668	72	2468.5848	92	3154.3028
13	445.7167	33	1131.4347	53	1817.1527	73	2502.8707	93	3188.5887
14	480.0026	34	1165.7206	54	1851.4386	74	2537.1566	94	3222.8746
15	514.2885	35	1200.0065	55	1885.7245	75	2571.4425	95	3257.1605
16	548.5744	36	1234.2924	56	1920.0104	76	2605.7284	96	3291.4464
17	572.8603	37	1268.5783	57	1954.2963	77	2640.0143	97	3325.7323
18	607.1462	38	1302.8642	58	1988.5822	78	2674.3002	98	3360.0182
19	641.4321	39	1337.1501	59	2022.8681	79	2708.5861	99	3394.3041
20	685.7180	40	1371.4360	60	2057.1540	80	2742.8720	100	3428.5900

[1] Equivalents of the fractional parts of an ounce (per ton) in grams per 1000 kg. are as follows: 0.1 oz., 3.4286; 0.2 oz., 6.8572; 0.3 oz., 10.2858; 0.4 oz., 13.7144; 0.5 oz., 17.1429; 0.6 oz., 20.5715; 0.7 oz., 24.0001; 0.8 oz., 27.4287; 0.9 oz., 30.8572.

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*Miami Copper Co., Miami, Ariz.

*Metallurgical engineer, 309 Broadway, New York.

Events and Economics of the War

The Italian army, after efforts to stem the Teuton invasion at the Tagliamento and Livenza rivers, is resting on the broad Piave River, where the two armies are now opposed; British and French aid is on its way. General Diaz has assumed command in Cadorna's place. In Russia, a revolt of the Bolsheviki in Petrograd under the leadership of Lenine was temporarily successful, but is assuming less importance as the loyal elements rally to the support of the Provisional Government. In Flanders, Canadian troops took Passchendaele and pushed a mile beyond. The creation of an Allied war council through which the Allies may act as a unit is again demanding consideration. Gaza, Askalon and Beersheba have been taken from the Turks by the British in Palestine.

In the United States, a compact has been made with Japan settling differences on Chinese questions. Germany has been asked to agree on the treatment of war prisoners. Strikes among shipworkers have been settled; Charles Piez of Chicago, president of the Link-Belt Co., has supplanted Rear Admiral Capps in supervising construction under the shipping program. The U. S. S. *Alcedo*, a converted yacht, was sunk by a torpedo, 21 of the crew being reported missing. The President has proclaimed that on and after Nov. 15 it will be unlawful to manufacture, distribute, store, use or possess explosives or ingredients thereof, except as provided in the Explosives Act.

Germans Destroy Belgian Plants

Details of Germany's systematic destruction of manufacturing plants in Belgium continue to reach the Belgian government, according to information from Havre. All machines and belting have been removed from the Deprez-Vassaat works at Herstal (Liège). In the district of Huy, the Wanze cement plants and the Régissa, Marchin and Barte works (zinc, plates and rolling mills) are shut down by German order. Factory brasses, and boilers from breweries, etc., have been removed and sent beyond the Rhine. At the Glacerie Saint-Roche, at Auvelais, brasses have been confiscated and other machine parts useless to the Germans, such as spare supplies, broken up. All machinery has been stripped from the Heuze works—as well as the electric cables and belting.

Organized wrecking crews have been dismantling blast furnaces, two of those of the John Cokerill Works, near Liège, having been completely destroyed. Engines, machinery and stocks of raw material are being removed. Seven of the eleven rolling mills at Ougree-Marihaye have been carried off. At Angleur everything has been removed, as at Grivegnee, where nothing remains but the steel works, which the Germans are operating to supply their own needs.

German requisitions for pit coal (from 36 to 90% of the total production), threaten to deprive the population of the occupied territory of all fuel during the coming winter. A paradoxical effect of the manner in which the Germans wage war is that the inhabitants of what is normally a coal-exporting country should be shivering before their empty fire places alongside shafts from which thousands of tons of coal are being taken every day. To make up for this want of coal, the Community Council of Anderlecht-les-Bruxelles has been constrained to grant 100,000 francs to the local aid and food committee to buy firewood; though Anderlecht is joined by rail, water and highway to the Charleroi district (45 km.) and to Borinage (50 km.), both large coal-producing centers.

Hoover Practically Food Dictator

The schedule of regulations made public by President Wilson on Nov. 3, authorizing Herbert C. Hoover to license importers, manufacturers, wholesalers, canners, packers and large retailers, and giving him almost unlimited control over the prices and distribution of the nation's fundamental foodstuffs, practically confers upon the Food Administrator all the authority of a dictator. It is said, however, that the policy pursued will be to obtain results so far as possible by voluntary coöperation. The regulations, which are an elaboration of the powers granted by the Lever Food-and-Fuel Act of Aug. 10, make it mandatory that the commissions of middlemen and the profits of wholesalers in certain commodities shall be no more than normal and in no case unfair; that there shall be no storage of foodstuffs beyond requirements for 60 days; that no licensee shall sell in quantities known to be in excess of the requirements of the purchaser; that there shall be no sales to firms coming under provisions of the licensing system but who have not been granted licenses; that commission merchants shall not sell to themselves, making a commission and a profit besides, and that grain elevators and warehouses shall at all times be at the command of the Food Administration. The regulations will be enforced, if dealers refuse to conform to their provisions, by withdrawal of the dealers' licenses, without which they will not be allowed to continue business.

A regulatory edict of the Government of far-reaching importance will become effective on Dec. 10, when the country's baking industry will be put on a war basis. After that date loaves of standard sizes only may be baked, and the industry must accept a formula prepared by the Food Administration. While the mixing of other cereals with wheat—a policy adopted in France and England—will not be insisted on, the new war loaf will differ in many respects from that which is baked at present. The Food Administrator believes that a saving of 100,000,000 lb. of sugar and an equal amount of lard will be effected within a year.

The acceptance of "returns" by bakers also will be forbidden, and it is estimated that this action will mean an annual saving of at least 600,000 bbl. of flou Seven cents a pound for bread under the new co tions is the present mark set where elaborate delivery and credit systems are abandoned. The people will be asked to coöperate in an effort to reduce these overhead charges to a minimum. Authority to proceed under a licensing system which will make it possible to put these regulations into effect has been given to the Food Administration by President Wilson. Bakers will be classed as manufacturers, thus bringing them within the scope of the Food Control law. The bakers will thus have a month in which to adjust their plants to the new conditions.

Priority Order for Western Roads

Seven railroads serving coal mines in the Utah and Wyoming fields have been ordered by Judge Robert S. Lovett, in priority order No. 3, to supply daily to such mines all or so many of the empty box and single-deck stock cars moving west or northwest over their lines as may be required to transport coal ready for shipment west or northwest, according to the direction in which such cars are being moved. The companies have, furthermore, been ordered to transport and deliver all cars of every kind loaded with commercial coal and destined to points west and northwest of point of shipment in such manner that they shall have preference and priority in shipment, after transporting (a) railroad fuel supply; (b) live stock and perishable freight, including sugar beets; (c) Government shipments, and (d) commodities to and from smelteries sufficient to keep same in operation. The railroads named are the Denver & Rio Grande Railroad Co., San Pedro, Los Angeles & Salt Lake Railroad Co., Utah Railway Co., Union Pacific Railroad Co., Oregon Short Line Railroad Co., Southern Pacific Co., and Western Pacific Company.

Brotherhoods Want Shorter Trains

The four railroad brotherhoods that forced the enactment of the Adamson eight-hour law a year ago have announced their intention to urge on Congress, when it convenes again, legislation limiting the load of freight trains. This is ostensibly in the interest of safety. But railroad men at Washington who have been directing the Government's war-efficiency work assert that such a law would paralyze the internal commerce of the country and jeopardize the fate of the armies at the front.

The whole campaign of the Railroads' War Board, which has resulted in hauling 20% more tonnage in 1916 with only a slight increase in cars and locomotives, has been directed to increasing the train load. In April the average train load was increased to 738 tons; May to 793 tons, and July to 783 tons. By making two trains do the work done by three in 1910, the War Board has accomplished the same result as if it had put thousands of new locomotives and scores of thousands of new cars on the rails. These have been the means of saving enormous quantities of labor and materials for the pressing needs of our Allies, especially in rebuilding Russian and French railroads. Now, with this accomplished the labor chiefs have planned a blow which railroad managers say would seriously cripple the service.

Legislative agents of the "Big Four" brotherhoods for several years have been introducing short-train bills in every state legislature. In only one state, Arizona, have they forced legislation. The bill they have now drawn and behind which the four brotherhoods are to exert all their efforts would limit all trains to 50 cars. The brotherhoods' agents have decided it is a waste of time to conduct a campaign in 48 states when one national law will cover the country.

Food and War Supplies Cached in New York

Huge quantities of food and war materials hoarded in the New York metropolitan district have been unearthed by the U. S. Secret Service, which was recently instructed by the President to aid the Food Administration in enforcing the provisions of the Food law. Supplies thus far discovered are estimated at over $75,000,000 in value, more than $35,000,000 of which is represented in steel, copper, leather, oils, cotton, jute, etc. Seizure of the food, which is possible under the law, will depend on the decision of the Food Administration and other war boards charged with the control and disposal of war supplies. Much of the steel, copper and jute is held by German interests, according to the *Times*, in particular some closely allied with the Deutsches Bank of Berlin. Part of the material is said to be owned by profiteers. The Alien Property Custodian, A. Mitchell Palmer, is prepared to seize these supplies wherever enemy ownership is proved.

Link Belt President Succeeds Capps as Shipbuilder

The executive functions hitherto administered by Rear-Admiral W. L. Capps, general manager of the Emergency Fleet Corporation, and by Naval Constructor A. D. Bolles, his assistant, are to be taken over by expert civilians. Charles Piez of Chicago, president of the Link Belt Co., has assumed entire charge of the shipbuilding program under E. N. Hurley, chairman of the Shipping Board, displacing Admiral Capps insofar as these duties are concerned, but not assuming the title of general manager. Admiral Capps has denied that he will resign, saying that he will continue to work in coöperation with Chairman Hurley. Mr. Piez was elected vice president of the Emergency Fleet Corporation about Nov. 1 in preparation for his appointment. While having general supervision of construction, he will give his personal attention to steel construction. James Heyworth, a Chicago contractor, will direct construction of wooden ships, of which there are 310 building, and also will supervise the building of the ships on the stocks which were taken over by Chairman Hurley's commandeering order. These duties heretofore have been administered largely by Naval Constructor Bolles.

Three other appointments of importance were those of A. J. Mason, a Chicago engineer, who will have the position of field inspector for the Fleet Corporation, visiting the various shipyards to see that they are maintaining their maximum efficiency and that they are kept supplied with labor and materials; Charles Day of Philadelphia, who will act as a consulting engineer; and John B. Payne of Chicago, who will be chief of the Fleet Corporation's local counsel.

The reason assigned for the change is that the construction work was being administered with a complete absence of business methods; that there was not the harmony existing between the officials of the Emergency Fleet Corporation and the builders that should obtain in order to bring out the maximum production and the best results in other respects; that the builders were held back for days and weeks because they could not get materials with which the Fleet Corporation was undertaking to supply them and that the builders were kept in an uncertain state because a decision by the Fleet Corporation on ship design or related matters on one day might be reversed the next.

Coal Pooled at Eastern Ports

The Tidewater Coal Exchange has been formally approved by the U. S. Fuel Administration, and an order has been issued requiring all transhippers of coal at New York, Philadelphia, Baltimore and Hampton Roads to make shipments through it. Practically all shippers to these points have been doing this since the exchange was organized some time ago. The few remaining outside, however, prevented the attainment of 100% efficiency in operation, which could not be reached unless all were members.

The new order will result in increased production of approximately 10,000,000 tons of coal per year, on account of the decrease in detention of cars at the ports, thus increasing the supply of cars to the mines. Coal will be pooled and classified according to grade, and the number of consignees has been reduced from 1000 to 50. Vessels have also been pooled at some of the ports, and this, with arrangements for bunkering in the stream, will facilitate the unloading of cars and loading of vessels.

Britain's Control of Labor Supply

The British Ministry of Munitions has direct control over most of the manufacturing which is now being carried on in England. The remarkable success of the war industry of Great Britain has been due in great part to the work of this Ministry. The English manufacturers have found that most of their serious problems of production were caused by the great changes in the supply and character of labor available for industry during the war period, as is the case at the present time in this country. For this reason, the labor supply department of the Ministry of Munitions proved to be of the greatest importance.

Members of the Ministry's special commission, which is headed by Sir Stephenson Kent, director-general of the labor-supply department, have been in Washington for a month giving the heads of Government departments, the Council of National Defense and the American Federation of Labor the benefit of England's experience of industry during the war. The conference at Washington proved to be so valuable that the Commission was urged to visit the important industrial sections in this country, that manufacturers and other employers, as well as employees, might also benefit. It has already visited St. Louis, Chicago, Pittsburgh, Cleveland, Buffalo, Boston and New York. Attendance at the conferences has been large in all these cities.

Americans in Paris War Conference

The American commission to the Allies' war conference, begun in Paris on Nov. 15, is headed by Col. E. M. House and includes Admiral W. S. Benson, chief of naval operations; Gen. Tasker H. Bliss, chief of staff, U. S. A.; a representative of the Treasury in the person of Assistant Secretary Oscar T. Crosby; Vance C. McCormick, chairman of the War Trade Board; Bainbridge Colby of the Shipping Board; Dr. Alonzo E. Taylor of the Food Administration; Thomas Nelson Perkins, representing the Priority Board, and Gordon Auchincloss, as secretary. In outlining the objects of the conference, Secretary Lansing said in part:

> The conference is essentially a war conference, with the object of perfecting a more complete coördination of the activities of the various nations engaged in the conflict and the more comprehensive understanding of their respective needs in order that the joint efforts of the cobelligerents may attain the highest war efficiency. While a definite program has not been adopted, it may be assumed that the subjects to be discussed will embrace not only those pertaining to military and naval operations, but also the financial, commercial, economic and other phases of the present situation which are of vital importance to the successful prosecution of the war.

Jailed for Tungsten Plot

Convicted of attempting secretly to export powdered tungsten to Sweden, three men were sentenced at New York, on Nov. 9, to one year and a day each in the Federal prison at Atlanta, Ga., and each was also fined $1000. The men were Fritz Oerundal, formerly chief steward of the liner "United States," and Waldemar J. Adams and Robert J. Collin, Swedish booksellers, of New York. Oerundal is a Dane, Collin a subject of Sweden and Adams a naturalized American citizen.

They have the lenient American laws to thank fo this light penalty, says the *Sun*. They confessed to scheme to ship secretly from this port a large quantit of tungsten which is wanted badly in Germany. The tri had no patriotic motives, for they were neutrals. Desi for money alone impelled them to hide beneath a stateroom floor on the liner "United States" 40 large package of the metallic powder, exportation of which has bee forbidden by the President. They admitted having conspired with two other men now in Sweden to delud the American customs authorities and the Britis Admiralty.

Solve Trench-Digging Problem

The trench-digging problem has been solved, accor ing to the U. S. Field Artillery *Journal*. Machine designed originally for pipe-line excavation, for i stance, may with little modification be employed f the defense of a nation. Ditch diggers can cut trench at a rate of three yards a minute. These are a ya across the top and 12 ft. deep, and they not only make perfect trench at one cut, but grades can be maintain accurately and curves negotiated.

Industrial News from Washington

By Paul Wooton, Special Correspondent

Mexico Has No Gold Commission in This Country

Contrary to published reports, there is no commission in this country for the purpose of arranging for the shipment of gold into Mexico as a privilege under the embargo recently established by the United States, says a statement authorized by the Mexican Embassy. Some time ago the American authorities were asked to allow the transfer of $5,000,000 monthly to enable the mining and oil companies in Mexico to meet obligations in that country payable in United States coin. Not only was this request granted, but the amount was doubled, $10,000,000 monthly being the total specified, the statement says.

In addition to this the American Government voluntarily offered to permit a large amount of silver pesos to be shipped into this country, where they will be exchanged for gold and returned to Mexico. The Mexican government has notified all gold-mining companies in that country that the national mint is open for the coinage of all gold bullion that they may desire to have so treated. This also will tend to ease the situation. The "commission" now in this country for the purpose of handling the gold question is merely a private committee of the Chamber of Commerce entrusted solely with the duty of purchasing coin, for which it pays in gold.

Western Metallurgy Advancing

After several months of almost constant travel on visits to mining districts and treatment plants throughout the West, Dr. F. G. Cottrell, chief metallurgist of he U. S. Bureau of Mines, has returned to Washington mpressed with the effective manner in which the metal-mining industry is rising to the existing emergency. He found the entire West striving to meet the abnormal demand for minerals, and was particularly impressed with the determined way in which the large interests are pushing their enterprises. He specifies in particu- ar the work in progress at Anaconda and the decision o erect a $25,000,000 steel plant at Seattle.

The metalizing of iron for the precipitation of copper in connection with leaching, while still being conducted on an experimental scale, is attracting wide at- ention, according to Dr. Cottrell. Interest in making sponge iron has been re-awakened as a consequence. Since looking into the matter personally, he is thor- ughly convinced of the seriousness of the arsenic situ- tion. The fact that all in a position to produce arsenic now that the Anaconda catchment plant will be turn- ng it out on a large scale, probably within the next ear, discourages the installation of other plants.

Dr. Cottrell observed with interest while on his trip he extensive steps that are being taken to manufac- ure chemicals at plants around Salt Lake City. An- ther matter to which he attaches special importance is he installation of additional equipment at cement plants to recover potash; also the amount of potash that is being recovered from bitterns and the progress that is being made toward the production of cyanide.

Western Tungsten Resources Inventoried

An inventory of the tungsten resources of the Western states has been made by F. L. Hess, of the U. S. Geological Survey, on a nine months' trip just finished. A feature of the tungsten situation, according to Mr. Hess, is the great number of contact-metamorphic deposits, which he expects to be an important factor in future production. The mineral collection in the National Museum at Washington will soon receive from the Atolia Mining Co., of Atolia, Calif., a single piece of scheelite, 5 ft. high, 2 ft. wide and 1½ ft thick, recently mined by that company. Mr. Hess, who visited the property, suggested that the remarkable specimen be preserved and succeeded in obtaining it for the museum.

He also examined a large number of molybdenum and vanadium deposits, visited several iron properties, investigated reported finds of potash and inspected the cobalt property of the Haynes Stellite Co. at Blackbird, Idaho. This is the first cobalt deposit to be operated as such in the United States, Mr. Hess believes. A mill has been erected and preparations made for treating the ore on a large scale. Several hundred new molybdenite developments were noted, the largest production coming from the tailings of the old Mammoth gold mine, at Schulz, Ariz. More than 500 tons have been obtained from this source, and the mine itself has been reopened.

High Price of Cement Justifiable

Complaints are reaching Washington from various sections of the country that cement prices are unreasonably high. Government specialists who have looked into the situation, however, believe that though some of the manufacturers may be attempting to recoup previous losses, cement in general is being sold at the mills at a fair price. The cost of manufacture under present conditions, it is pointed out, is high, having increased more in this particular industry, it is believed, than in any other, due largely to the fact that the machinery used wears out rapidly. Replacements are not only expensive but result in delays which curtail production. The industry, furthermore, uses quantities of explosives and is also subject to the existing increased costs of fuel and labor. Car shortage, too, has added to the tribulations of the cement manufacturer. While there has been considerable comment concerning division of territory by cement makers, this should not be held responsible for increase in price. It has, on the other hand, made possible economies in selling and in reducing transportation charges.

Editorials

Taxation of Mining Companies

T. O. McGRATH, auditor of the Shattuck Arizona Copper Co., presents in an interesting communication published in this issue a different view of the allowance to mining companies for depletion according to the terms of the present income tax law; that is, different from the view expressed in an editorial in the *Journal* of Oct. 27. We agree with Mr. McGrath that this matter of depletion may be a much more jumbled affair than was set forth in our editorial. The language of the provision in the law exhibits the same imperfect comprehension of matters of business that is displayed in many other parts of the law. There is a similarity between the work of our Congress and that of the Bolsheviki in Russia.

In cases of confusion in the written law the courts give a good deal of weight to what was the manifest intention of the legislators. In the present case we think that there is no doubt that the manifest intention was to recognize that the dividends of a mining company are to a large extent nothing more than return of principal invested in the company and therefore ought not to be taxed as income. As to just how the allowance ought to be made, or was to be made, Congress had no clear idea. It thought, apparently, that mines ought to be valued as of Mar. 1, 1913, and that the principal represented by such valuation ought to be permitted to come back to its owners tax-free; but in order that there should be no attempt to deduct too much in any one year the allowance was limited to the percentage of the orebody that might be extracted in any year. Valuation as of one day is of course something that is apt to be highly unjust, as it would have been if the price for copper on Mar. 1, 1913, had been 12c. per lb. Fortunately, the price for copper on that day was 14.55c. per lb., which is only a trifle below the decennial average at that time; but, of course, in the light of what has happened since, it is doubtful whether such a figure is a proper one.

Anyway, the value of a mine having been determined, and the manifest intention of Congress being to let the owners liquidate it free of taxation, the computation really resolves itself into the primary factors of mine valuation; namely, the net interest that should be allowed on a mining investment and the period of time during which the orebody is going to be extracted. We do not think, as Mr. McGrath intimates, that the Bureau of Internal Revenue will allow all net income to be considered as a return of principal. We think the chances are rather that it will take the view expressed in our editorial of Oct. 27. Even so, mining companies will obtain an important exemption from taxation on their income as commonly reported. Of course, that is nothing more than right, for the income commonly reported is always something more than net income, and being partly a return of capital the mining company would be taxed first on its capital and then again on the liquidation of the same capital were it not for an allowance for depletion.

While we are on the subject of taxation of mining companies we may draw attention to the fact that while holding companies may not include in their capital their investments in other companies, on the other hand they do not have to include in their income the dividends received by them from such investments.

Mining Engineers in Service

THE part that mining engineers are playing in the military service of the United States, both in the line and in the staff, and also in the industries that are the foundation of everything, is an important one. Several of our good friends are officers in the 11th Engineers, which was one of the first regiments to go to France. Another group is forming the 27th Engineers, the special mining regiment. Many other well-known mining engineers are scattered among the line regiments.

In the United States Naval Consulting Board mining engineers are bountifully represented. Herbert Hoover, one of the leaders of our profession, is United States Food Administrator, and with him are Requa, Merrill and Edgar Rickard. Several of our distinguished consulting engineers are now consulting engineers to departments of the United States Government. Westervelt is chairman of the War Minerals Committee.

Now it has befallen to another well-known and accomplished mining engineer, Benedict Crowell, who had previously been major in the Ordnance Corps, to be appointed Assistant Secretary of War. Mr. Crowell is a man of interesting personality and distinguished professional attainments. In his new post he will be able to do a lot of good work for which he is well fitted and will reflect credit upon his profession while rendering service to his country.

Useless State Reports

SOME states have established departments of mine inspection or geology, which as a part of their duties issue reports of mineral production that, technically, are "not worth the paper they are printed on." Statistics giving terms of value instead of quantity may be superficially interesting, but they are devoid of usefulness to the mining industry, terms of value being variable in normal times and meaningless under conditions of extraordinary variation such as have prevailed during the last three years. Straining for a "showing" by comparing present war-time prices with 1913 values is not worth while. With such wide fluctuations as now prevail, no useful comparisons can be made respecting the real progress of the industry unless comparative quantities are known. Mere value reports are of no use to the mineral industry which should be served by the state departments issuing them. Even when these reports are intended for the daily press, the state bureaus should take the lead in giving to newspapers something useful to disseminate. Furthermore, these "value" reports will be extremely confusing a few years hence, and in these times of imperative conservation are an indefensible waste of white paper and labor.

Anaconda as a Manufacturer

THE Anaconda Copper Mining Co., which is now building a copper-rod and wire mill at Great Falls, Mont., expects to have the plant in operation before the middle of 1918. This will not be Anaconda's maiden effort in a commercial manufacturing business, for during many years it has been a manufacturer of mining machinery and of firebrick, both clay and silica. In each of those lines it has been, and is, one of the largest manufacturers west of the Mississippi River.

Going into the copper-rod and wire business is simply an extension of Anaconda's manufacturing activities. Nothing could be more natural than this, for it produces refined copper at Great Falls; and in Montana, and indeed the entire Northwest, which is becoming an electrified empire, it has a fine market for the products. It would look rather foolish to freight Great Falls wire bars to the East in order to draw them into wire that would subsequently be freighted back to electrify the St. Paul railway, through Montana and Idaho, or to supply the Montana Power Co.

We may confidently expect that Anaconda's next step in the manufacturing business will be to erect a brass factory. Producing refined copper and refined zinc at Great Falls, the logical thing will be to combine them to make as much brass as the Western territory requires. Montana is an empire in which the Anaconda Copper Mining Co. supplies the major part of the raw material, ncluding metals, coal and lumber. The creation of a manufacturing industry on such a basis is a logical development.

The 27th Engineers

THE War Department is finding that it has been making the same mistake that was made in Great Britain and France. Probably it is duplicating a good many of their mistakes, but we now have reference to one in particular. In the first place, men were drafted indiscriminately for the line regiments of the Army. Later t was found necessary to organize regiments for special purposes, such as gas and flame work, tunneling and mining work, etc., by which time it appeared that the men who ought to be in those special regiments were scattered indiscriminately and were not easy to collect.

In the United States the first draft took men in the ame proportion from every part of the country. The quotas drawn from Lake Superior, the Minnesota iron anges, Butte, Bisbee, etc., consisted largely of miners. For example, about 2000 men were taken from Butte, a large proportion of whom were miners, which is one of the reasons for the scarcity of miners in Butte at present.

Now Major Perry and Captain Landers, two of our well-known mining engineers, are organizing the 27th Engineers, U. S. N. A., which is to be especially a mining regiment, and are asking for volunteers to it. We hope that they will get all that they need and that mine managers will coöperate in the recruiting of this regiment, for the number of men that it will require is not very large and the working force of the mining industry will not thereby be diminished seriously. If miners who have already been drafted and are now scattered among the several cantonments could be released for reassembly in the mining regiment, that would be desirable. But that would be a difficult thing to do. Nevertheless the War Department ought to try to do something of the sort and ought to give its attention to the avoidance hereafter of using special material for the purposes for which ordinary material is sufficient.

However, the withdrawal of miners already drafted is manifestly something that is impracticable immediately, and the pressing matter is to recruit the 27th Engineers as rapidly as possible. We hope that mine managers will coöperate in this, especially in those districts—like the lead and zinc mining districts—where there is now a surplus of labor and miners can be spared. But everywhere it may as well be frankly recognized that a second quota of the draft will soon be called to the colors, and there will be no occupational exemption except probably in the case of shipwrights. It would be an excellent thing therefore for miners who hold numbers indicating the probability of their being called in the next draft to volunteer now for the 27th Engineers, which would take them into a regiment of congenial character and would enable them to preserve previous associations.

British Mineral Statistics

THE British mineral statistics for 1916, lately published, are interesting as an index of what may happen to our own mineral industry, the United States having entered the war under conditions similar to those of Great Britain, that is, both were essentially nonmilitary nations, and both were obliged to withdraw from peaceful pursuits a large percentage of the working population. Unfortunately, the mineral industry of Great Britain is far less diverse than that of the United States, and in the production of metalliferous minerals is relatively unimportant, except for iron ore.

The noteworthy feature of the British statistics is their exhibition of how the production of the essentials has been fairly well maintained, while the non-essentials have fallen off to a much larger extent. Thus, comparing the figures for 1913 with those of 1916, we find that in the former year there was a production of 287,430,473 tons of coal, 15,997,328 tons of iron ore, and 3,280,143 tons of oil shale. In 1916 coal production had declined to 256,375,366 tons, iron ore to 13,494,658 tons, and oil shale to 3,009,232 tons. Turning now to non-essentials, if we may be permitted thus to characterize the rocks, we find that gravel and sand declined from 2,409,152 tons to 1,961,650 tons. Igneous rock declined from 7,098,493 tons to 4,843,176 tons. Limestone declined from 12,740,664 tons to 10,541,573 tons. Sandstone declined from 3,977,303 tons to 1,999,308 tons. If our interpretation be correct, the decline in the production of sand and rock reflects curtailment in domestic building operations, things not immediately necessary having manifestly been postponed. On the other hand.

attention has been concentrated on the production of coal and iron, which are indispensable, and their output has been pretty well maintained. The British statistics may be considered to reflect good organization.

According to late advices from Washington in regard to the Explosives Act, which became effective Nov. 15, the U. S. Bureau of Mines has ruled that explosives may be used by a company, situated at a point where no licensing agent has yet been appointed, immediately after it has filed with the Bureau of Mines an application for a license by mail or telegraph. The purpose underlying this ruling is to prevent any possible loss of production.

BY THE WAY

We have just received the circular of the Stockholders Mining Co. This sounds too good to be true.

This one is revived by *Everybody's:* An Italian, having applied for citizenship papers, was being examined in the naturalization court. Q—"Who is the President of the United States?" A—"Mr. Wils." Q—"Who is the Vice President?" A—"Mr. Marsh." Q—"Could you be President of the United States?" A—"No." Q—"Why?" A—"Mister, you 'scusa me please; I vera busy worka da mine."

As the traveler waited for an outgoing *fotinga* he heard the *administrador* of the Busy mine address a group of subordinates. "Boys, there's some monkey business going on. I can't see why these niggers want to carry off copper ore, but it is disappearing in bunches. Keep a sharp lookout." The next night the traveler put up at the neighboring Hope mine. Just at dusk there was a slight commotion down hill from headquarters and soon a half-breed foreman reported, "Juan, he come back with some copper rocks and want his money." Up jumped the new super, shouting: "Tell that crazy fool to beat it. The idea of his thinking we would buy ore." A few days later in the capital the traveler met an old acquaintance. After an exchange of refreshment courtesies the O. A. grew confidential. "Say, Bill," he said, nudging his chair up close, "there'll be things doing in Hope stock pretty soon. Last time I went north I made old O. N. Bale dig me up 500 shares as a bonus on the option deal. This is where I cash in on the top price." As the traveler puffed his Corona that night he reviewed the experiences of the past few days, and although naturally unsuspicious, he could not refrain from murmuring, "I wonder, now, if the Hope mine is going to make a little shipment."

It was a proud boast, often heard in America in the years that are gone, that what one man could do could be done by another. A Yankee could turn his hand at anything. Happily, says *Power*, we have emancipated ourselves from this notion, always false but never so clearly recognized as false as in these days, when it is the ideal that every turn of the hand shall conform to the dictates of science. Modern efficiency has little liking for Jack-of-all-trades. If current reports be true, one of the disruptive forces in the new-blown democracy of Russia is just this lack of appreciation of specialization and of the organization necessary to coördinate it into industrial production. One of these reports is to the effect that the miners and other workmen at a certain property called on the engineers, demanding that since Russia was a free country and all its citizens on a footing of equality, the engineers must take their turn in the mines and work as the others did. Then followed this colloquy: The Engineers: "And who will do our work?" The Workmen: "Some of us will take turns in your offices." The Engineers: "But what will you do there?" The Workmen: "The same as you do—sit around, sharpen pencils and smoke cigarettes."

Geology Fellers

Used to think I nawed all about minin'
For, damme, was born at the trade.
I learned 'ow to 'andle a muck stick
An' nawed 'ow to put up a raise.
In h'early days over in Redrouth
Wen fayther was shif'boss, I nawed
The 'ol bloody mine like a pictur'
An many's the set that I've sawed.

In sinkin' a winze, or block 'olin'
Or in cavin' a stope on the sub,
There was nothin' that I could be beat at,
An' I 'eld up my h'own at the pub.
I could 'andle a 'ammer at single
Or double, if needs that there be.
An throughh'out the 'ol bloody country
There was no better miners than we.

I nawed 'ow to 'andle my powder
An' just 'ow to crimp on a cap,
An' all other things about blastin',
An' just 'ow a vug we should tap.
An' put'n' up timber for square sets
Was simple as simple could be,
For h'it's all a day's work for a miner
Jus' the same as 'is pasty an' tea.

All we 'ad was a compass an' tapeline
That we used for to 'ole thro' a drif,
An, damme, at that we come closer
Than some I 'ave seen with the gif
For figgerin' an' for surveyin'—
But mind I ain't sayin' as 'ow
There ain't lots 'oo've 'ad edication
'oo can do jus' as well, I'll allow.

But now, I 'as come to conclusion
That, damme, I don't naw so much—
H'understand that h'it's not about minin',
But of strikes, an' the fault planes, an' such.
We mined h'out the h'ore as we foun' h'it,
Not stoppin' to figger h'out 'ow
We could catch 'er again if we lost 'er,
Like the fellers—'oo naws—does h'it now.

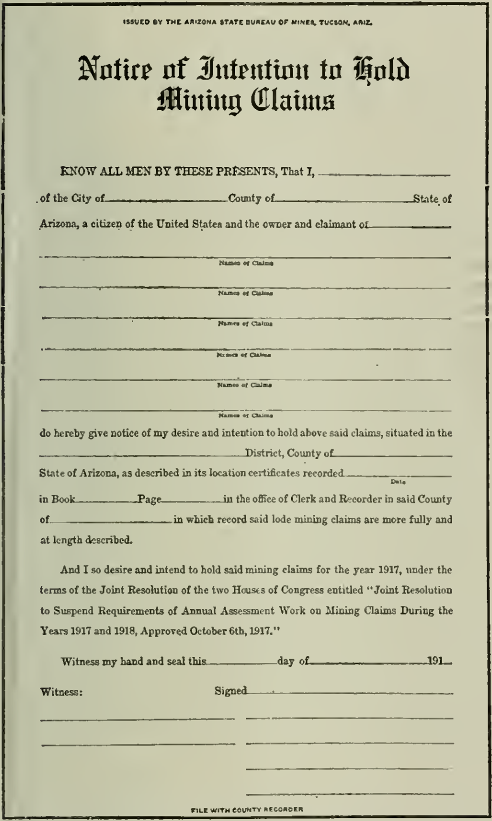
Dos thee naw these geology fellers?
Why, damme, just listen to me.
They can tell thee more things about minin'
An 'ow the worl' 'appened to be,
Than thee ever did'st read of in Scriptur'.
An', damme, I naw that h'it's true,
For 'av'ent I seen 'em find pay dirt
W'en we thought that the minin' was thro'?

I 'as. An' I'll say this much further—
Tho' I'm an ol' 'and at the game,
An' I naws that on one h'end of minin'
I can 'andle whatever you name—
That wen h'it comes down to the sayin'
Of just where your h'ore must be to,
Just call in geology fellers,
An' they'll bloody soon tell you 'oos 'oo.

D. E. CHARLTON.

Release from Assessment Work

Every holder of a mining claim desiring release from assessment work under the provisions of the Assessment Bill, signed on Oct. 5 by President Wilson, must "file or cause to be filed in the office where the location notice or certificate is recorded on or before Dec. 31, of each of the years 1917 and 1918, a notice of his desire to hold said mining claim under this resolution." The full text of the law is as follows:



ISSUED BY THE ARIZONA STATE BUREAU OF MINES, TUCSON, ARIZ.

Notice of Intention to Hold Mining Claims

KNOW ALL MEN BY THESE PRESENTS, That I, ______________

of the City of ______________ County of ______________ State of Arizona, a citizen of the United States and the owner and claimant of ______________

______________ Names of Claims

______________ Names of Claims

______________ Names of Claims

______________ Names of Claims

______________ Names of Claims

______________ Names of Claims

do hereby give notice of my desire and intention to hold above said claims, situated in the ______________ District, County of ______________ State of Arizona, as described in its location certificates recorded ______________ Date in Book ________ Page ________ in the office of Clerk and Recorder in said County of ______________ in which record said lode mining claims are more fully and at length described.

And I so desire and intend to hold said mining claims for the year 1917, under the terms of the Joint Resolution of the two Houses of Congress entitled "Joint Resolution to Suspend Requirements of Annual Assessment Work on Mining Claims During the Years 1917 and 1918, Approved October 6th, 1917."

Witness my hand and seal this ________ day of ______________ 191__

Witness: ______________ Signed ______________

FILE WITH COUNTY RECORDER

FORM SHOWING CORRECT WAY OF FILING NOTICE OF INTENTION TO HOLD CLAIM

Public Resolution No. 12, 65th Congress

Joint resolutions to suspend the requirements of annual assessment work on mining claims during the years 1917 and 1918.

Resolved by the Senate and House of Representatives of the United States of America, in Congress assembled, that in order that labor may be most effectively used in raising and producing those things needed in the prosecution of the present war with Germany, that the provision of Section 2324 of the Revised Statutes of the United States which require on each mining claim located, and until a patent has been issued therefor, not less than $100 worth of labor to be performed or improvements to be made during each year, be and the same is hereby suspended during the years 1917 and 1918: Provided, that every claimant of any such mining claim in order to obtain the benefits of this resolution shall file, or cause to be filed, in the office where the location notice or certificate is recorded, on or before Dec. 31, of each of the years 1917 and 1918, a notice of his desire to hold said mining claim under this resolution: Provided further, that this resolution shall not apply to oil placer locations or claims.

This resolution shall not be deemed to amend or repeal the public resolution entitled "Joint resolution to relieve the owners of mining claims who have been mustered into the military or naval service of the United States as officers or enlisted men from performing assessment work during the term of such service," approved July 17, 1917.

Approved Oct. 5, 1917.

It is important that claimholders should take notice that they must record their intention to hold, precisely the same as though they were recording their assessment work. For the benefit of Arizona claimholders, the Arizona State Bureau of Mines has issued a blank form especially for this purpose, which may be obtained by writing directly to the Bureau. A reproduction is given in an accompanying illustration.

The use of this blank form is not mandatory but it will obviate the numerous mistakes and consequent delays that are inevitable if claimholders attempt to signify their desire to hold their claims without knowing exactly how to proceed. Such notice should be sent to the county recorder of the county in which the claims are situated.

Manufacture of Ferrochromium[*]

The work of Faraday, Stodarts and Berthier gave to the arts ferrochrome, or ferrochromium, of which more is now made in the electric furnace than any other ferroalloy except ferrosilicon. Berthier found that the addition of ferrochromium with 17% chromium to steel, so as to give 1½% chromium in the steel, gave a better quality product. Ferrochrome was produced commercially in Germany in 1873, and in England and France in 1877. Until the introduction of the electric furnace in 1899, ferrochrome was made entirely either in crucibles or the blast furnace. The crucible was used only for making the higher grades, and in this the chromite was reduced with charcoal, and a flux of lime, borax, fluorspar or water glass. Reduction of chromite in the blast furnace is somewhat difficult and requires considerable fuel. Little ferrochrome is made now by crucible or blast furnace, as the electric furnace is cheaper, especially where water power is obtainable. A small amount of carbon-free ferrochrome is made by the thermit process.

For making ferrochromium, foreign manufacturers use only chromite containing less than 1% of phosphorus and sulphur and about 50% Cr_3O_2, while high-grade anthracite is generally employed as a reducing agent. American manufacturers make use of a lime slag, and may employ coke or charcoal as the reducing agent instead of anthracite. Some also use Cuban ore, which contains considerable phosphorus and sulphur. Several types of electric furnace may be used, but all are constructed on the principle of the Sieman's crucible with a conducting hearth, or are similar to the Héroult steel furnace with vertical electrodes in series.

The charge, consisting of powdered chromite and, say, anthracite, is piled into the open top of the furnace, around the electrodes, while the molten charge is tapped into pots, where the slag and metal separate. Ferrochrome containing as low as 5% carbon can be made economically, while the slags run 0.5-1% Cr_2O_3. High-carbon ferrochrome is refined in an arc furnace, the alloy being subjected to long heating with a slag of chromite, lime and fluorspar, the proportions being adjusted to the amount of carbon and silica to be removed, and the silica that must be fluxed in the chromite used. This slag covers the ferrochrome, and the time of heating depends on the carbon in the alloy. The resulting slag contains about 25% Cr_2O_3, and is used over again, thereby avoiding loss of chromium. With this process the carbon can be reduced from 10 to 0.25%, but 0.5% is usually low enough.

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[*] Excerpt from an article, "Chromium—Its Ores and Uses," by Heinrich Ries, in "Mineral Foote-Notes," of Foote Mineral Co.

Ferrochromium is extensively used in the manufacture of steel for armor plates, armor-piercing projectiles, automobiles, high-speed tool steel, etc. The alloy as such is not used directly, but is added to the steel, giving an alloy steel. Simple chromium steel was one of the first alloy steels to be made, and has been much used in safes, but it is of more importance now when associated with other metals, as nickel or vanadium. Indeed, there is sharp competition now between chrome-nickel steel and chrome-vanadium steel, the two alloys exerting similar beneficial effects on the hardness and toughness of the steel. The distinguishing feature of chrome steels is their great hardness. They usually contain 1-2% Cr and 0.8-2% C. Armor plate has about 3.25% Ni, 1.5% Cr, and 0.25% C. The quantity of carbon in ferrochromes for several different purposes is about as follows: For tool steels and high-speed steels, less than 2%; for general open hearth casting, 4-6%; for armor plate and projectiles, 8-9 per cent.

Metal Exports Under Licensing System in September, 1917

WASHINGTON CORRESPONDENCE

Unusual interest attaches to exports in September, 1917, because this was the first entire month following the inauguration of the licensing system for which it was possible to compile export statistics. In many cases no exportations whatever were made to European neutrals, and exports of metals to Latin America and to Japan showed a marked decrease. On the other hand, there were important increases in the quantities shipped to countries associated with the United States in the war.

In September, 2,017,838 lb. of unrefined copper was exported. This is a marked increase over September, 1916, when only 457,308 lb. was sent abroad. The amount of refined copper exported decreased notably. It was 60,601,803 lb., as compared with 65,265,153 lb. in September, 1916. In the months for which comparisons are presented, the copper exports to France increased from 23,854,325 to 37,584,619 lb. Exports to the United Kingdom showed a decrease from 14,873,682 lb. in September, 1916, to 7,221,518 lb. in September, 1917, and those to Italy decreased from 13,492,878 to 9,871,457 pounds.

The cutting off of practically all exports of lead to neutrals and the sharp decline in the amount sent to Russia are mainly responsible for much lower figures for this metal in September, 1917, than in September, 1916. In September, 1916, 32,710,557 lb. of lead was exported, whereas the total for September of this year was 8,899,719 lb. The exports to Russia in September, 1916, were 20,065,462 lb. against a total of 4,537,567 lb. in the same month of 1917. Another feature of lead exports was the fact that not a single pound was cleared for Japan, whereas that country took 1,632,000 lb. in September of 1916.

Despite the fact that there were heavy decreases in exports of spelter to neutrals and to Russia, the total exports of this metal increased decidedly in September, 1917, over the amount exported in the same month, 1916. The figure in September of this year was 52,868,729 lb., as compared with 37,737,249 lb. in September, 1916. The principal increases were in the shipments to the United Kingdom, France and Italy. Exports to the United Kingdom in September this year were 24,725,657 lb. as compared with 15,359,454 lb. in September, 1916. Exports to France in September of this year were 16,467,576 lb. as compared with 11,351,944 lb. in the same month of 1916. The exports of spelter to Italy increased from 2,812,202 lb. in September, 1916, to 7,137,059 lb. in September, 1917. Total exports of spelter for the first nine months of the current year were 327,690,984 lb. During the corresponding nine months of 1916, they were 259,483,661 pounds.

There was no important change in the amount of sulphuric acid exported. During September, 1917, the total was 1,257,985 lb., against 1,236,702 lb. in September, 1916. Sulphur exports fell from 19,424 tons to 10,052 tons. It is interesting to note in the September customs report that the United States is becoming a regular exporter of superphosphates. Regular shipments have been made for several months. In September, 1917, 4093 tons was exported.

While imports of manganese ore decreased from 73,536 tons in September, 1916, to 36,755 tons in September, 1917, the total imports for the first nine months of the current year are nevertheless greater than those for the corresponding portion of 1916. During the 1917 period, 494,633 tons of manganese ore was imported, against 469,222 tons in the same months of 1916. The imports from Brazil decreased from 55,360 tons in September of 1916 to 26,472 tons in September of this year.

Pyrites importations during the first nine months of 1917 were 691,560 tons, against 1,011,702 tons during the same months of 1916, a decided decrease. During September, 1916, and September, 1917, imports were 95,333 tons and 80,844 tons respectively. Due largely to increased amounts received from Mexico, lead imports during September, 1917, reached a total of 11,417,875 lb., as compared with 4,639,312 lb. in September, 1916. Chile, which in September, 1916, sent 1,289,920 lb. of lead to the United States, exported none at all to this country in September, 1917.

Zinc imports for the first nine months of the current year were 128,054,141 lb., which is a decided decrease from the record of the corresponding months of 1916, when 243,541,390 lb. was imported. During September of this year they were 7,888,290 lb., and in the same month of last year 9,919,070 pounds.

International Ore Co., of Saltillo, Coahuila, Mex., is constructing a zinc smeltery, comprising 600 retorts, according to the Boletin Financiero y Minero de Mexico of Oct. 10 The furnaces will burn crude petroleum.

NEW PUBLICATIONS

A Report on the Bauxite and Fullers Earth of the Coastal Plain of Georgia. By H. K. Shearer. Pp. 340; illus. Bull. 31, Geological Survey of Georgia, Atlanta.

Report of Proceedings of the American Mining Congress, Chicago, Ill., Nov. 13-16, 1916. Pp. 642; illustrated. American Mining Congress, Washington, D. C.

Contains, besides business reports, etc., a large collection of technical and semi-technical papers.

Advanced First-Aid Instructions for Miners, a Report on Standardization. By G. H. Halberstadt, A. F. Knoefel, W. A. Lynott, W. S. Rountree and M. J. Shields. 4½ x 5¾, pp. 154; illus. U. S. Bureau of Mines, Washington.

A useful book in simple language, the nature of which is well described by the title.

Mining Rights on the Public Domain: Lode and Placer Claims, Tunnels, Mill Sites and Water Rights, Statutes and Decisions, Forms and Procedure on Patent Applications. By R. S. Morrison and Emilio D. De Soto. 15th Edition. 5 x 8, pp. 771. Bender-Moss Co., San Francisco.

This is a new edition of a standard book of which the usefulness has been thoroughly proved.

A Microscopic Study of the Silver Ores and Their Associated Minerals. A dissertation submitted to the Department of Geology and Mining and to the Committee on Graduate Study of the Leland Stanford Junior University in Partial Fulfilment of the Requirements for the Degree of Doctor of Philosophy. By F. N. Guild. Pp. 57, illus. Reprinted from Economic Geology, Vol. XII, No. 4, June, 1917. Economic Geology Publishing Co., Lancaster, Penn.

The American Fertilizer Handbook, the Standard Reference Book and Directory of the Commercial Fertilizer Industry and Allied Trades. 7½ x 10½, pp. 436; illus. $1. Ware Bros. Co., Philadelphia, Penn.

Contains special articles and statistics of interest to the fertilizer trade on such subjects as potash, phosphates, pyrites, sulphur, etc.; directory of fertilizer manufacturers of the United States; classified directory of the allied fertilizer trades.

Compressed Air Practice in Mining. By David Penman. 5 x 7½, pp. 221; illus. Charles Griffin & Co., Ltd., London; J. B. Lippincott Co., Philadelphia.

A complete treatise on the subject, aimed to give a thorough understanding of the principles underlying the generation and use of compressed air in mining. Should be of value to the student as well as to those engaged in practical mining.

Sandstone Quarrying in the United States. By Oliver Bowles. Pp. 143; illustrated. Bulletin 124, U. S. Bureau of Mines, Washington.

An exhaustive treatise on grades of sandstones in the United States, their uses, methods of quarrying and the machinery used in quarrying, conveying and finishing for the market. Contains tables of distribution, value, etc. Number of men employed in industry, accidents and fatalities and their principal causes.

Military Preparedness and the Engineer; a Handbook for the Civilian Engineer. Second edition. By Ernest F. Robinson. 4 x 6½, pp. 361; illus. $2. Clark Book Co., New York, N. Y.

Another case of "second edition revised and enlarged" to which much material has been added describing engineering on the European battlefields with particular reference to wire entanglements and consolidation of mine craters. An interesting book either for civilian engineers or anyone contemplating service with the colors.

American Society for Testing Materials. I, Membership List, List of Standards, etc.; 6 x 9; pp. 252. II, Standards Adopted in 1917; 6 x 9; pp. 44. Edited by the Secretary-Treasurer and published by the society, Philadelphia, 1917.

No. I is the regular annual report of the society, containing lists of members and officers, bylaws and a condensed statement of the various standards which have been adopted up to date. This gives data by which the full account of any standard test can be obtained. No. II contains a full account of four standards proposed at the annual meeting of this year and since approved by letter-ballot of the members. All the new standards relate to the testing of paints and varnishes. The society continues to grow, and on Aug. 1, 1917, had 2193 members. The International Association for Testing Materials, with which it is affiliated, has been prevented by the war from holding any meetings since 1913, and its activities are practically suspended.

Report on Mining Operations in the Province of Quebec, 1916. Theo. C. Denis, Superintendent of Mines. 7 x 9½. pp. 172, with maps and illustrations. Department of Colonization, Mines and Fisheries, Quebec, 1917.

The total value of the mineral products of the Province of Quebec in 1916 was $13,287,024 and 8063 men were employed. As compared with the previous year, there was a substantial increase in mine production, but a decrease in clay products and building materials, due mainly to the disorganization resulting from the war. The report is an unusually careful and complete statement of conditions in the various branches of the mining industry, of which asbestos, copper, magnesite and chrome ore are the more important. It is illustrated by a number of reproductions of photographs. Appended to the report is an interesting paper by J. A. Bancroft, of the Canadian Survey, on the geology and mineral resources of the district along the National Transcontinental Railway from Harvey Junction to Doncet and the Canadian Northern from St. Thecle to Rivière-à-Pierre.

Report of the Committee on Petroleum, California State Council of Defense. Max Thelen, Eliot Blackwelder and D. M. Folsom, Committee. 6 x 9, pp. 192, with maps and diagrams. California State Printing Office, Sacramento, 1917.

This excellent report contains a great mass of information about the California petroleum fields—their history, location and conditions. After a chapter devoted to the general subject of petroleum, it goes into a description of the various oil districts of the state, their situation, extent and statistics. Transportation facilities are fully described and mapped out. There are chapters on the uses of California oil, its refining and adaptation to use as fuel, and its marked effect on the manufacturing and fuel situation on the Pacific Coast. The concluding chapters relate to probable future production and the best methods of conserving and increasing the supply. The committee is evidently of the opinion that too much of the California oil is used as fuel and considers in its report how and with what substitutes some of it can be replaced without curtailing industry. The report is illustrated with a number of maps, diagrams and sketches which add much to its clearness and value.

Summary Report of the Geological Survey, Department of Mines for the Year 1916. Pp. 419, illus. Canadian Department of Mines, Ottawa.

The 1916 report is of particular interest because of the search for new minerals demanded by war requirements and the incidental stimulus given to other mining explorations. Molybdenite deposits near Quyon, Que., are reported on by Charles Camsell, and those of the Lillooet district in British Columbia by C. W. Drysdale. The tungsten deposit at Burnt Hill, New Brunswick, and the scheelite mine in Halifax County, Nova Scotia, were also reported on by Mr. Camsell. D. D. Cairnes reported wolframite in the gold placers of Canadian Creek, Yukon Territory, in the Klotassin area. Magnesite deposits of the Grenville district, Quebec, were investigated by M. E. Wilson; A. O. Hayes described the deposit at Orangedale, Nova Scotia, and the Bridge River magnesite deposits in British Columbia are reviewed. It is impracticable to give a complete list of the mineral deposits covered in the present volume, but on account of the special interest in the Manitoba region it is worth while to mention that E. L. Bruce has reported on the copper areas at Flinflon and Schist Lakes; also that J. A. Dresser has described the country east of Lake Winnipeg, including the gold areas of Rice Lake and Gold Lake.

Personals

J. B. Tyrrell, of Toronto, Canada, sailed from New York on Nov. 14 for England.

J. D. Hubbard is now general superintendent for the Holden Mining and Milling Co. at Tuscarora, Nevada.

Edward Ervin has been appointed superintendent of the Gold Pan mine in the Rice Lake district of Manitoba.

W. G. Anderson has resigned the management of the Ore Chimney Mining Co., Ltd., at Northbrook, Ont., Canada.

D. B. Dowling, of the Canadian Geological Survey, is at Peace River, making an examination of the well of the Peace River Oil Company.

L. D. Cooper, chief engineer of E. J Longyear Co. of Minneapolis, Minn., passed through New York recently en route to the Birmingham, Ala., district.

Charles Chynoweth, of Houghton, Mich., secretary of the Wolverine & Arizona Mining Co., has gone to Bisbee, Ariz., to attend the fourteenth annual meeting of the company.

W. C. Webster, secretary, general manager and director of the Nichols Copper Co., 25 Broad St., New York, has resigned. Mr. Webster expects to take a rest before assuming further duties.

H. S. Buck, manager of the Fort Smith Spelter Co., Fort Smith, Ark., will become general manager of the plant soon to be established at Greencastle, Ind., by the newly organized American Zinc Products Company.

Lee L. Wilcox, chief engineer for the Republic Iron and Steel Co., has just completed some work at the company's Hartford group mines, at Negaunee, Mich., and returned to his headquarters at Gilbert, Minnesota.

L. E. Dunham, who has been connected with the iron-ore department of M. A. Hanna & Co., Cleveland, for a number of years, has been appointed director of purchases for the various interests of which the firm is agent.

D. A. Angus of the Right-of-Way mine, Cobalt, Ont., has been appointed manager of the Tough Oakes mine at Kirkland Lake, Ont., in place of **Charles O'Connell**, who becomes manager of the Boston Hollinger mine, Boston Creek.

George R. Jackson, superintendent of the Maas and Negaunee mines of the Cleveland-Cliffs Iron Co., and master mechanic **O. D. McClure** are at White Sulphur Springs, Va., on business for the company.

John G. Worth, a well-known mining engineer, is a captain in the U. S. Army and is commanding officer of the Auxiliary Remount Depot at Macon, Ga. Captain Worth is getting ready to begin shipping the 10,000 animals that are to come to his station immediately.

Horace B. Patton, for 24 years professor of geology and mineralogy at the Colorado School of Mines, has opened an office at 817 Fifteenth St., Golden, Colo., as consulting and field geologist. He will give special attention to oil and gas and metalliferous deposits.

Benedict Crowell, a well-known mining engineer, has been appointed Assistant Secretary of War to succeed William M. Ingraham Mr. Crowell is an engineer by profession and has been in Washington for some time in an advisory capacity to the General Munitions Board. Some months ago he was commissioned a major in the Engineer Corps and placed in charge of the Washington office of the Panama Canal. He will resign his commission to accept the new appointment

Elmer LeC. Goldsmith, John W Lewis, Edward J Francis, Elmo N. Murphy, Carl R French, William D Lewis, and Charles H Moore, all second lieutenants in the Engineer Officers' Reserve Corps, have been relieved from duty at the engineer training camp Fort Leavenworth, Kan., and ordered to report by letter to the Director, U S Geological Survey, for assignment to duty connected with military mapping. Charles M Madden, Edward H Stelle, Frederic E Smith, Edward P. Asbury, George H. Davidson, Frederick W Look, Gordon D Cooke, Joseph W Geary, Jr., and Walter K Wood, all second lieutenants in the Engineer Officers' Reserve Corps, have been relieved from duty at the engineer training camp at American University, D. C., and with Sec Lieut. Herman J. Switzer, E O R C have likewise been ordered to report by letter to the director, U. S. Geological Survey, for assignment to duty connected with military mapping.

Obituary

Lieut. A. T. Skill was killed in action in France on Oct. 26. He was 35 years of age and previous to his enlistment was mining recorder at Elk Lake, in northern Ontario.

Marks Lissberger, a pioneer in the white metal business of the United States, died after a long illness on Nov. 9. He was born in Germany and came to New York in 1844. He founded the firm of Marks Lissberger & Son.

Schuyler Livingston Parsons died suddenly in New York, Nov. 4. He was born and brought up in New York and had been for many years engaged in the trade in sulphur, nitrates and other heavy chemicals. He was head of the well known firm of Parsons & Petit, dealers and importers, and agents in the United States for the Italian Consorzio Obbligato, which controls the production and exports of Sicilian sulphur.

Lieut. Col. Thomas C. Irving, of Toronto, Ont., commander of the 4th Divisional Engineers overseas, was recently killed in France. He was an engineer by profession and a graduate of McGill University. He was formerly associated with F. H. Clergue in the development of the group of industries at Sault Ste. Marie, now owned by the Lake Superior Corporation, and was specially identified with the Helen iron mine and the construction of the Algoma Central Ry. Latterly he was vice president of Robert W. Hunt & Co., Ltd., inspecting engineers of Toronto. He was made a lieutenant-colonel in the fall of 1916 and received the Distinguished Service Order. He was 38 years of age.

Societies

New York Section of the Mining and Metallurgical Society of America will hold its next meeting on the evening of Nov. 22 at the Columbia Club. The guests of the evening will be Major O. B. Perry and Major Rousseau. Major Perry will talk on the subject of "Trench Methods."

Engineers' Club and New York Electrical Society will hold a joint meeting at the Engineering Societies' Building, 29 West 39th St., New York, on Nov. 15, at 8 p.m. Lieut.-Col. Ivor Thord-Gray, late commanding 11th Northumberland Fusiliers, B. E. F., will give a short informal talk on "Some Phases of Trench Warfare," illustrated by British and French official pictures. An address will also be given by Capt. P. Corcoran, late commanding 37th Divisional Signal Co., B. E. F., on "Electrical Communication in Modern Warfare."

United Engineering Society entertained the members of the British Labor Commission now in this country at a dinner given on Nov 13 in New York at Delmonico's. The commissioners present were Sir Stephenson Kent, director-general of the labor-supply department; G. H Garrod, deputy assistant secretary of the labor-regulation department; G. H. Baillie, chief technical dilution officer of labor-supply department; and Capt Cyril Asquith, director of artificer's allocation of labor-supply department. Col. C. C. Carty acted as toastmaster In their addresses, the commissioners described the British munitions-workers volunteer system, explaining in particular the regulations forbidding the enticement of labor away from one employer by another. Contrary to the prevalent impression in this country, industrial conscription does not exist in England though the Defence-of-the-Realm Act and the authority of the Ministry of Munitions give almost equivalent power in case the voluntary system becomes unsatisfactory. The extraordinary part that women have taken in industry since the war and their aptitude in the lighter work of the engineering plants was interestingly reviewed by Mr Baillie

Industrial News

Wellman-Seaver-Morgan Co., Cleveland, Ohio, has established an office at Seattle, Wash., which has been put in charge of Glenville A Collins Mr Collins' office is at 1317-18 L C Smith Building

A. Leschen & Sons Wire Rope Co., St Louis, Mo, has opened a new office and headquarters building adjoining its plant at St. Louis at a cost of $140,000 Included in the three-story fire-proof structure are provisions for the general offices, also dining, rest and shower rooms for employees, while, adjoining the building, arrangements have been made for a tennis court and golf course.

Davis-Bournonville Co., with general offices and factory at Jersey City, N. J., has taken over the entire plant of the Davis Acetylene Co., at Elkhart, Ind. The latter company has been dissolved and the manufacture of acetylene-lighting generators and accessories discontinued. The plant will hereafter be operated under management from Jersey City for the manufacture of acetylene pressure generators for the oxy-acetylene process, and for special products. The Canadian factory at Niagara Falls, Ont., which has been jointly occupied by the two companies, has also been taken over, and will be operated exclusively for making oxy-acetylene apparatus for the Canadian trade. The Davis-Bournonville Co. has also made additions to its Jersey City plant. It has recently opened a Government sales office in the Colorado Bldg., Washington, D. C., with Henry R. Swartley, Jr., resident manager.

New Patents

United States patent specifications listed below may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

Chlorination—Apparatus for the Chlorination of Minerals. Ricardo Reyes, Mexico, Mexico. (U. S. No. 1,243,977; Oct. 23, 1917.)

Concentrator. William A. Huelsdonk, Modesto, Calif. (U. S. No. 1,244,611; Oct. 30, 1917.)

Continuous Zinc-Smeltery. Woolsey McA. Johnson, Hartford, Conn. (U. S. No. 1,244,504; Oct. 30, 1917.)

Copper—Process for the Treatment of Copper Ores. George Cutler Westby, Ludwig, Nev., assignor to Western Process Co. (U. S. No. 1,244,810; Oct. 30, 1917.)

Drilling—Pitman for Drilling Machines. William C. Sole, Sullivan, Ind. (U. S. No. 1,245,051; Oct. 30, 1917.)

Drilling Machine. Dane Spehar, Miami, Ariz. (U. S. No. 1,244,385; Oct. 23, 1917.)

Dump Cars—Door Lock for Dump Cars. August Anderson, Chicago, Ill., assignor to American Car and Foundry Co., St. Louis, Mo. (U. S. No. 1,244,684; Oct. 30, 1917.)

Furnace Shield. Walter S. Rockwell, New York, N. Y., assignor to W. S. Rockwell Co., New York, N. Y. (U. S. No. 1,245,030; Oct. 30, 1917.)

Loading Excavator. Thomas F. Moore, Syracuse, N. Y., assignor to Moore Trench Machine Co., Syracuse, N. Y. (U. S. No. 1,245,118; Oct. 30, 1917.)

Mine Car—Interlocked Mine-Car Wheel and Journal Box Warren V. Johnson, Bloomsburg, Penn., assignor to American Car and Foundry Co., St. Louis, Mo. (U. S. No. 1,244,739; Oct. 30, 1917.)

Mine-Car Assembly. Warren V. Johnson, Bloomsburg, Penn., and Frederick H. Gibbs, Brooklyn, N Y., assignors to American Car and Foundry Co., St. Louis, Mo. (U. S. No. 1,244,740; Oct. 30, 1917.)

Mine-Car Wheel and Attaching Means Therefor Frederick H. Gibbs, Brooklyn, N. Y., assignor to American Car and Foundry Co., New York, N. Y. (U. S. No. 1,245,142; Oct. 30, 1917.)

Nitrogen—Process for Forming Nitrogen Compounds Using Manganese and Carbonaceous Material. Leland L. Summers, Chicago, Ill. (U. S. No. 1,212,264; Oct. 9, 1917.)

Ore Treatment—Process for the Treatment of Ores George Cutler Westby, Ludwig, Nev., assignor to Western Process Co. (U. S. No 1,244,811; Oct. 30, 1917.)

Pneumatic Tool. Mather W. Sherwood, Franklin, Penn., assignor to Chicago Pneumatic Tool Co., Chicago, Ill. (U. S. No. 1,243,770; Oct. 23, 1917.)

Producing Ammonia. Carl Bosch and Alwin Mittasch, Ludwigshafen-on-the-Rhine, Germany, assignors to Badische Aniline and Soda Fabrik, Ludwigshafen-on-the-Rhine, Germany. (U. S. No 1,244,680; Oct 30, 1917.)

Steel-Heating Furnace. William R. Bennett, Elmwood, Conn (U. S. No. 1,244,578; Oct. 30, 1917.)

Zinc—Recovery of Metals from Ores and the Like Charles S. Vadner, Butte, Mont. (U. S. No 1,245,137; Oct. 30, 1917.)

Editorial Correspondence

SAN FRANCISCO—Nov. 10

Soapstone Deposit at Sutter Creek is being developed and a considerable tonnage is ready for extraction. Soapstone is found in shists near Sutter Creek and Jackson, but has never been mined commercially to any extent. It also occurs in 26 other counties in the state, extending from the extreme north to the extreme south. It has been developed in most of these counties, but commercially only in a few and that for local use in the construction of firebacks and furnace linings.

Comstock North-End Mines in the last week of October made good progress in development, repairs and extensions of drifts and produced medium-grade ore in the Union and Ophir. In one crosscut on the 2400-ft. level of the Union, the vein was opened for 31 ft. and yielded 81 tons of ore, assaying $20.83. In another direction, same crosscut was driven 44 ft., yieldng 96 tons, assaying $27.28; and another crosscut yielded 100 tons, assaying $26.98 per ton. The Union milled a total of 285 tons in the last week, averaging $22.23 and 146 tons averaging $6.75 per ton. Ophir extracted from 2100-ft. level, 144 ons assaying $16.51 and 5 tons averaging $8.15. Andes saved 30 cars of low-grade ore. Jacket, in South-End or Gold Hill district, saved 76 cars of low-grade ore from surface tunnel. Hardinge mill and concentrating tables operated 40 hours durng the week; old cyanide plant in operaion; new equipment being completed; seventy tons of mine ore were put in mill bins for the present.

Platinum in Siskiyou County has just been investigated by L. M. Prindle and H. C. Ferguson, U. S. Geological Survey, and C. A. Logan of the State Mining Bureau. n the last three months practically every hydraulic district has been visited. Logan overed the ground from Crescent City, Del Norte County to Yreka, via Weitchpec, Oreans, Somes Bar, Forks of Salmon and hen went into the Salmon River country. Prindle and Ferguson have completed a urvey of the Klamath River mines from Happy Camp to Hamburg Bar. It has been ound that until within the last two years ractically no attention has been given the latinum resources in these regions. In many of the hydraulic mines the metal was thrown away because its value was nknown to the miners. But since the onditions brought about by the war have increased the value of the natural alloy of latinum with iridium and osmium, in which he platinum occurs in these regions, and this value is four to five times the value f gold, the miners are waking up to the pportunity. Most of the platinum in the state is of the same character as in Sisiyou and adjoining counties, and much of might more properly be classed as "platiniridium," which in Trinity River region as been found in nuggets of a few ounces weight. Platinum is a constituent of the lack sands of Feather River in Butte ounty, Yuba River in Yuba County, north ork American River in Placer County, Klamath River and other streams in Siskiyou ounty, Trinity River in Trinity County, American River in Sacramento County and n the beach sands in Del Norte, Humboldt, an Luis Obispo, Santa Barbara, Santa ruz, Mendocino and Ventura counties. lso in concentrates from lode mines in he central and eastern parts of the state. he total amount of platinum produced n the state in 1915, reported by the State Mining Bureau, was 667 oz., valued at 21,149. This came from eight counties, s follows: Sacramento, 196 oz.; Butte, 26; Yuba, 132; Trinity, 13; Calaveras, Merced, Plumas and Stanislaus, combined, 00 oz. The total in 1914, as reported by he Geological Survey, was 463 oz., valued t approximately $32 per oz., or about the ame as in 1915.

BUTTE—Nov. 10

Strike Bulletins, containing statements ttacking the mining companies, and calcuated to curtail the production of copper, ave caused the indictment on four counts f disloyalty to the United States Government, of George Tompkins, a member of he Metal Mine Workers' Union. He was rraigned Nov. 3 before Judge Bourquin. he indictment charges him with conveying alse reports and false statements to defeat the success of war operations of the United States and to aid the enemy. The "strike bulletins" were freely circulated among Butte miners and were traced to him. They formed the principal base for indictment. Tompkins was ordered to enter a plea to the indictment within a few days.

Price of Coal, for prepared sizes, has been increased from 10 to 20%, as a result of Federal and state control, which is exactly the opposite effect the public had hoped for. Much dissatisfaction is expressed with the seemingly unwarranted procedure of Federal Fuel Administrator Garfield in authorizing an increase of 65c. a ton for prepared sizes, thus advancing the price to $3.60 from $2.95, the price fixed Aug. 21 on Montana coal; all without consulting either the Governor or other officials of the state and all to the advantage of producers, but to the great detriment of the consumer. When this increase was announced, Governor Stewart wired the Federal Administator, protesting against the authorization of the increase, first, because he was not consulted in the matter and second, because the increase did not seem warranted by the cost of production as known to the state authorities, but unknown to the Federal administration, which did not itself make any investigation in the field. The only satisfaction received so far, in reply to the Governor's protest, is the assurance that in the future prices would not be changed without the consent of the state authorities; that an investigation would be made in the field as soon as possible and that prices might be reduced if such investigation should reveal facts to warrant such action; that the authorized raise was only temporary, pending the results of the promised investigation, and was intended to prevent a shortage of production at a critical period. In the meantime the damage has been done. Operators and representatives of the United Mine Workers' Union have been in session for several days at Great Falls, and have agreed on a material increase in the wage scale of the miners on the strength of the authorized increase of the price of coal to the operators. In the face of previous experiences, the general public does not entertain any hopes that a reduction of wages and prices, following an investigation, would be countenanced by either laborers or operators and has resigned itself to pay the bill. Whether it will do so gracefully should retail prices continue to soar as they have recently, in spite of promises of relief by the legal authorities, remains to be seen.

DENVER—Nov. 10

Colorado School of Mines affairs are again receiving a public airing as the result of an opinion rendered by Attorney General Leslie E. Hubbard, strongly recommending a full hearing of charges made by the Alumni association against Victor C. Alderson, president of the institution, and three of the trustees, A. E. Carlton, Harry M. Rubey and James T. Smith.

Mine Gas has from time to time given considerable trouble in some of the well-known metal mines of Colorado. For several years, the sinking operations and development in the bottom level of the Blue Bird mine, in Cripple Creek district, were hampered by gas. In this property, relief was sometimes obtained by laying a water pipe in the drift and spraying water at points where the gas appeared to collect. Less trouble was experienced in the bottom of the shaft, so long as the bottom was just within the water level of the district. This gas appeared to produce a choking sensation but did not seem to be poisonous. In another mine in the Cripple Creek district, the Wild Horse, the mine gases seem to give trouble under low barometric conditions. The effect of the gas is being combated by setting bulkheads at every level of the main shaft, so that the miners can work under a slight air pressure sufficient to keep the gas out of the workings.

LEADVILLE—Nov. 10

Shortage of Railroad Cars at the mines, in Leadville district, recently resulted in greatly reducing production and placing a large number of men out of employment. Normally, the combined output from the mines is 61,000 tons a month. During October, this total was reduced to 40,000 tons, but the shortage is now nearly overcome. The D. and R. G. handles fully 90% of the output of the district, and the fact that it is now necessary to furnish standard-gage cars to the hill mines makes the situation that much more difficult. At the large mines closer in, no men were laid off although the output was reduced. These companies undertook development to keep the men at work, while there was a lack of cars. Among these companies are the Iron Silver, Western, and Down Town Mines Co. Manganese producers, believing that the Government would soon demand the shipment of their ores, continued to break ore at the usual rate. The Cramer Leases, Grey Eagle, Bohen, and Nisi Prius, have a combined output of 500 tons daily under normal conditions.

SALT LAKE CITY—Nov. 9

New Power Line is being built by the Utah Power and Light Co., from the Cardiff mine, along the south fork of Big Cottonwood Canyon, and up over the divide near the West Toledo and Columbus-Rexall into Alta. This is nearly completed and will connect with the power line of the Wasatch Mines Co. by the first week in November. The power plant of the Wasatch Mines Co., in Little Cottonwood, has been giving good service, but in cold weather the flow of water in the canyon is sometimes reduced so low, that it is not possible to furnish power to all of the mines. When the new line has been connected, it will do away with difficulties in cold weather, and insure abundant power at all seasons.

JOPLIN—Nov. 10

Organization of Mine Operators for the Oklahoma section of this district has been virtually accomplished. At a complimentary luncheon given by the Admiralty Zinc Co. on Nov. 6, over 40 operators, representing most of the large companies in the field, agreed that an organization was needed, and elected A. E. Bendelari, manager of mines for the Eagle-Picher Lead Co. in this district, as permanent chairman, with authority to appoint finance and membership committees to complete the organization. It is planned to raise $25,000 and build a club house on the top of what is known as Blue Mound, in Kansas, just across the state line, north of Picher. It will be a safety and sanitation association, such as has existed successfully at Webb City, Mo., for two years, and the primary purpose will be to improve conditions in the new field. A membership of 500 will be attempted.

Water at Admiralty Zinc Co.'s mines, at Douthat, Okla., will be handled by a method used with success elsewhere and introduced into this district by O. F. Brinton, manager. The mines are near two creeks, and the beds of each of these small streams have been gone over and all crevices and holes that seemed to lead underground have been caulked with a mixture of concrete and clay. This has been done on each stream for several hundred yards near the mines. Also all drill holes and other openings in sinks or depressions near the mines have been stopped with the same mixture. Damming was not necessary in the creeks, but the water was diverted to one side and half the bed fixed at a time. As a result of this work, the water problem is nearer solved at the Admiralty properties than at any time since work was begun. At the No. 4 mill, just completed, there is only sufficient water to use in the mill, although operations will be conducted at 220 ft. Several 10-in. centrifugal pumps were used for months at the Admiralty, but it was only after the plan above described was put into effect that real headway against the water was accomplished. It is the belief of Manager Brinton that they were pumping the same water over and over before stopping the "surface leaks."

SPOKANE, WASH.—Nov. 9

Unfairness of Federal Tax Law, in basing the amount of taxes to be paid on the capitalization was discussed at a meeting held here. A large number of mining men and their lawyers from eastern Washington, northern Idaho and western Montana were present and the views expressed were so widely divergent that anything like concerted action was out of the question. It was finally agreed to seek more light from the Federal authorities. It was shown that unfair charges would be imposed if taxation was based on capitalization as some properties of equal value were capitalized differently. Comfort was taken from a statement in the law which permits the exercise of discretion by treasury officials. It was held that the Government would act fairly if informed of the conditions, but it was urged that pains be taken to supply the information. An illustration of the inequality of the proposed tax was shown by a comparison of the American Smelting and Refining Co. and the Hecla Mining Co. The smelting company with a capitalization of $117,000,000 and an income of $29,000,000, would be taxed only $2,600,000, or 9.01%, while the Hecla company with a capitalization of $250,000 and a net income of $2,000,000 would be compelled to pay 52.5%. The burden is made heavier at this time by the new low levels for lead, the high cost of supplies and machinery and the higher rate of wages, it is held. The tax will be greater than many mines can stand and greater than Congress intended they should stand, it is believed. "For my part I would be willing to give the mine to win the war," said Roy Young, manager of the Electric Point Mining Co., of Northport, Wash. "But I see no fairness in a plan of war taxation that takes a large part of the earnings of one mine and a small part of another. I have no doubt but that there will be a satisfactory adjustment when a clearer understanding of the situation is given the national heads."

HOUGHTON, MICH.—Nov. 10

Mining Costs of 1917 will be higher for Lake companies than at any time within the last 30 years. Omitting all consideration of the higher wages, the highest in the history of the district, the cost of supplies has advanced to a startling extent. Coal is costing the average independent producer 90% more than last year, and then it was higher than it had been for 25 years. Powder is up 100%, and the powder companies are making no contracts with the mines, the Government having the first call on the output. Steel rails are up 110% over the prices of a year ago. And the worst feature about steel rails is that the best delivery is three or four months. Carbide ordinarily can be bought for $57 a ton, now it is $115 a ton, and almost impossible to secure even at these high prices. Most of the mines here have purchased carbide from Duluth jobbers. The last carload they had in Duluth got here a week ago. The jobbers tried to buy some in Europe, and found it is selling for $400 a ton in that market. Under the circumstances, any mine manager who keeps his mining costs down to within even a 25% increase of the costs last year, will be accomplishing wonders.

Reworking Stamp Sands will probably be attempted before long at several of the old mill sites in Keweenaw County. It is understood, the Calumet & Hecla Mining Co., which controls the Delaware, is going to retreat the old Delaware sands. Regrinding and leaching processes will be used in this work, although it is probable that eventually the finer sands and slimes will be treated with the flotation process, as well. It is said that the Delaware sands will run close to 6 lb. per ton in copper and that 4 to 5 lb. can be recovered, probably at a cost of under 7c. per lb. It is hardly likely that expensive plants, similar to those in use by the Calumet & Hecla at Torch Lake, will be erected in Keweenaw County. This would mean big initial expenditures as well as costly upkeep, while the sands can be transported to Lake Linden at comparitively low costs. There is possibly half a million tons of the Delaware sands. Then, at the old Allouez Cliff and Central mill sites are hundreds of thousands of tons more, all of which can be handled cheaply. At the Central and the old Allouez mill locations, the sands likely will not run so high in copper as those at the Delaware but it is believed there is sufficient content to make the operations pay. At the Cliff a great deal of rich sand is scattered about. For some time past tributors have been working over some of the old stockpiles at the Cliff and reported to have been taking out considerable copper in nuggets, small masses and coarse copper, the latter from the sands. All through Keweenaw County, at a dozen or more old mine locations, are piles of stamp sands that can be worked over at a profit. The wonder to many mining people of this region is that the work has never been undertaken, for there is no expensive mining to be done. Not until a southern Michigan concern attempted to contract for a quantity of Delaware sand to use in manufacturing shingles for fireproof structures was serious thought given the matter.

DULUTH, MINN.—Nov. 10

Shipments from Lake Superior district of iron ore will show a falling off of about 6,500,000 tons for this season, as compared with the 1916 record of 65,188,648 tons, according to present indications. Besides having a bad start through the late opening of navigation last spring, a number of adverse factors contributed, including: Labor shortage; ruling by National Defense Committee that only sufficient ore to supply requirements of blast-furnace operators until next June should be carried to the Lake Erie docks; lastly, the unusually cold weather of last month has been a serious hindrance to the ore movement. On a number of days during October, the ore became frozen and it was necessary for the cars to be steamed at Proctor and Two Harbors before proceeding to the docks

DEADWOOD, S. D.—Nov. 10

Construction in 1917 in various sections of the state includes: In Lawrence County, the construction by the Homestake company of a second power plant on Spearfish Creek, at Maurice, just above the intake to its present plant. The water will be taken from Little Spearfish Creek and a part from the main creek above Savoy and flumed to the site about eight miles' distant; the pipe installation has been completed and the new unit will be installed soon after the first of the year. The Custer Peak Copper Co. has completed, at its property near Nahant, a concentrator comprising 10 stamps, Harz jig, ball mill and four Wilfley tables; the plant was placed in commission on native copper ore in September. In Pennington County, the Homelode company, near Silver City, installed an amalgamation-concentration plant which has been in operation several months. The equipment consists of a 10-ft. slow-speed Lane mill, plates and concentrating tables. In Meade County, the U. S. Gypsum Co. has erected a modern 100-ton plaster mill at Piedmont. The Dakota Plaster Co. has erected a plaster mill at Black Hawk to replace the one destroyed by fire. The Refinite Co at Ardmore, Fall River County, has completed a plant for the calcining of kaolin, with a capacity of 10,000 lb. of dried product per day. The Spokane Lead and Silver Co at Spokane, Custer County, has completed the foundations for the new concentrator to be erected.

TORONTO—Nov. 8

Tax on Canadian Copper Co., subsidiary of the International Nickel Co., under the retroactive-tax legislation for operations covering the last two years, amounted to $1,366,892. This is the largest check ever received by the Ontario treasury. The tax is based on the market value of the refined product allowing for cost of refining and marketing.

Gold and Silver Discoveries at different places have been reported. A 6-in. vein carrying native silver in Bernhardt Township, a few miles north of Kirkland Lake, is stated to have widened in the test pit. A large pyrite dyke on claims owned by Fred Dwifee and Charles Ross, in Boston Township, is stated to show good gold and silver contents. Silver is reported to have been found in Corkill Township, in the Gowganda mining division, about 15 miles southwest from Elk Lake.

The Mining News

ALASKA

ALASKA UNITED (Treadwell)—Ready Bullion mine produced in September 8015 tons, yielding $18,623; operating expenses, $26,005; operating loss, $7382; construction expense, $3311; net loss, $10,693. The 700 Claim produced no ore, 7.97 tons concentrates being saved from cleanup. Ready Bullion did 589 ft. development on 2200- and 2400-ft levels. Increase in stock of broken ore, 4145 tons.

ARIZONA

Cochise County

SHATTUCK ARIZONA (Bisbee)—Produced in last 10 months, 10,531,089 lb. copper 1,881,956 lb. lead, 134,729 oz silver and 1352.90 oz gold. Production for October amounted to 808,518 lb copper, 41,161 lb lead, 10,251 oz silver and 66 oz gold, comparing with 711,924 lb copper, 41,362 lb lead, 3631 oz silver and 85 oz gold in September

Gila County

INSPIRATION (Miami)—Production for October amounted to 2,100,000 lb against 250,000 lb in September and 11,300,000 lb in October, 1916

Mohave County

GOLD ORE (Goldroad)—Installation of new hoisting equipment completed, shaft sinking under way

UNITED OATMAN (Oatman)—Crosscut just started 600-ft from portal and work on face discontinued

MOSS BACK (Oatman)—Preparations being made to sink shaft to 500-ft. depth. W. H. Holcomb, manager

Pinal County

RAY & GILA VALLEY RAILROAD made application for rehearing of Arizona Hercules Copper Co. case, in which latter seeks to compel the railroad to build spur to company's mine and another to mill at Kelvin. Hearing set for Nov 10.

RAY CONSOLIDATED (Ray)—Production for October amounted to 7,700,000 lb. copper, comparing with 7,413,000 lb. in September, and 7,590,000 lb in October, 1916.

SILVER KING OF ARIZONA (Superior) Unwatered to 250-ft. depth, being retimbered, crosscut being driven on 120-ft. level to cut orebody. Former silver producer. A W Hillebrand, New York, president; W. F Ainsworth, manager

Yavapai County

JEROME VERDE (Jerome)—It is rumored that United Verde Extension exercised an option to purchase 600,000 shares at 60c per share about 30 days ago. Stock, however, has lately suffered a severe decline on New York Curb

ARIZONA NATIONAL MINING (Prescott)—Operating Arizona Lookout mine at Humboldt. Reported in "Journal," Oct 27, under Anderson & Birch, as having recently shipped high-grade lead-silver ore. Has been sending out shipping-grade ore during last two years, milling second-class ore, using flotation. F M Anderson, president; Sidney Birch, vice president

Yuma County

UNITED MINES (Bouse)—Main crosscut on 650-ft level stopped 370 ft. from inclined shaft. Temporary concrete bulkhead put in 240 ft. from shaft to stop water; unable to handle with present equipment. Drifted on fault vein, face 170 ft from crosscut in altered rock containing hematite, quartz and spar. Expect to install another compressor unit to allow continuation of bulkheaded crosscut and drift to the north and crosscut to west to expose granite contact, where surface indications are favorable.

ARKANSAS

Boone County

GLORIA (Zinc)—Holding three car zinc-silicate ore for higher price. Othe operators doing likewise

Marion County

SALINA (Dodd City)—Resumed development

DIXIE (Buffalo)—A. H. Cofer report free and disseminated ore in new tunnel.

GOODLUCK (Rush)—New tunnel i zinc-carbonate ore; 20-ton shipment mad last week. Leased by Householder & Bower

Searcy County

LUCKY DOG (St Joe)—Installing additional machinery

WAKEFIELD (Pindall)—Moore Williams and associates recently purchased 3 acre Wakefield lease, on American Zin

Lead and Smelting Co.'s land; opening carbonate of zinc. Will install hand jigs.

CALIFORNIA

Amador County

EAST EUREKA (Sutter Creek)—Stamp mill and other surface-plant machinery being dismantled and sold; has been idle for long time. Several unsuccessful attempts made in last five years to reopen.

Butte County

CHROME DEPOSIT being operated at Swayne in Feather River Canyon. First car of ore shipped Nov. 3; expect to ship one carload a day. Operated by Norris & Noyes, of San Francisco. Ore is hauled by motor trucks to the Swayne tramway, thence sent to the Western Pacific, and marketed at Niagara. Same operators reported to have optioned manganese mine at Clipper Mills.

BLOOMER HILL (Oroville)—To be reopened by Philadelphia and Seattle men. New flume line under construction. Mill and hydro-electric plant contemplated. Former producer under name of Chambers mine. Reported that $25,000 will be spent to develop ore at depth.

Humboldt County

FOREST FIRES spread from Eureka into Del Norte County; reported that no lives have been lost.

Kern County

BUTTE (Randsburg) — Will continue milling low-grade ore from large dumps, averaging about $6 per ton, instead of extracting new ore.

Nevada County

WASHINGTON ASBESTOS (Washington)—Ten of 20 stamps of Fairview mill dropping on asbestos ore. Reported teams hauling product to Nevada City for rail shipment to Oakland. John D. Hoff, of Oakland, president.

Placer County

CHROME MINING in Forest Hill district still active and some good-sized deposits disclosed; most of deposits are small and scattered, but small cost of extraction and hauling and high price of clean ore make chrome mining profitable.

Plumas County

DROEGE (Greenville)—Main lode prospected near surface for distance of nearly a mile disclosing good ore in depth. On Phoenix claim, vein of sulphide ore proved to 350-ft. depth, by shaft.

Tehama County

TEDOC MINING CO. (Red Bluff)—Contracted with J. B. Lukens to haul chrome ore over 12 mile road from mine to Harrison Gulch road. Lukens using White motor trucks. From Harrison Gulch road to Red Bluff hauled by George A. Shepard over road recently completed by Tedoc company. Expected to get out 2000 tons before winter storms block upper road.

Trinity County

THREE GOLD NUGGETS valued at total of $1555 taken from recent cleanup by Patrick Holland near Coffee Creek on Trinity River, being largest found in county for several years. Several $50 pieces found in cleanup. Run for the season totaled about $1200.

Tuolumne County

DREISAM (Soulsbyville) — High-grade ore from large lode.

CONFIDENCE (Confidence)—Ball mill to be installed.

GOLDEN GATE (Sonora)—Machinery sold to Angels Iron Works; will be hauled to Jamestown for rail shipment to Angels Camp.

MONARCH GRAVEL MINING CO. (Confidence)—Supplemental permit issued to sell 3000 shares at $2; proceeds for development.

San Bernardino County

AFTERTHOUGHT (Ingot)—Dryer will be installed soon, when flotation mill will begin operating. Miners being increased. John T. Milliken, superintendent.

MAMMOTH (Kennett) — More skilled miners working at Stowell, Delta Consolidated, Friday-Lowden. In main Mammoth mine, new ground being opened. Production for October estimated to be 1,590,000 lb. copper.

CLARK MOUNTAIN MINING CORPORATION (Los Angeles)—Authorized to sell 25,000 shares at 50c. Recently optioned Silver King and Silver King No. 2 claims in Clark Mountain district. Agrees to pay Morris Cohen 101,000 shares of stock and one-fifth of smelter returns up to total of $10,000. All shares in escrow pending further action of commissioner of corporations.

CELESTITE DEPOSIT at Ludlow, known as Ward claims, reported optioned by Frank G. Mernard, of New York. Celestite occurs here and in Inyo County with colemanite. Sulphate of strontium is found in California only in Calico and Death Valley regions, according to the State Mining Bureau. Records show the carbonate occurs in Genessee Valley, Plumas County.

ATOLIA-RANDSBURG TUNGSTEN region reported active. "Spud-Patch" situated between these towns producing 20 tons high-grade ore per month. Vinton Durand taking out 20 lb. daily besides fines which are concentrated; James Rice producing ore containing 60 lb. per ton, treated by wet concentration; D. A. Blue and Charles Walton leased Skylark claim in Osdick group, including mill. Round Valley mine producing 12 tons daily. Scheelite strike reported at Holcomb Valley, near Bera Valley dam.

COLORADO

Boulder County

WHITE RAVEN (Ward) — Producing good silver ore.

CATASTROPHE (Boulder) — Is being developed under lease by I. N. Behr. Crosscut from tunnel level opened 10-in. vein of tungsten ore.

UP TO DATE (Boulder) — Recently shipped ore carrying gold, silver, lead and copper. Developed for several years. Will be worked through deep main-haulage tunnel.

Clear Creek County

NEW ERA (Freeland)—Mill running two shifts.

FRISCO (Empire)—This Daily district mine shipping lead-carbonate ore.

COLORADO CENTRAL (Georgetown)—Compressor plant and saw-mill being built.

PAY ROCK (Silver Plume)—Company recently organized to reopen mine.

BIG FIVE (Idaho Springs) — Several lessees operating through tunnel with success.

ASHBY TUNNEL (Silver Plume)—Extensive crosscutting planned; vein on this level is large, but oreshoots not yet opened. Pay ore continuous above from surface to 600-ft. level.

HALL TUNNEL (Georgetown) — This and all Husted holdings under bond and lease. Tunnel in 2000 ft., will be driven 1300 ft. to cut extension of Colorado Central and Aliundi veins. Other properties will be merged in general scheme of development.

Dolores County

CADIZ (Rico)—Property will be developed

Gilpin County

BEZANT (Central City) — Being unwatered.

PITTSBURGH (Central City) — Stated 50-ton mill will be built by Cashier Co.

FEDERAL (Central City)—This Russel Gulch mine will be reopened.

ANNEX (Central City)—Lease and bond taken; gasoline hoist being installed to unwater mine. Shaft is 240 ft. deep. Former gold producer.

CROWN POINT (Central City) — This property, near Gilpin-Clear Creek county line, will be worked by Idaho Springs men. Will be drained to 400-ft. level, and crosscutting done.

Ouray County

HIDDEN TREASURE (Ouray)—Mine being cleaned out and retimbered for examination. Owned by Mrs. Thomas F. Walsh, Washington, D. C.; former producer of high-grade lead-copper-silver ore, changing at depth to milling-grade, complex sulphide. Vein will be cut at depth, and probably drained by new Camp Bird tunnel.

GENESEE (Ouray)—Genesee-Vanderbilt, Yankee Girl, Robinson, Joker Tunnel and others in Red Mountain district will be operated by one company. Former producers of high-grade copper-silver ore, and closed down after drop in silver price. Joker Tunnel driven to unwater old mines finished but promoters lacked funds to continue work. These properties worked during last year under lease to James M. Hyde.

HIGHLAND MARY (Silverton)—Shipping copper ore. Improving equipment.

San Juan County

BELCHER (Silverton)—Reopened and being developed. Ferguson and Marshall, operators.

SUMMIT COPPER MINING CO. (Silverton)—Will ship while Silverton and Northern R.R. remains open. Worked through Koehler tunnel. John Kennedy, manager.

San Miguel County

BELMONT-WAGNER DEVELOPMENT CO. (Telluride)—Subsidiary of Tonopah Belmont Co, of Nevada, that recently acquired Alta mine, formerly operated by Wagner Development Co. Office building and boarding houses enlarged, and terminals for aërial tramway to mill from Palmyra mine recently opened up, constructed.

Summit County

MINNIE (Breckenridge)—Lead sulphide ore, carrying silver, shipped by lessees.

ELLA (Breckenridge)—Lessees shipping good-grade oxide ore to Salida smeltery.

FIRST NATIONAL (Breckenridge) — Lessees opened shipping grade ore in 339-ft. level of this Iowa Gulch mine.

Teller County

VICTORY GOLD (Cripple Creek)—Ore opened in development work on 425-ft. level from Beacon shaft of Prince Albert group.

PORTLAND (Colorado Springs)—Unit will be added to Independence mill; as originally planned with five units, is in operation, treating 1250 tons daily.

QUEEN BESS (Cripple Creek)—Development from 1000-ft. level of El Paso Gold King shaft opened good-grade ore; shipping 2-oz. gold ore.

CRESSON (Cripple Creek)—Recent development on 1400-, 1500-, and 1600-ft. levels opened good-grade ore. Has cash on hand for one year's dividends and three years' dividends in ore reserves.

GEORGIA

ARIZONA & GEORGIA DEVELOPMENT CO. (Temple)—Operating Tallapoosa mine, 12 miles distant, in Haralson County. Expect to complete 30° incline to surface soon. Plans to sink 500 ft. further to provide stoping ground, and to crosscut at 230-ft. depth on pitch; development at present extends to 315 ft. Hauling surface ore to No. 48 siding, also called Morgan's. J. W. Tudor, in charge.

MICHIGAN

Copper

WHITE PINE (White Pine)—Flotation plant will be ready shortly after Jan. 1.

LA SALLE (Calumet) — In high-grade rock for last three weeks on 45th level.

KEWEENAW COPPER (Calumet) — Shipping better rock for last 10 days.

SENECA (Calumet)—Will start sinking shaft in about five weeks.

MASS (Mass)—Shipping 1000 tons daily with favorable prospect of getting more men and increasing output.

BALTIC (Baltic)—No. 2 shaft down to 32nd level, No. 3 to 34th. No. 2 shipping over half of mine rock.

WHITE PINE EXTENSION (White Pine)—Drifts on 2nd level, 2450 ft. long and on 4th level, 1100 ft.

HANCOCK (Hancock)—Production for October amounted to 332,000 tons, as compared with 350,000 for September.

SOUTH LAKE (Lake Mine)—Shortage of experienced men caused shutdown on night shift. Indiana only running day shift for some time past.

VICTORIA (Victoria)—Management decides to continue production during winter, but construction and development suspended; costs recently above 23½c.

NEW ARCADIAN (Houghton) — Shaft, down 1730 ft., cut branch of New Arcadian lode in hanging wall, sometimes a short distance from main lode and sometimes merged into it. At 250-ft. level, lodes were 150 ft. east, and at 1700-ft. about 50 ft. east.

Iron

LUCKY STAR MINING CO. (Negaunee) —Has men working in Prince of Wales mine, drifting from old workings into large orebody on Lucky Star adjoining, which plan permits large saving in cost. Oliver Iron Mining Co.'s lease of latter expired in June and mine reverted to Breitung interests operating the Lucky Star, which is a new mine owned jointly by the Arctic Iron Co., a subsidiary of Cleveland Cliffs Iron Co., and Breitung-Kaufman interests, and operated by agreement by the latter. Company known as Lucky Star Mining Co., N. M. Kaufman, president; W. G. Mather (President, Cleveland-Cliffs Iron Co.), vice president; E. N. Breitung, secretary and treasurer.

MINNESOTA

Mesabi Range

SOUTH AGNEW (Hibbing)—Jones & Laughlin started sinking large shaft last week.

MISSISSIPPI (Keewatin) — Jones & Laughlin resumed operations last week after two-year shutdown. Building 150-ft. concrete smokestack at power plant.

BENNETT (Keewatin) — Operated by Pickands, Mather & Co. Recently moved office and engineering staffs into new steel-and-concrete building.

ADAMS AND SPRUCE (Eveleth)—These mines of Oliver Iron Mining Co. will be stripped requiring complete change of depot and warehouse tracks of Duluth, Missabe & Northern Railway.

SCRANTON (Hibbing)—Lease, owned by Lackawanna Steel Co., with Pickands, Mather & Co. operating and handling sales, reported taken over by Hoyt Mining Co. and various steel companies.

BRUNT (Mountain Iron)—Operated by Hanna Ore Co. Baumgartner Co., of St. Paul, have steam shovel working, making new yards for Great Northern R.R. at mine; Duluth Missabe & Northern Ry. have been hauling up to present.

MISSOURI

Joplin District

WAYLAND (Galena, Kan.)—Now in ore at 234 ft. in shaft. This is first operation at this depth in Galena camp.

PRODUCERS (Joplin)—Moving mill from here to lease recently drilled, northwest of Picher, Okla. Two shafts sunk to ore level.

LAURA G. (Joplin)—Will reopen Beacon Hill and Three C leases on Leonard land, north of Chitwood. To try operations at 210 ft. soon.

BILHARZ (Baxter Springs, Kan.)—Decided to rebuild Bluebird mill, north of Commerce, completely destroyed by fire two weeks ago.

RANGE LINE (Joplin)—Sinking second shaft on mill site on Rex M. & S. land. Will move mill from another portion of tract to new mine. Operations at 130 ft. J. F. Brewer, manager.

N. J. & B. (Duenweg)—Completed 150-ton mill on lease of Walker land, north of town. Lead, calamine and blende from 110 to 188 ft. Principal run at 149 ft., where blende encountered. J. H. Johnson, principal owner and manager.

ADMIRALTY ZINC (Douthat, Okla.)—No. 4 mill completed; electrically equipped; capacity, 600 tons. Has four jigs, seven sets of rolls, 14 tables, Dorr thickener and classifier. Operations to be conducted at 220-ft. level; two shafts down to this level and connected.

GOLDEN ROD (Oklahoma City, Okla.)—At No. 1 property, just south of Picher, made 301 tons of concentrates last week from 1804 tons of sulphide ore. Operating at 220 ft.; heavy water preventing former owners from working at this depth. Concentrates averaging 62% metallic zinc, with 0.2% lead and 1.15% iron.

MONTANA

Cascade County

ANACONDA (Great Falls)—Zinc plant operating at capacity; will be increased considerably when new roasters are installed. Foundations for wire mill completed; plant to be completed about May, 1918.

Deerlodge County

NATIONAL TUNGSTEN AND SILVER CO., at Windy Gap, about 26 miles from Anaconda, began operating mill last month on 1000-ton wolframite ore reserve. Vein is 6 ft. wide. Also operating Hidden Lake mine, in Cable district, former gold producer, where 150-ton cyanide plant is under construction.

Jefferson County

MT WASHINGTON (Wickes) — Two carloads a day to smeltery.

FREE COINAGE (Clancy)—Unwatering 180-ft shaft. Silver-zinc ore.

Silver Bow County

BUTTE-COPPER CZAR MINING (Butte)— G B McDaniels killed Oct 28, by 100-ft fall while being hoisted in bucket.

ANACONDA (Butte)—Tropic mine in eastern section resumed night shift on Oct. 28; shipping regularly. During August, 17 accidents occurred at Butte mines, being 1.01 accidents per 10,000 shifts; 16 mines had no accidents.

BUTTE-RAMSDELL COPPER (Butte)—Situated in center of city. Sinking two-compartment shaft on Ramsdell started three months ago and now down to 165-ft. depth; encountered vein on 150-ft level, carrying copper, zinc and silver. Shipments of 50 tons a day will be increased when equipment is installed. Henry Malloy, president. John D Pope, vice-president.

NORTH BUTTE (Butte)—Report for quarter ended Sept 30 shows Granite Mountain shaft retimbered and 225 ft of structural steel put in place, 30 ft. of which is completely concreted; 195 ft reinforced concrete placed below 2600-ft level. Speculator shaft repaired and being used for hoisting ore and for lowering supplies to the Granite Mountain shaft. Shaft at Sarsfield claim is 305 ft. deep; installing surface plant has 5000-gal. tank for water supply. Another suit for $65,000 for death of John J. Brady in Granite Mountain fire filed.

NEVADA

Clark County

GREEN MONSTER (Goodsprings)—Small body zinc ore carrying some copper and lead opened. Orebody is a replacement in limestone. Owned by Hearst Estate. C. B. Neal, superintendent.

Nye County

TONOPAH ORE PRODUCTION for week ended Nov. 3 amounted to 10,223 tons, valued at $178,902, comparing with 10,578 tons the previous week. Producers were: Tonopah Belmont, 2415 tons; Tonopah Mining, 2850; Tonopah Extension, 2380; Jim Butler, 800; West End, 913; MacNamara, 476; Montana, 105; Rescue, 195; Midway, 89 tons.

MANHATTAN RED TOP (Manhattan)—Shaft down 167 ft. vertical; abnormal flow of water now overcome with addition of No. 7 Cameron pump. New wagon road completed.

Washoe County

NIXON NEVADA (Reno)—Developing with 30 men; taking out copper ore. Shipped 14 carloads during summer. Seven veins on surface. Situated 14 miles north of here.

White Pine County

NEVADA CONSOLIDATED (McGill)—Production of copper amounted to 7,000,000 lb. in October, comparing with 6,524,352 lb. in September and 8,676,327 in October, 1916.

NEW MEXICO

Grant County

CHINO (Santa Rita) — Production for October amounted to 6,333,000 lb., comparing with 7,719,496 lb. in September, and 6,921,081 lb. in October, 1916.

GOLD BUTTES MINING AND MILLING (Duncan, Ariz.)—Situated in Steeple Rock district; consists of three groups; Rival Mining Co. extension of 180 acres to southeast and 520 acres to northwest and Dark Thunder Mountain Copper Group of 120 acres. Development work consists of 4000 ft. exposing gold and silver ore. Examined by E. T. Morton, Clifton, Ariz. J. F. Fraser, president.

OKLAHOMA

OSAGE INDIAN OIL LEASES, covering area of 20,000 acres, were sold Nov. 12 for $1,687,000, as announced by Secretary Lane. The Indians will also receive a royalty of one-sixth upon the oil taken out.

SEVENTEEN I. W. W.'S IN TULSA, Okla., were flogged, tarred and feathered by band of 60 black-robed and hooded "Knights of Liberty." Regarded as a sequel to the recent I. W. W. activities, including the dynamiting of home of J. Edgar Pew, vice president of the Carter Oil Co. The latter outrage was assumed to be part of plan to terrorize the oil industry.

OREGON

Jackson County

BLUE LEDGE (Medford) — Surveying route for railroad from Grant's Pass to this copper mine. A. H. Wise, of Grant's Pass, Ore., in charge.

UNITED COPPER CO. (Medford)—Copper King mine near here leased by W. M. Cowley, president of Cowley Investment Co., and Howard H. Startzman, of Seattle. Developing.

RED OAK (Gold Hill)—This placer mine on Galls Creek, three miles southwest of here, under lease to M. G. Womack of Medford, Ore., and M. A. Carter, of Ashland, Ore. Reopening with small crew of men.

Josephine County

CHROME ORE being hauled from deposit on old McGrew road, 15 miles southwest of Waldo, Ore., by J. H. Gregg.

JACK AND TOM (Kerby) — These chrome claims located a few weeks ago, showing considerable high-grade ore; will haul to Waters Creek. J. M. Finch and T. P. Johnson, owners and managers.

UTAH

Salt Lake County

WEST TOLEDO (Alta)—New equipment to be installed on divide between Alta and Big Cottonwood. Working from Alta side.

UTAH COPPER (Bingham)—Production of copper for October amounted to 18,100,000 lb., comparing with 17,839,378 lb. in September, and 20,325,520 lb. in October, 1916.

OHIO COPPER (Bingham)—Concrete foundation for new 3000-ton flotation plant built, and machinery en route. Experimental flotation plant recovering 85%, compared to 40 and 50% formerly.

CARDIFF (Salt Lake)—Shipping from stockpile, since smelter embargo lifted, about 50 tons daily, compared with 100 to 135 tons normal daily output; conserving ores awaiting better lead prices and concentrating on development and mining ore, which is being held.

Utah County

PACIFIC (American Fork)—Mill of Fissures Exploration Co. producing car of concentrates about every three days. Strike of shipping ore reported.

MINERAL FLAT (American Fork)—Being developed by same interests as Miller Hill; prospect and drainage tunnel 3000 ft. long driven. Three fissures cut and fourth expected soon.

MILLER HILL (American Fork)—Tunnel in about 2200 ft. cut two fissures 60 ft. apart. First fissure being explored by drifting and raising; crosscutting from here to reach second fissure. J. C. Jensen, vice-president, and W. Lester Mangum, general manager.

CANADA

Alberta

PEACE RIVER OIL (Peace River)—Flow increased by dynamite. Oil sands are about 70 ft. thick; drill has so far entered only 20 ft.

Manitoba

REX (Herb Lake)—Report of E. E. Chase, of Denver, Colo., says vein averages 3 ft. wide, opened for 1700 ft. with filling of quartz carrying free gold. Being operated by Mines Exploration Syndicate organized by Makeever Bros. Shaft 120 ft. deep; drifting north and south on orebody. Walter Neal, general manager; Charles Crook, superintendent.

Nova Scotia

NOVA SCOTIA STEEL AND COAL CO. (New Glasgow)—This company reports production for the quarter ended Sept. 30 as follows, in gross tons; 139,795 tons coal; 7174 tons iron ore; 17,069 tons limestone; 25,268 tons coke; 21,874 tons pig iron; 30,847 tons steel ingots and 32,657 tons finished steel and forgings.

Ontario

SPANISH RIVER CLAIMS in township of Shakespeare, containing total of 80 acres, six miles north of Webbwood, examined by A. G. Morrison preparatory to diamond drilling.

PATRICIA SYNDICATE (Boston Creek)—Active development being undertaken. Shaft down nearly to 50-ft. level in ore.

DOME LAKE (South Porcupine)—Annual report estimates ore reserves at 9089 tons, averaging $9.03 gold contents per ton.

NEWRAY (South Porcupine)—Shareholders ratified sale of controlling interest to Crown Reserve and increase of capital from $1,500,000 to $3,000,000.

ADANAC (Cobalt)—New vein encountered at 310-ft. level about 6 in. wide, carrying smaltite and native and ruby silver.

PRESTON (South Porcupine) — This property (which does not include the Preston East Dome mine), optioned by Hayden mine interests.

MEXICO

CARNEGIE LEAD AND ZINC (Cananea, Sonora)—Bond issue for $250,000 for funds to erect mill decided upon at special stockholders meeting. New plant designed by J. F. Sanford, superintendent; machinery ordered. Announced company has $71,000 in bank and $8000 due from smelters.

CHILE

CHILE (Chuquicamata)—Copper production in October amounted to 9,050,000 lb., comparing with 3,294,000 lb. in September.

PERU

CERRO DE PASCO (La Fundición)—Production of copper in October amounted to 7,325,032 pounds.

CHOSEN

ORIENTAL CONSOLIDATED (Unsan)—By telegraph, October cleanup amounted to $120,153. September bullion amounted to $105,910, divided as follows: Tabowk mill, $25,316; Taracol mill, $20,127; Malbong, $14,302; Taracol cyanide plant, $12,356; Malbong tube mill, $3837. Low cleanup due to rains in September and low-grade of ore; rainfall was $12\frac{11}{16}$ in. and skips were kept bailing in addition to pumping to prevent flooding of mines; Taracol mine flooded. Shortage of native labor at present due to harvest season.

The Market Report

SILVER AND STERLING EXCHANGE

ov.	Sterling Exchange	Silver New York, Cents	Silver London, Pence	Nov.	Sterling Exchange	Silver New York, Cents	Silver London, Pence
8	4.7515	86⅛	44	12	4.7515	86⅛	43¾
9	4.7515	86⅛	43¾	13	4.7515	86	43⅝
10	4.7515	86⅛	43¾	14	4.7515	86	43⅝

New York quotations are as reported by Handy Harman and are in cents per troy ounce of bar ilver, 999 fine. London quotations are in pence per roy ounce of sterling silver, 925 fine.

DAILY PRICES OF METALS IN NEW YORK

	Copper	Tin	Lead		Zinc
ov.	Electrolytic	Spot.	N. Y.	St. L.	St. L.
8	*23½	72	6¼ @6½	6.17½ @6.37½	7½
9	*23½	72½	6¼ @6½	6.17½ @6.37½	7½ @7⅝
10	*23½	72½	6¼	6.17½ @6.25	7½ @7⅝
12	*23½	72¾	6.20 @6.25	6.15 @6.25	7½ @7¾
13	*23½	73	6¼	6.15 @6.25	7⅝ @7⅞
14	*23½	74½	6¼	6.20 @6.25	7¾ @8

* Price fixed by agreement between American pper producers and the U. S. Government, accordg to official statement for publication on Friday, eptember 21, 1917.

The above quotations (except as to copper, the rice for which has been fixed by agreement between merican copper producers and the U. S. Government, wherein there is no free market) are our ppraisal of the average of the major markets based nerally on sales as made and reported by producers nd agencies, and represent to the best of our judgent the prevailing values of the metals for the eliveries constituting the major markets, reduced to asis of New York, cash, except where St. Louis is e normal basing point.

The quotations for electrolytic copper are for cakes, gots and wirebars.

We quote electrolytic cathodes at 0.05 to 0.10c. low the price of wirebars, cakes and ingots.

Quotations for spelter are for ordinary Prime estern brands. We quote New York price at 17c. r 100 lb. above St. Louis.

Some current freight rates on metals per 100 lb. e: St. Louis-New York 17c.; St. Louis-Chicago, 3c.; St. Louis-Pittsburgh, 13.1 cents.

LONDON

	Copper			Tin		Lead	Zinc
	Standard		Electrolytic				
ov.	Spot	3 Mos.		Spot	3 Mos.	Spot	Spot
8	110	110	125	265¾	265	30½	54
9	110	110	125	267¼	266½	30½	54
10	.	...					...
12	110	110	125	269	268	30½	54
13	110	110	125	273¾	273¼	30½	54
14	110	110	125	278	277½	30½	54

The above table gives the closing quotations on ondon Metal Exchange. All prices are in pounds erling per ton of 2,240 lb. For convenience in mparison of London prices, in pounds sterling per 240 lb., with American prices in cents per pound e following approximate ratios are given, reckoning change at $4.75½. £30½ = 6.474c.; £54 = 11.462c.; 120 = 25.473c.; £137 = 29.082c.; £240 = 50.946c. ariations, £1 = 0.212277c.

Metal Markets

NEW YORK—Nov. 14

Lead and zinc are the only metals of ajor importance in which there is now uch market interest. During this week inc became a little stronger, on small busiess, while lead held its own on greatly iminished business.

Copper—There were no features of imortance that need to be reported.

Copper Sheets have been cut 1c. and are quoted at 33c. per lb. for hot rolled, and 1c. higher for cold rolled. Wire has also been reduced, being quoted at 29c. per lb., f.o.b. mill.

Tin—The advance in this market continued. The volume of business was limited by the supply, which was very small. Banka tin has disappeared from the market and cannot be quoted. Chinese tin is quoted at 70@71 cents.

On Nov. 13 the United States Government requisitioned tin in order to obtain a comparatively small quantity for the Navy Department. Being unable to obtain any from dealers, the metal needed was requisitioned from the cargo of the "Mahopac," which arrived on Monday. This was consigned to dealers who had resold it to consumers. It is unknown what compensation the Government will offer to the latter, to whom the tin really belonged.

Lead—The strength exhibited at the end of last week continued into Thursday and Friday, when large business was done. On Saturday it nearly petered out, and on Monday the market became rather dead, with a tendency toward softness, the price of the A. S. & R. Co. being shaded a little on some transactions. The volume of business done on Monday, Tuesday and Wednesday was relatively light, but more inquiry developed on Wednesday and the tone of the market became firmer. Before the market had become really dull it was easier to sell December lead at an advantage than it was spot and prompt lead. An interesting feature of the week was some transactions in more distant futures —January, February and March—sales for that delivery being made at 6¼c., New York. In the St. Louis market some producers asked 6⅜c. right through the week, but we had no reports of that price being realized by anybody, and during the latter part of the week, when the market was soft, business was done as low as 6.15c. Sales of the week, whereof we had reports, aggregated about 6500 tons, not including a round tonnage arranged with the Government; but, as previously remarked, the bulk of this business was done on Thursday and Friday.

Zinc—The market advanced slightly from day to day on small business, the inspiration for the advance being found in the idea that the Government would soon take some steps to buy zinc. Conferences with the producers were in fact instituted this week, a committee of producers having been appointed to formulate a plan for presentation to the War Industries Board.

Producers of zinc organized a committee Nov. 13 to cöoperate with the War Industries Board in fixing a basis for establishing prices for the various grades of the product. The committee was formed following a consultation on Nov. 12 between the zinc men and Eugene Meyer, Jr., who has charge of purchases of non-ferrous metals for the Government. The members of the new zinc committee are Edgar Palmer of the New Jersey Zinc Co., chairman; Charles T. Orr, Cornelius F. Kelly, C. M. Loeb, Sidney J. Jennings, N. Bruce McKelvie, Charles F. Baker, Walker W. Vick, R. A. Cowles, A. P. Cobb, E. W. Furst, S. M. Evans, J. D. Lang, and S. S. Tuthill. The committee is expected to hold frequent meetings until the necessary data for study by the War Industries Board have been got together. A method for establishing prices for zinc ore is also to be studied and recommended to the Washington authorities.

Zinc Sheets—Price of zinc sheets has not been changed. Market is still at $19 per 100 lb. f.o.b. Peru, Ill., less 8% discount.

Aluminum—This market continues dull with small transactions taking place at 36@38c. per lb. for No. 1 ingots at New York.

Antimony—Dull and weaker. Spot quoted 13¾@13½c. There is no quotation for futures, none being offered. The Chinese and Japanese houses are out of the market for the present. An interesting feature of the antimony market has been some recent transactions in Cookson's. About a month ago the British Admiralty permitted the shipment of about 50 tons to maintain the name of the old brand. This lot was promptly taken up by consumers.

Bismuth—Unchanged at $3.50 per pound.

Cadmium—This metal is quoted at $1.40@1.60 per pound.

Nickel—Steady at 50c. per lb., premium of 5c. per lb. for electrolytic.

Quicksilver—Strong at $100, with indications that a trifle more would have to be paid for spot, which is becoming scarce. San Francisco reports, by telegraph, $100, strong.

Gold, Silver and Platinum

Gold—Gold in the United States Nov. 1 is estimated by the Treasury Department as follows: Held in Treasury against gold certificates outstanding, $1,481,761,849; held as reserve for Federal Reserve notes, $340,637,000; in Treasury current balances, $197,533,851; in banks and circulation, $1,021,616,341; total, $3,041,549,041. This is an increase of $341,412,065 over the report of Nov. 1 last year.

Silver—The market during the last week has been fairly steady without any marked features. The shipments to London for the week ended Nov. 10 were about 300,000 oz.

Mexican dollars at New York: Nov. 8, 65⅝c.; 9, 65⅝c.; 10, 65⅝c.; 12, 66c.; 13, 66c.; 14, 66 cents.

Platinum—Firm at $105.

Palladium—Still in good demand at $125@130.

Zinc and Lead Ore Markets

Joplin, Mo., Nov. 10—Blende, per ton, high $72.90; basis, 60% Zn, premium, $72.50@70; medium to low, $62.50@55; calamine, per ton, basis 40% Zn, $35@38; average selling price, all grades of zinc, $56.07 per ton.

Lead, high $76; basis 80% Pb, $65@75; average selling price, all grades of lead, $73.10 per ton.

Shipments the week: Blende, 7053 tons, calamine, 844 tons, lead, 1172 tons. Value, all ores the week, $528,370.

An embargo on cars east from St. Louis, coming this week, put several buyers out of the market at the week-end, reducing the sales for next week 30% to 40%. But one company is paying the premium quotation, and aside from its purchases, ore as high in quality is selling on $65 base. The strike of coal miners in Kansas caused the closing of some mills.

Platteville, Wis., Nov. 10—Blende, basis 60% Zn, $62 base for premium ore down to $57 base for medium grade. No market or sales of lead ore were reported. Shipments for the week were 2661 tons of zinc ore and 501 tons of sulphur ore. For the year to date, the figures are 125,140 tons of zinc ore, 6365 tons of lead ore, and 24,698 tons of sulphur ore. Shipped during the week to separating plants, 3543 tons of zinc ore.

Other Ores

Manganese Ore—Metallurgical ore is unchanged at $1.20 per unit.

Molybdenum Ore—Sales reported at $2.20 per lb. on the basis of 90% molybdenum sulphide. For ore assaying less than that 1c. per lb. is deducted for each per cent. down to 85%, after which the deduction becomes 1½c.

Tungsten Ore—Transactions were reported at advancing prices, $26 per unit having been paid for the highest grade of wolframite; that is, ore assaying 70% tungsten trioxide and free from all impurities. Lower grade ore realizes relatively lower prices. We hear of $22 per unit talked about for ore assaying 65%, and $19 for ore assaying 60%. The variations in price, according to the grade and character of the ore, make it difficult to quote an average for this market. Arrivals of tungsten ore from South America are reported as being much curtailed owing to difficulty in doing business with firms who used to ship to this country but have come under the Trading-with-the-Enemy Act There has been delay in obtaining licenses to deal with those concerns.

Pyrites—Spanish lump quoted at 15c. per unit, on basis of 10s. ocean freight, buyer to pay excess freight and war risk, except that concession of 2% of war risk is allowed. Ocean rates remain at 35s. for Northern, 40s. for Southern and 42s. 6d. for Gulf ports.

Iron Trade Review

PITTSBURGH—Nov. 13

The different departments of the steel market are giving a different account of themselves, now that price fixing by Washington is practically completed, some departments being active and others very quiet The sheet market has been decidedly active, inquiry being excellent and sales fairly heavy for shipment during the remainder of this year, with occasional sales for January Some of the sheet mills had practically run out of orders, and some buyers had run out of material but were unwilling to buy at prices asked The tin plate mills are still well filled and scarcely any sales are being made

The American Sheet and Tin Plate Co will shortly open its books for contracts with manufacturing consumers, for both sheets and tin plates, for the first half of 1918 and this will probably set the pace for the independents.

In wire products and tubular goods there is only moderate activity. The steel-pipe mills have issued new discount cards, based on 51%, using the same differentials as obtained in the cards of Apr. 2 and May 1, while the iron-pipe mills have issued a new card bearing the same discounts as that of July 2, all the cards being dated Nov 2. Boiler-tube discounts, to conform to the basis price for pipe, have not yet been issued

In unfinished steel there is scarcely any open-market business being done A producer has bought 12,000 tons of ingots, at a high price relatively to the price set for billets, and would buy more. Two lots of 2000 tons of billets have been sold for export, at above the set price, which does not apply on exports except in case the material is eventually for war use. Sheet and tin-plate mills are being covered by the regular sources of supply, at the set prices, but consumers without a regular source of supply have difficulty. One is inquiring for 12,000 tons for first half and has received no offers as yet

The mills as a rule are adhering strictly to the spirit and letter of the price agreement, but occasionally an exception is found, only among the smaller interests. One small producer of bars has quoted a higher price than that set, under the guise of "preferred service." The trade, at large, hopes such attempts at evasion will disappear, as they would encourage legislative action on steel prices.

The rate of steel-ingot production this year has been about 5.5% ahead of that of last year while the rate of pig-iron production has fallen 1.4% behind Increased steel production is largely if not wholly in plates and tin plates.

Pig Iron—There is considerable unsatisfied inquiry for bessemer and basic iron, the inquiries coming chiefly from those not regular buyers Furnaces assert they are taking care of regular customers as well as possible, this applying particularly to foundry iron, for which the consumer usually has a regular source of supply We quote foundry and basic at $33, malleable at $33.50 and bessemer at $36 30, f.o.b. valley furnaces, 95c higher delivered Pittsburgh

Ferroalloys

Ferromanganese—There is almost complete stagnation Producers are confronted with higher costs for ore while on the other hand there is a possibility of the authorities undertaking to set a price Prompt or forward could probably be bought at $250 but the more common quotation is $275.

Graham Furnace, Graham, Va., has been transferred to John B. Guernsey & Co., Roanoke, Va., who will run it on ferromanganese, using Brazilian ore

Coke

Connellsville—The Fuel Administration has set prices at $6 for furnace, $7 for foundry and $7 30 for crushed, over 1-in size Previously there had been merely the announcement of a general price of $6, named by the President on Sept 21 after the coke operators had recommended to the War Industries Board a price of $6.50. Although there was a general wage advance Oct. 1 the H. C. Frick Coke Co. has announced another general advance, effective Nov 10 putting the mining rate up to $2.29, an advance of 6 [illegible], and the inside day rate up to $1.15, an advance of 28%. Labor and car supply conditions are quite unsatisfactory and little coke is being offered in the market

STOCK QUOTATIONS

N. Y. EXCH.†	Nov 13
Alaska Gold M	3
Alaska Juneau	2¼
Am.Sm.& Ref.,com.	73
Am. Sm. & Ref., pf	101½
Am. Sm. Sec., pf, A	92½
Am. Sm. Sec., pf B	‡96
Am. Zinc	12½
Am. Zinc, pf	40
Anaconda	58½
Batopilas Min	1¼
Bethlehem Steel	79½
Bethlehem Steel, pf	86
Butte & Superior	16
Cerro de Pasco	31
Chile Cop	13½
Chino	37½
Colo Fuel & Iron	32½
Crucible Steel	53
Dome Mines	6½
Federal M. & S	12
Federal M. & S., pf	30
Great Nor., ore ctf.	24
Greene Cananea	35½
Gulf States Steel	75
Homestake	‡96
Inspiration Con	41½
International Nickel	27½
Kennecott	30½
Lackawanna Steel	72
Miami Copper	27½
Nat'l Lead, com.	42
National Lead, pf	100½
Nev. Consol	17
Ontario Min	4
Quicksilver	1
Quicksilver, pf	1½
Ray Con	21½
Republic I &S.,com.	70½
Republic I. & S., pf	90
Sloss-Sheffield	36
Tennessee C. & C.	12½
U. S. Steel, com.	92½
U. S. Steel, pf	108½
Utah Copper	75
Va Iron C. & C.	51

N. Y. CURB†	Nov 13
Big Ledge	1½
Butte & N. Y.	50
Butte C. & Z	6½
Butte Detroit	1/16
Caledonia	49
Calumet & Jerome	1¼
Can Cop. Corpn	1¼
Carlisle	‡4½
Cashboy	03½
Con. Ariz. Sm.	1 3/16
Con. Coppermines	7½
Con. Nev.-Utah	‡ 1/16
Emma Con.	.50
First Nat. Cop	2 1/16
Goldfield Con.	41
Goldfield Merger	03½
Greenmonster	¼
Hecla Min	4 1/16
Howe Sound	3½
Jerome Verde	‡1
Kerr Lake	4½
Louisiana	¼
Magma	33
Majestic	28
McKinley-Dar-Sa.	58
Milford	1½
Mohican	‡ 25
Mother Lode	29
N. Y. & Hond	12
Nipissing Mines	7½
Nixon Nevada	69
Ohio Cop	75
Ray Hercules	‡3
Richmond	‡ 56
Rochester Mines	.36
St Joseph Lead	15½
Standard S. L.	½
Stewart	25
Success	13
Tonopah	4½
Tonopah Ex	1½
Tribullion	1½
Troy Arizona	14
United Cop	‡ 50
United Verde Ext	‡33½
United Zinc	‡1¼
Utica Mines	¼
Yukon Gold	1½

SAN FRAN.*	Nov 13
Alta	04
Andes	11
Best & Belcher	03
Bullion	02
Caledonia	10
Challenge Con	05
Confidence	05
Con. Virginia	10
Gould & Curry	02
Hale & Norcross	03
Jacket-Cr. Pt	05
Mexican	20
Occidental	60
Ophir	10
Overman	01
Savage	01
Sierra Nevada	12
Union Con	‡ 27
Utah Con	01
Belmont	3 50
Jim Butler	73
MacNamara	‡ 21
Midway	10
Mont.-Tonopah	09
North Star	04
Rescue Eula	09
West End Con	63
Atlanta	08
Booth	03
Comb. Frac	‡ 03
D'field Daisy	‡ 02
Florence	10
Jumbo Extension	15
Kewanas	06
Nevada Hills	09
Nevada Packard	11
Round Mountain	10
Silver Pick	08
White Caps	‡ 07
Big Jim	75
United Eastern	3 50

BOSTON EXCH.*	Nov 13
Adventure	1¼
Ahmeek	83
Algomah	25
Allouez	51
Ariz Com., ctfs.	9
Arnold	25
Bonanza	21
Butte-Balaklava	30
Calumet & Ariz	63
Calumet & Hecla	440
Centennial	13
Copper Range	45½
Daly West	1½
Davis-Daly	3½
East Butte	9½
Franklin	4½
Granby	64
Hancock	9½
Hedley	‡16½
Helvetia	25
Indiana	1½
Isle Royale	24
Keweenaw	1½
Lake	6½
La Salle	2½
Mason Valley	4
Mass	6
Mayflower	1½
Michigan	1½
Mohawk	60½
New Arcadian	1½
New Idria	10
North Butte	13½
North Lake	.50
Ojibway	1½
Old Dominion	36
Osceola	59
Quincy	63½
St Mary's M. L.	51
Santa Fe	80
Seneca	16
Shannon	5½
Shattuck-Ariz.	19
So. Lake	1½
So. Utah	12
Superior	5
Superior & Bost.	3
Trinity	4
Tuolumne	1½
U. S. Smelting	42½
U. S. Smelt'g, pf	44
Utah Apex	2½
Utah Con	12½
Utah Metal	3½
Victoria	2
Winona	1
Wolverine	33
Wyandot	.50

BOSTON CURB*	Nov 13
Alaska Mines Corp.	12
Bingham Mines	9½
Boston Ely	45
Boston & Mont	49
Butte & Lon'n Dev	.10
Calaveras	1½
Calumet-Corbin	‡.01
Chief Con.	2
Cortez	05
Crown Reserve	20
Crystal Cop	.51
Eagle & Blue Bell	2
Gila Copper	17
Houghton Copper	50
Intermountain	1 1/16
Iron Cap, Com	14½
Iron Cap Cop., pf.	‡14
Mexican Metals	.26
Mines of America	1½
Mojave Tungsten	27
Nat. Zinc & Lead	26
Nevada-Douglas	1½
New Baltic	75
New Cornelia	13½
Oneco	36
Pacific Mines	‡.35
Rex Cons	.08

SALT LAKE*	Nov. 13
Bannack	26
Big Four	01
Cardiff	3 00
Colorado Mining	12
Daly	1 40
Daly-Judge	8 00
Empire Copper	1 17
Gold Chain	14
Grand Central	55
Iron Blossom	44
Lower Mammoth	03
May Day	03
Moscow	11
Prince Con	51
Rico Wellington	16
Silver-King Coal'n	2 50
Silver King Con	3 70
Sioux Con	03
So. Hecla	1 00
Tintic Standard	1 45
Uncle Sam	02
Wilbert	18
Yankee	03

TORONTO*	Nov 13
Adanac	11
Bailey	04
Beaver Con	28
Chambers Ferland	10
Coniagas	2 95
Hargraves	08
La Rose	31
Peterson Lake	09
Temiskaming	24
Wettlaufer-Lor.	05
Davidson	32
Dome Exten.	09
Dome Lake	15
Hollinger	4 40
McIntyre	1 30
Newray	15
Porcu. Crown	20
Teck-Hughes	33
Vipond	18
West Dome	14

STOCK QUOTATIONS—Continued

COLO SPRINGS	Nov. 13
Cresson Con.	4 75
Doctor Jack Pot	03½
Elkton Con.	02
El Paso	15
Gold Sovereign	02½
Golden Cycle	1 72
Granite	35
Isabella	07
Mary McKinney	06
Portland	1 00
United Gold M	18
Vindicator	35

LONDON	Oct. 2		
Alaska Mexican	‡£0	5s	0
Alaska Tre'dwell	‡ 1	0	0
Burma Corp	4	1	3
Cam & Motor	0	11	9
Camp Bird	0	8	6
El Oro	0	10	3
Esperanza	0	9	0
Mexican Mines	5	17	6
Nechi, pfd.	0	11	0
Oroville	0	18	9
Santa Gert'dis.	0	15	0
Tomboy	0	20	0

* Bid prices † Closing prices ‡ Last Quotations.

MONTHLY AVERAGE PRICES OF METALS

Silver	New York			London		
	1915	1916	1917	1915	1916	1917
Jan.	48 855	56 775	75 630	22 731	26 900	36 6
Feb	48 477	56 755	77 585	22 753	26 975	37 7
Mar	50 241	57 935	73 861	23 708	27 597	36 41
April	50 250	64 415	73 875	23 709	30 662	36 9
May	49 915	74 269	74 745	23 570	35 477	37 9
June	49 034	65 024	76.971	23 267	31 060	39 0
July	47 519	62 940	79 010	22 597	30 000	40 11
Aug	47 163	66 083	85 407	22 780	31 498	43 4
Sept.	48 680	68 515	100 740	23 591	32 584	50 9
Oct	49 385	67 855	87 332	23 025	32 351	44 3
Nov	51 714	71 604		25 094	34 192	
Dec	54 971	75 765		26 373	36.410	
Year	49 684	65.661	..	23 675	31 315	..

New York quotations cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Copper	New York		London			
	Electrolytic		Standard		Electrolytic	
	1916	1917	1916	1917	1916	1917
Jan	24 008	28.673	88 083	131 921	116 167	142 8
Feb	26 440	31 750	102 667	137 895	133 167	148 1
Mar.	26 310	31 481	107 714	136 750	136 000	151 0
April	27 895	27 935	124 319	133 842	137 389	147 1
May	28 625	28 788	135 457	130 000	152 522	142 0
June	26 601	29 962	112 432	130 000	137 455	142 0
July	23 865	26 620	95 119	128 409	125.500	140 4
Aug	26.120	25 380	110 283	122 391	126 304	137 0
Sept	26 855	25 073	113 905	117 500	134 071	135 2
Oct	27 193	23 500	122 750	110 000	142 523	125 0
Nov	30 625		134 659		155 432	
Dec	31 890		145 316		162 842	.
Year	27 202		116 059		138 281	..

Tin	New York		London	
	1916	1917	1916	1917
January	41 825	44 175	175 548	185 8
February	42 717	51 420	181 107	198 9
March	50 741	54 388	193 609	207 4
April	51.230	55 910	199 736	220 1
May	49 125	63 173	196 511	245 1
June	42 231	62 053	179 466	242 0
July	38 510	62 570	168 357	242 1
August	38.565	62 681	189 870	243 9
September	38 830	61 542	171 345	244 0
October	41 241	61 851	179 307	247.4
November	44 109		186 932	
December	42 635		183 368	
Av. year	43 480		182 096	

Lead	New York		St Louis		London	
	1916	1917	1916	1917	1916	1917
January	5 921	7 628	5 826	7 530	31 167	30
February	6 246	8 636	6 164	8 595	31 988	30
March	7 138	9 199	7 375	9 120	34 440	30
April	7 630	9 288	7 855	9 158	34 368	30
May	7 463	10 207	7 332	10 202	32 967	30
June	6 936	11 171	6 749	11 123	31 011	30
July	6 352	10 710	6 185	10 644	28 137	30
August	6 244	10 594	6 088	10 518	29 734	30
September	6 810	8 680	6 699	8 611	30 786	30
October	7 000	8 710	6 898	6 650	30 716	30
November	7 042		6 945		30 500	.
December	7 513		7 405		30 500	
Year	6 853		6 777		31 359	

Spelter	New York		St Louis		London	
	1916	1917	1916	1917	1916	1917
Jan	16 915	9 619	16 745	9 449	89 810	48
Feb	18 420	10 045	18 260	9 875	97 762	47
Mar	16 846	10 300	16 676	10 130	95 048	47
April	16 695	9 459	16 525	9 289	99 056	54
May	14 276	9 362	14 106	9 192	94 217	54
June	11 752	9 371	11 582	9 201	68 591	54
July	8 925	8 643	8 755	8 473	50 750	54
Aug	8 730	8 360	8 560	8 190	51 587	54
Sept	8 990	8 136	8 820	7 966	52 095	54
Oct	9 829	7 983	9 659	7 813	54 159	54
Nov	11 592		11 422		56 023	
Dec	10 665		10 495		55 842	
Year	12 804		12 634		72 071	

New York and St Louis quotations, cents per pound. London, pounds sterling per long ton

Pig Iron, Pgh	Bessemer‡		Basic‡		No 2 Foundry	
	1916	1917	1916	1917	1916	1917
January	$21 60	$35 95	$18 78	$30 95	$19 70	$30
February	21 16	38 37	18 93	30 95	19 51	30
March	21 81	37 37	19 20	33 49	19 45	35
April	21 65	42 23	18 95	38 90	19 45	40
May	21 78	46 04	19 11	42 84	19 58	43
June	21 95	54 22	18 95	50 05	19 34	50
July	21 95	57 45	18 95	53 80	19 20	53
August	21 95	54 17	18 95	50 37	19 22	53
September	22 88	46 40	19 68	42 24	19 53	45
October	21 81	37 25	21 26	33 95	21 51	33
November	30 07		28 18		26 55	
December	35 16		30 95		30 79	
Year	$23 88		$20 98		$21 15	

‡ As reported by W. P. Snyder & Co

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Solving the Ore Treatment Problem at White Caps Mine

BY JOHN G. KIRCHEN*

The oxidized gold ore of the White Caps mine, at Manhattan, Nev., changed at 150 ft. to a refractory sulphide containing stibnite and realgar as well as iron and manganese. The new treatment plan is a carefully controlled roast followed by leaching with dilute, neutral cyanide solution. A 90% extraction is indicated at a total milling cost of $2 per ton.

THE mining town of Manhattan, Nev., has recently come into prominence through the discovery of high-grade gold ore in the White Caps mine. Manhattan is 45 miles north of Tonopah, the nearest railroad point, and was one of the early southern Nevada "boom camps." The capital interested was chiefly from San Francisco, and when the 1906 disaster occurred, the Manhattan boom collapsed.

Oxidized gold ore outcropped on the White Caps property and was followed by an inclined shaft to a vertical depth of 200 ft. The ore was treated in a local mill. At the 150 ft. depth, the water level was reached and the ore changed to a sulphide which was refractory to amalgamation or direct cyanide treatment. In 1912 a group of Tonopah men leased the property and erected a mill and cyanide plant of 75-ton daily capacity. By the time the lease expired, all the available oxidized ore had been worked out. Operations on company account were then resumed, and shipments were made of high-grade sulphide ore. However, as this was limited in quantity, and there was no method of treating the lower-grade sulphide ore, the mine was shut down. During this period a new, two-compartment vertical shaft was raised to the surface. Total production from these operations, exclusive of ore on dumps from recent development, was 19,909 tons, assaying $19.14 per ton in gold, and amounting to $381,053 in terms of gross value.

WHITE CAPS MINE AND MILL, MANHATTAN, NEV., LOOKING SOUTHEAST

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*General manager, White Caps Mining Co., Manhattan, Nev.

In June, 1915, the White Caps Mining Co. was incorporated and took over all of the assets of the old Dexter-White Caps Mining Co. The new company began active work on the White Caps property, and a process was developed[1] for treating the sulphide ore. It was found that by roasting the ore within certain degrees of temperature the roasted product could be readily cyanided, and a good extraction obtained with a fairly low cyanide consumption.

In February, 1916, work was started sinking the vertical shaft to the 300-ft. level. By August of the same year the two main oreshoots had been cut on this level. Sinking was again resumed and the shaft sunk to the 425-ft. level on which the ore was cut in April, 1917. The ore occurs in a bed of limestone from 20 to 100 ft. thick, the limestone being cut by numerous faults into blocks up to 200 ft. long. Only two of these have been explored to date, and in them have been found the east and west oreshoots respectively. On the 425-ft. level, the east oreshoot was 195 ft. long, with a maximum width of 40 ft., and the west oreshoot was 90 ft. long, with a maximum width of 18 ft. It is difficult accurately to estimate tonnage and grade, but the ore so far developed is expected to exceed $20 per ton. A new mill, recently completed, consists of a crushing and cyaniding plant with an estimated daily capacity of 150 tons, and a 22½-ft. diameter, seven-hearth, Wedge mechanical roasting furnace. Crude oil will be used as fuel for the roaster.

EARLY FUTILE ATTEMPTS TO TREAT SULPHIDE ORE

The long delay in the development of the mine was due to the peculiar mineralogical composition of the deposit and consequent difficulty of treatment, rather than to any lack of ore. The form in which the gold occurs is not known. The 75-ton mill that was erected in 1912 was an all-sliming cyanide plant constructed by the Associated Milling Co. for treating the ores from the White Caps and other Manhattan properties. This mill was operated successfully for a year, during which time an average extraction of 92% was obtained. As already stated, the oxidized zone in these properties extended only to a depth of about 150 ft. When this point was reached, it was found that an extraction of over 50% could not be secured by the simple cyanide treatment, and consequently the mill was forced to suspend operations in June, 1913.

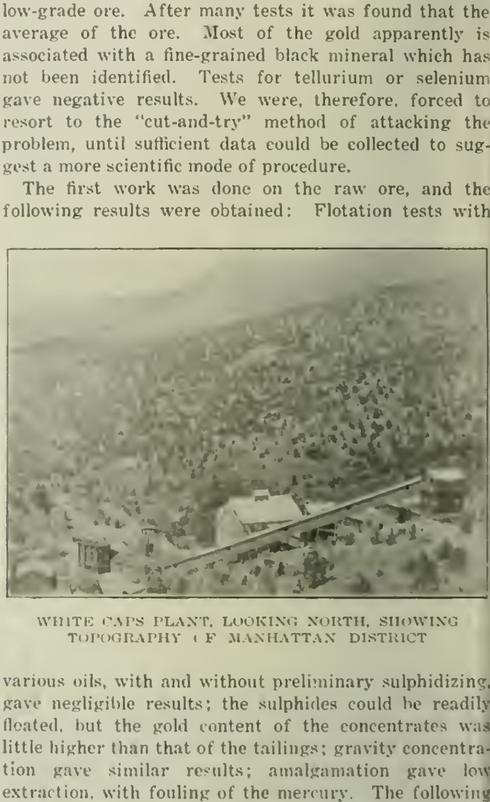
ANALYSIS OF LOW-GRADE WHITE CAPS ORE

Chemical Analysis		Mineralogical Analysis	
SiO_2	43 0%	SiO_2	43 00%
Al_2O_3	0 4	Al_2O_3	0 40
CaO	18 0	$CaCO_3$	32 15
MgO	4 0	$MgCO_3$	9 56
Fe	6 1	Fe_2O_3	3 98
Mn	0 2	FeS_2	7 07
S	4 3	MnO_2	0 32
As	0 6	As_2S_2	0 86
Sb	0 6	Sb_2S_3	0 84
Au	$16 00		

Then followed a period during which various efforts were made to discover some method of treating these base ores. Samples were sent to metallurgists and ore-testing companies, but the results of their tests were apparently unsatisfactory. Since the oxidized ore could be readily treated by cyanide, the idea of a preliminary oxidizing roast was one of the first to be investigated. However, because of conditions which will be explained later, these roasting tests were failures. In June, 1915, I took over the control of the White Caps mine, and exhaustive experimental work was begun, which finally ended in a satisfactory solution of the problem.

The accompanying table gives a typical analysis of the low-grade ore: After many tests it was found that the stibnite carried a small amount of gold, usually ranging from a trace to $2 per ton. The realgar carried more low-grade ore. After many tests it was found that the average of the ore. Most of the gold apparently is associated with a fine-grained black mineral which has not been identified. Tests for tellurium or selenium gave negative results. We were, therefore, forced to resort to the "cut-and-try" method of attacking the problem, until sufficient data could be collected to suggest a more scientific mode of procedure.

The first work was done on the raw ore, and the following results were obtained: Flotation tests with various oils, with and without preliminary sulphidizing, gave negligible results; the sulphides could be readily floated, but the gold content of the concentrates was little higher than that of the tailings; gravity concentration gave similar results; amalgamation gave low extraction, with fouling of the mercury. The following cyanide tests gave unsatisfactory results: Simple cyanide treatment, with various amounts of cyanide, alkali and lead salts; the bromocyanide process; preliminary treatments with caustic soda, sodium sulphide, sodium thiosulphate, cuprous thiosulphate and sodium sulphite; the sodium-sulphide treatment[2] of cyanide tailings; cyanide treatment of flotation tailings; and aluminum-caustic soda desulphurizing, followed by cyanide treatment.



WHITE CAPS PLANT, LOOKING NORTH, SHOWING TOPOGRAPHY OF MANHATTAN DISTRICT

CONCLUSIONS FROM THE TESTS

From the above tests the following conclusions wer drawn: (1) The gold is not in a free state, since i cannot be amalgamated nor dissolved by cyanide ev after the arsenic and antimony sulphides are remove by flotation or by preliminary treatment with alkalin sulphides; (2) the gold is probably not associated wit the sulphides, nor combined as a telluride, as both grav ty concentration and flotation were unsuccessful; (3) t is possible that the gold is combined with the manganese, but there is not enough data at present to varrant any definite conclusion; (4) it is known that rsenic and antimony sulphides and manganese compounds are all, under some conditions, detrimental to yanide treatment and also that roasting is the common nethod of handling these substances.

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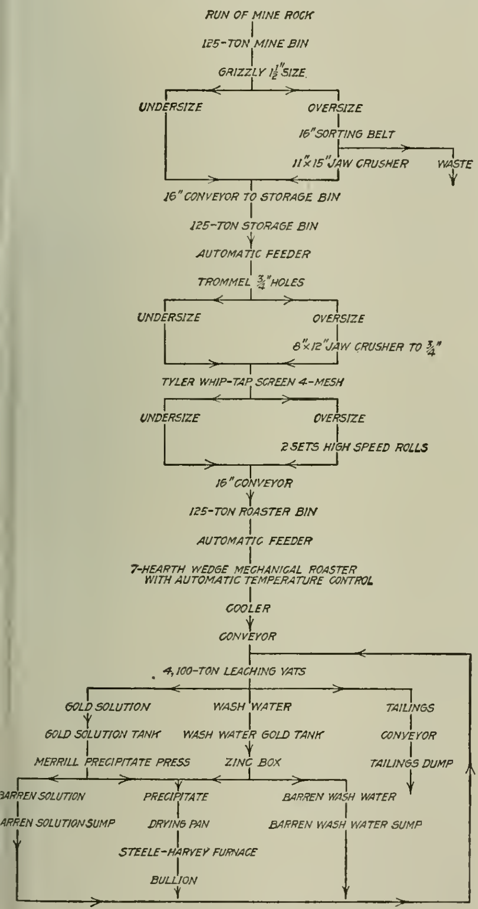
[1] A new mill embodying this process has lately been put in operation

[2] Described by W. R. Feldtmann, Bull 127 I. M. M., Apr 1915

The calcines from an ordinary oxidizing roast at a emperature of 1500° F. yielded less than 50% extraction to cyanide treatment. The calcines contained



FLOW SHEET OF WHITE CAPS MILL AT MANHATTAN, NEVADA

noxidized antimony sulphide. Addition of lead acetate as of little benefit. Treatment with caustic soda and horough water washing, followed by cyanide treatent, gave better results, but the process was not ommercially feasible. Chlorination was not considered racticable, because of the limestone gangue.

Specimens of pure stibnite were then roasted, and he following conditions observed: The oxidation of he stibnite was slow below a temperature of 800° F., ut at this point the oxidation became rapid, and fusion took place at 850° F. After fusion, complete oxidation did not take place during eight hours of continuous rabbling at a temperature of 1600° F.

By careful temperature control, it was possible to oxidize the stibnite completely in six hours. This same procedure was followed with the ore, and good results were obtained by cyanide treatment of the calcines. Pure stibnite added to a duplicate of the above test lowered the extraction nearly 50%. However, a roast of six hours under Manhattan conditions would be expensive, and such accurate temperature control would be almost impossible.

It was found that stibnite was very slightly soluble in a pure dilute cyanide solution, but readily soluble in a caustic alkaline solution. Consequently, by keeping the temperature below 1050° F. (the decomposition point of calcium carbonate) the formation of caustic lime could be avoided and it would be possible to treat the ore with practically a neutral cyanide solution, which would not dissolve the antimony sulphide. The ore was, therefore, given a one-hour roast under the above conditions, and agitated in a neutral 2-lb. cyanide solution for one hour. An extraction of 90% with a cyanide consumption of less than ½ lb. was the result.

Leaching tests were next tried on the same type of calcines, and it was found that practically the same extraction could be secured by leaching a four-mesh product for 15 hours. A series of tests, re-using the same solution after zinc precipitation, showed no fouling of the solution and no difficulties in precipitation. Due to the excess of calcium sulphate formed during the roast, the slimes settle rapidly without the use of lime. After these results had been fully verified, plans were drawn up for the 150-ton mill, the details of the process being given in the accompanying flow sheet.

From roasting tests made on the ore by the Wedge Mechanical Furnace Co., it is estimated that the fuel-oil consumption will be less than 4 gal. per ton. On this basis the total milling cost, including crushing, roasting and cyaniding, will be approximately $2 per ton. The extraction should be about 90%. I take this opportunity to acknowledge the valuable assistance rendered by D. B. Bradner, whose untiring work developed the data from which a solution of the metallurgical problem of the White Caps ore was possible.

Platinum Metals Co. Not Employed on Government Work

Because of reports that the Platinum Metals Co. of Philadelphia, Penn., is testing platinum-bearing materials for the Government, the U. S. Geological Survey has pointed out that, although the Survey is studying the platinum deposits of the United States, it has sent no materials to the Platinum Metals Co. for testing. Furthermore, it has not investigated the so-called "amagnite process" for saving platinum, though it has received a few samples of so-called "amagnite" from the company. Included in the advertising matter issued by this company is a copy of a letter addressed to the Survey's specialist on platinum by the company itself; the Geological Survey announced that no statement in this letter is indorsed by a Government official, even if this impression may be created.

Industrial Uses of Antimony*

By K. C. Li†

The industrial applications of antimony are principally as an alloy, the three most important being babbitt metal, type metal and Britannia metal. Antimony compounds, especially the oxides, are used in enameling and as pigments; the sulphide is extensively used in coloring and in vulcanizing rubber.

Antimony is one of those metals which have been brought into great prominence by the deplorable war now raging in Europe, but apart from its destructive uses in warfare it has numerous other uses which have proved beneficial to commerce and to mankind generally. I shall discuss the latter in detail beginning with the better-known uses and passing on to those which are not so well known. Pure antimony is hard but brittle and on that account cannot well be used alone for manufacturing purposes. It therefore is commonly employed as an ingredient of certain alloys. The principal uses of antimony may be enumerated as follows:

1. Babbitt Metal. The best known of the antimony alloys is what is generally known as bearing or babbitt metal. This is an alloy composed of tin, antimony and copper mixed together in varying proportions depending upon the amount of pressure likely to be brought to bear upon the metal. As its name indicates, it is used for making machine bearings, the qualities of which should be hardness, toughness, and smoothness. The antimony gives the necessary hardness, while the tin and copper render the metal tough, and enable it to take on a smooth surface. A large number of compositions for babbitt metal have been given in books and papers, and I will cite only one or two.

BABBITT OR WHITE METALS

	Sb	Pb	Sn	Cu	Zn
Light loads	12%		80%	8%	
Heavy loads	8%		90%	2%	
Medium loads	16%		76%	8%	
Heavy axles	18%		72%	10%	
Light axles	77%		17%	6%	
Very hard metal	82%		12%	4%	2%
Magnolia metal	16.5%	83.5%			

2. Type Metal. Next to babbitt metal in importance comes the well-known alloy called type metal. This is a composition of lead, antimony, and tin. Type metal must have the type clear-cut and of sufficient hardness to resist the pressure of printing. The antimony gives the necessary hardness and also helps to perfect the molding of the letters. The usual formulas of this alloy are given in the accompanying table.

COMPOSITION OF TYPE METALS

	Sb	Pb	Sn	Cu	Zn
French	30%	55%	15%		
Hard lead	20%	80%			
No. 1 English	18%	62%	20%		
Monotype	19%	70%	11%		
Stereotype	14.8%	80.7%	4.8%		
Linotype	12.5%	85%	2.5%		

3. Britannia Metal. A third alloy of antimony which is fairly well known is that named Britannia metal. It is an alloy consisting of tin and antimony containing up to 20% of antimony with small percentages of copper or other metals. The metal is used for making teapots, spoons and various other articles for domestic use. In this alloy antimony is again used for its hardening effect, and probably also because it is practically a non-oxidizing metal and renders the alloy less susceptible to rust. The compositions mentioned in the table are common, but there are many others with only slight variations.

COMPOSITIONS OF BRITANNIA METALS

	Sb	Pb	Sn	Cu	Zn
English	10%		86%	1%	3%
Best	10%		90%		
German	9%		84%	2%	5%
German (for castings)	64%		20%	10%	6%

I canvassed a number of antimony consumers for the purpose of ascertaining what use they made of antimony and the information elicited by these inquiries may prove interesting.

Minor Applications of Antimony

4. Battery Plates. Several manufacturers of accumulators and storage batteries use antimony in the manufacture of the grid or framework of the battery plates. The antimony is mixed with lead in varying proportions according to the class of work for which the battery is used. The addition of antimony serves a double purpose: It strengthens the framework and at the same time reduces the weight slightly.

5. Toys. Antimony is used to some extent in toy making, and one toy maker stated that antimony was used for the following reasons: "Toys cast of pure lead are heavy and bend easily. By adding antimony the weight is reduced and the strength is increased to such an extent that the toys can be made thinner, thus using less material. From 3 to 25% of antimony may be used."

6. Siphon Tops. Another inquiry brought out the fact that antimony is used to harden the tin employed in the manufacture of siphon tops.

7. Cable Covering. I have recently been informed that a large Canadian concern has carried out a series of experiments to determine whether antimony could be used instead of tin in the manufacture of lead-covered electric cables. It is said that these experiments have been successful, and if so, it means the opening up of a new field for antimony. The substitution of antimony for tin always leads to a large reduction in cost.

8. Shrapnel. Antimony at present is most extensively employed in the manufacture of ammunition. It is used in the making of chilled shot as well as for most bullet mixtures. Its chief purpose is as a hardening agent. In shrapnel bullets lead is required to give the necessary weight, and antimony is added to make the bullets sufficiently hard to withstand the shock caused by the explosion of the shell. The amount of antimony is from 12 to 25%. An 18-lb. shrapnel shell contains about 8 lb. of bullets, the composition of the bullets being about 82½ parts lead to 12½ parts of antimony

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*Excerpt from a paper entitled "Antimony, Its Metallurgy and Uses," read before the American Institute of Metals and reprinted from its "Journal," Vol. 11, No. 1.

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There is therefore about 1 lb. of antimony in an 18-lb. shell. When one considers the millions of shrapnel shells that are being made at present, one can easily understand the present activity in antimony.

9. Hard Lead. Antimonial lead, or "hard lead," is now being extensively used in acid works in making pumps and pipes, and is also replacing soft lead in the lining of acid-proof chambers. Other uses, as for coffin metal, etc., of less importance, are omitted here.

USES OF ANTIMONY COMPOUNDS

1. Antimony White Oxide. A large number of experiments have been carried out with the object of substituting antimony oxide for tin oxide in the making of enamels. The experiments were in the beginning not especially encouraging, but ultimately it was found that antimony oxide could be used with success. In order to produce a satisfactory antimony-oxide enamel much greater care must be exercised than in the case of tin-oxide enamels. This extra care is rendered necessary, first because of the difficulty of controlling the color; second, because of the liability of dark specks to appear; and, third, because of the danger of poisoning. The whole subject of antimony-oxide enamels was ably discussed in a paper read before the American Ceramic Society in February, 1915, at Detroit, by Prof. Homer F. Staley. I take the liberty of quoting a summary of his paper: "Oxide of antimony enamels of good gloss can be made from three types of formulas: (1) The high boric oxide, no lead type; (2) the medium boric oxide, no lead type; (3) the low boric oxide, lead-bearing type. With reference to color, oxide-of-antimony enamels contain three color components: (1) Tan, probably due to sulphur and fading as the smelting continues; (2) a yellow, due to lead oxide and persistent; (3) a blue, due to combination of antimony oxide, boric oxide, calcium and fluorine, which grows more intense as smelting continues. Opaque whites are produced by controlling the heat treatment and composition so that the tan and yellow are neutralized by the blue. The dark specks in antimony-oxide enamels are due to contamination with organic or metallic dirt after the enamel is smelted. The remedy for this s extreme cleanliness."

SULPHIDE USED IN RUBBER INDUSTRY

2. Antimony Sulphide. Rubber vulcanizing is a process n which there is an increasing demand for an antimony compound. Vulcanized rubber is used for various purposes, chief of which is the insulation of electrical conductors. The red trisulphide of antimony is fused with sulphur, thus being converted into pentasulphide. The product is dissolved in a solution of sodium sulphide, and on the solution being evaporated the pentasulphide crystallizes out as a red powder. In the vulcanizing process this powder parts with the excess of sulphur and is reduced again to the trisulphide, which mixes mechanically with the rubber, giving a red color.

3. Pigments. Still another field in which antimony compounds have been used is in the manufacture of pigments or paints. Many different colors and shades of color are obtained from antimony compounds. When roasting furnaces (as in Herrenschmidt's method) are used for antimony smelting, trioxide of antimony is formed as a fine, white powder in the flues and dust chambers of the furnaces. It may be collected in this form and used as a pigment without further treatment. This product is commonly called "antimony white." This paint can withstand the action of water, is durable for outside work, is non-poisonous and comparatively cheap.

"Antimony black" is a pigment used for bronzing metals and plaster casts. It is metallic antimony which has been deposited electrically or chemically as a fine powder from a solution containing antimony. A fine vermilion color is obtained by precipitating the red trisulphide of antimony from solution, with sulphuretted hydrogen. As a pigment the antimony vermilion is in many ways superior to red oxide of lead, red chromate of lead, or mercury vermilion. Antimony vermilion is a pigment specially suited for oil painting, and its low cost and covering power render it advantageous for carriage and house painting. A yellow pigment is produced by the slow oxidation of antimony sulphide. This is called "antimony yellow." Various shades of yellow can be obtained by mixing different proportions of antimony yellow with other mineral compounds.

4. Glass Making. When antimony tetroxide is fused with antimony sulphide in suitable proportions, the resulting product is the trioxide, which always contains more or less of the sulphide. The color of the impure trioxide varies according to the quantity of sulphide it contains. This is known as "antimony glass" and is used as a coloring matter in glass making and in the preparation of the yellow background and of carnation in the decoration of pottery.

5. Safety Matches. Still another antimony compound is used in the process of making safety and wax matches, as well as in the composition put on the side of the box for the purpose of striking the matches. The heads of the matches contain about 3% of the trisulphide of antimony, while the composition on the box contains about 8% of the same material. The antimony trisulphide used is in the form of powdered antimony crude.

There are several other uses to which antimony and antimony compounds may be put, but these have not attained sufficient commercial importance to warrant their discussion at present.

Employer's Liability in Arizona

BY A. L. H. STREET*

Under the Arizona statute an employer is liable for injury sustained by his employee, regardless of negligence, if the employee was not himself at fault. The supreme court of the state recently affirmed judgment in favor of a mine employee who was injured by the escape of compressed air used in ventilating the mine, when he opened a valve under circumstances which involved no contributory negligence. (Inspiration Consolidated Copper Co. vs. Mendez, 166 Pacific Reporter, 278.) The law is upheld as being a valid measure, subject to exemption of liability where the injured employee has been guilty of contributory negligence or has disregarded plain warning of danger given him by his employer.

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Collahuasi La Grande Copper Mines, Tarapacá Province, Chile

By PAUL T. BRUHL*

The Collahuasi La Grande mines, owned by a French company, are in a rugged region of the Andes, at about 16,000-ft. altitude. Igneous rocks predominate and lodes are generally faulted, the dip varying considerably. Orebodies are irregularly distributed lenses or chimneys. High-grade ore carries 22.5% Cu, but during the war 11% ore yields a profit. Simple concentration is now employed, but it is believed that flotation might render available large deposits of 5% copper ores.

THE Collahuasi La Grande mines are situated in the province of Tarapacá, Chile, about 50 km. by rail north of the important seaport of Antofagasta, and are under the direction of the Société Française des Mines de Cuivre, a French company with head offices in Paris. As the mines are at an altitude of nearly 16,000 ft., the trip is best made in three stages. The first stop-over is at Calama (8000 ft.) and the second at Ollagüe (12,000 ft.). It is unwise for a man not accustomed to high altitudes, even though he be physically fit, to be impelled by the desolation of a dusty landscape and the many inconveniences of the hotels to make the journey a continuous one, for if that be attempted he lays himself open to a possibly fatal attack of *puna*, or mountain sickness.

OLCA VOLCANO, ALTITUDE 17,500 FT. IN PROVINCE OF TARAPACA, CHILE

The scenery at the mines is wild and rugged, and similar to that of some parts of the State of Nevada. The vegetation consists of semicircular tufts of a coarse grass, and in the warmer months a few small flowering plants are found in the valleys. In the district are five volcanoes, ranging in height from 17,000 to 20,000 ft. Three of them are active, as they emit fumes, and two are extinct. Andesites, porphyries and felspathic rocks are the principal formations in the district. The lodes are usually faulted at points where they are traversed by dikes of quartzose porphyry, diabase and diorite, which in general have a northeasterly strike. The orebodies are irregular in occurrence, and are usually i the form of great lenses or rich chimneys, some of the latter containing perhaps a thousand tons of 35% ore The various lodes dip and strike at different angles and the same lode may dip in opposite directions within a short vertical distance. The entire district, fo a few miles round the principal claims, shows surfac indications of copper, and numerous prospecting shaft have been sunk, but without disclosing deposits of value Some of the samples taken a few feet below the outcro assayed between 20 and 30% copper, but as the or deteriorated in grade at shallow depth, further sinkin was abandoned. There is a well-defined silver-bearin lode near-by, which was worked about 15 years ago, th hand-picked ore being carted for treatment to a 1 stamp mill. The average of a number of samples whic I took in the old workings was 2 oz. of silver per to and a selected specimen assayed 14 oz. of silver, wit a trace of gold. A high-grade sulphur deposit is worke on the northern slope of the volcano of Olca,[1] east which mountain lie extensive "bad lands."

The following ores of copper are found in the min of the district: Silicate of copper, copper glance, bo nite, chalcopyrite, brochantite, cuprite, tenorite a olivenite. Native copper has also been found, but unimportant quantities. Prior to the war only t deposits assaying 18% copper were considered profi able; contracts were made later for 11% ores. typical analysis of the high-grade ore is: Cu, 22.5%

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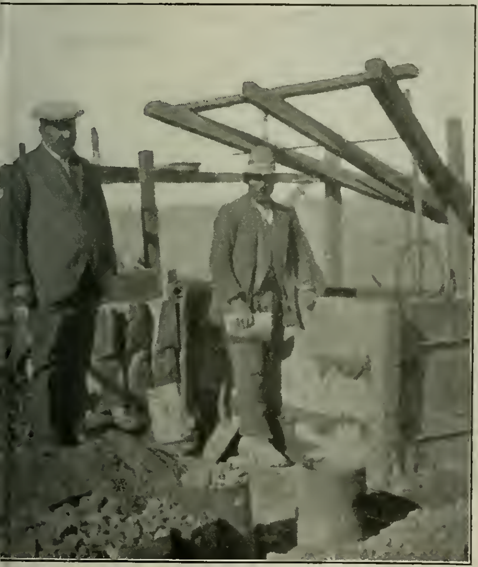
*Care of Nevada Consolidated Copper Co., McGill, Nev.

[1] [The sulphur deposit was mentioned, and the summit of t volcano illustrated, in the "Journal," pp. 289-293, Aug. 12, 1916. Editor.]

iO$_2$, 49.5; Fe$_2$O$_3$, 7.9; Al$_2$O$_3$, 1.5; CaO, 1.25; S, 3.85, oisture, 1.25; Ag, 9.8 oz.; Au, 0.1 oz. The ore in one f the mines at times assayed 2% Mn, and in another 5% Fe$_2$O$_3$.

The ancient method of mining was of the crudest escription, consisting of a network of burrowings in he richest portions of the lode. At present, overhand toping is practiced in an orderly and methodical way. 'he drums at the primitive shafts are vertical, and otated by mules harnessed to horizontal beams fixed t the base of the drum. The modern shafts are quipped with steam-driven hoists. Elaborate pumping nstallations are unnecessary, and little timber is reuired, especially in the upper levels, where the ground frozen for many months in the year. In the early ays the ore was carted over the company's road to the ort of Iquique. A branch line from the Antofagasta & olivia Ry. now runs directly below the bins. The con- act system at first in vogue has been replaced by a stem of piecework. Men working in ore are paid much per ton of ore placed at the surface; men in rren ground so much per running meter, and bonuses e given. Shift pay is inadvisable underground unless ere is ample supervision. The Boliviano is the most itable miner, as he is accustomed to high altitudes d is a steadier worker, and more easily handled, than e independent Chileno. The government stipulates e proportion of Chilean labor to be employed.



MARITATA, OR HAND JIG, USED AT THE COLLAHUASI MINES, CHILE

Recovery by Concentration Is Low

An aërial tramway connects the main shaft and dump th the mill, which is situated over the hill in the lley beyond. On the dumps are about 90,000 tons of % copper ore. The mill has a simple flow sheet, the uipment consisting of crushers, jigs, Wilfley tables, d Frue vanners. The heads ran about 8% Cu, the tailings 4 to 5% Cu, and the concentrates 20 to 25% Cu. The recovery could undoubtedly be improved by fine grinding of the jig tails and table middlings, and sending them, together with the vanner slimes, through a flotation machine. Preliminary tests showed that the copper content of the tailings could be reduced to 0.75%. There is a good deal of impregnated quartz assaying 4 to 6% Cu, which it is impossible to concentrate. The plant had to be closed down owing to the scarcity of *llareta*—or *yareta, fungus cordillerensis*—a fuel of fair calorific value but high in ash. The installation of oil burners beneath the boilers has permitted, I am told, resumption of milling activities. The dumps have been sorted over roughly from time to time, and the product has been treated on *maritatas* or hand jigs. Sorting is best carried out in the spring and summer months, as during the thaw the sulphide particles, which have been fractured during the winter, fall away from the gangue. For this reason the dumps are said to "grow."

In two of the *quebradas* or valleys are old slag heaps and small reverberatory furnaces, said to have been erected in the early days of the Spanish conquest, but I do not consider this likely, owing to the remoteness of the region and the modern design of the furnaces. The slag assays from 3 to 4% Cu, which is not bad practice, considering the poor quality of the fuel. It is hand-jigged to give a 17% product, 11% of which is in the form of metallics.

Sampling of the Ore

Each car is loaded with about 260 sacks of ore, with a total weight of 20 to 21 tons. When the carload comes solely from the yard crusher, every twelfth sack is set aside for the sample. At times, however, a load may consist of ore from three different mines, as, for example: Mine *A*, 160 sacks; mine *B*, 60 sacks; mine *C*, 40 sacks. Twelve sacks are taken of each lot. Mine *A* sample is reduced by hand to 6 sacks, mine *B* to 2½ sacks, mine *C* to 1½ sacks, and the correct amount by weight goes, after reduction to ¼-in. size, to a small automatic sampler. A relatively larger initial sample is taken from mines *B* and *C* than from mine *A*, because the sacks from them contain ore of varying grade. The assay values as determined at the mine agree reasonably closely with those resulting from a sample taken in Europe. The ore sent in by contractors is handled in the same way, 10% of the sacks being reserved for sample. Ore trammed in from the main shafts is scoop-sampled as it enters the bins. When a contractor employed at jigging the dumps wished to make a consignment, a sample was taken at the dumps by quartering 10% of the cans, which were not taken at random, but so selected as to give a fair and representative sample. This first sample was taken to see whether the picked ore and the jig concentrates were of high enough grade. If the assay proved to be satisfactory, the ore was weighed and passed to the bins, where a second sample was taken as a check on the first and as a safeguard against the addition of poor ore after the first sample had been obtained. The two assays agreed closely.

To sample the unsacked ore loaded from the bins into gondola cars, a slot 4 in. square (large enough to take the largest piece of ore), was cut in the floor of the chute and provided with a three-sided baffle and a small chute leading to the sampling floor. By this means 10 to 20% of the ore can be taken for the sample, depending on the rapidity of loading. Crude as the method undoubtedly is, it nevertheless yields satisfactory results for a big shipment. The cyanide method was used in making the copper determinations, except in the case of the ores from one of the mines when interfering elements were present. The monthly composite sample of the ore despatched for shipment was assayed by both the cyanide and iodide methods.

BOOKKEEPING IN THE TECHNICAL DEPARTMENT

Four books are used. No. 1 is the "metal book," which states day by day the weight of ore brought in, from where and by whom, together with the assay value. The book enables one to see at once the month's output on any particular date, and also the quantity of ore despatched. Book No. 2 has a numbered page for each miner, which is subdivided as follows: Tons of ore; meters driven; a number referring to book No. 3; price; and sum earned. Book No. 3 contains in the opening pages the contracts for "meters driven," and, further on, the tons of ore sent in by each *cuadrilla* or gang. It contains the total work done and sum earned by the gang. The sum to the credit of each individual member is entered in book No. 2. The page is subdivided as follows: Names of *cuadrilla;* tons of ore; price; total; a number referring to book No. 1; and the number of each man in book No. 2. Book No. 4 gives in alphabetical order the name and number of each miner in book No. 2.

The monthly cost sheet is presented in the following way: Leaf (A) total exploratory work; (B) total costs of mine "X"; (C) total costs of main ore yard per ton of ore; (D) total costs per ton placed in the yards of the various mines; (E) total costs per ton placed on the railway; (F) total costs per ton of ore handled on the property; (G) distribution of workshop expenses; leaf (H) all other expenses.

Employees are paid every two or three months so as to minimize loss of time due to the celebrations which go hand-in-glove with payday. Too scrupulous an observance of the numerous fiestas of the Spanish calendar is not permitted; the officially recognized holidays being the independence days of Peru, Bolivia and Chile, and Christmas.

The climate is healthful, cold and dry. Carcasses of animals do not putrefy on exposure, but, gradually becoming desiccated, are scattered by the wind. Radiation is sufficiently intense to cause the skin to peel off at the end of a day's outing. The snowfall is not usually heavy, and the snow does not lie long on the hillsides. The wind rarely attains a high velocity, corresponding in general to the figure 3 in the Beaufort scale,[2] in which 12 is regarded as a wind of hurricane force. During the 15 months I spent in the district it seldom rained, the upper atmosphere being cold enough to cause a precipitation of all moisture in the form of snow, hail, ice needles or frost. The last, I noticed, lay most thickly on a granitic formation across the valley. The electrical phenomena are interesting. To comb or brush one's hair, unless it has been well wetted, is at times impossible. A dull glow can be produced by merely crumpling a piece of paper, and a spark obtained by placing a finger ⅛ in. from a brass bedstead. The removal of a woolen vest recalls memories of an enthusiastically observed Fourth of July. At certain periods of the year the lightning storms are both violent and dangerous; usually, however, the lightning is of the *resplandores* type—that is to say "heat lightning"—close to the horizon and in the vicinity of the active volcanoes. Earthquakes are infrequent and of low intensity. The barometer remains generally between 380 and 385 mm. (15 and 15.2 in.) mercury pressure. The game in the district includes duck, wild geese, partridges, an occasional ostrich, rock rabbit and vicuña.

PILE OF "FUNGUS CORDILLERENSIS," USED AS FUEL IN SOME CHILEAN MINING DISTRICTS

Observations have been made on the probable causes of *puna*, and although no definite conclusion was reached, it was thought that the malady develops from the effect on the blood of the intense radiation. It is not due directly to altitude, as in Bolivia the Indians speak of a *puna* belt above which no ill effects are noticed. The symptoms are either a great dizziness or an agonizing headache, which may be relieved by purgatives and a few drops of ammonia in a glass of water.

Tarapacá offers many attractions to capital. The copper deposits are of great extent, and large quantities of ore assay over 5%. The sulphides of copper occur in sufficient quantity to justify the installation of a large flotation plant, as they are easily floated and yield high-grade concentrates.

National Rivers and Harbors Congress will hold its fourteenth annual convention at Washington, D. C., Dec. 5-7. Its slogan is "Use the waterways and win the war."

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[2] This value of 3 is regarded as equivalent to a wind velocity of about nine miles per hour and is sometimes rated as "gentle breeze."

Metallurgy of Titanium Ferroalloys[*]

Titanium alloys are manufactured from rutile, ilmenite and titaniferous magnetite, the first-mentioned being the most important commercial source. Extended use of titanium alloys in steel metallurgy largely due to A. J. Rossi. Titanium acts as a deoxidizer and denitrogenizer and has great affinity for slag. Effects in metallurgy of iron not yet clearly established.

IT IS a singular fact that whereas in most instances a commercially successful product is the result of the labor of many men, the wide use of ferrotitanium is directly due to the work of one man, A. J. Rossi, dean of titanium investigators. The service that titanium in the form of its ferroalloys renders to the iron and steel industry is one that is becoming more indispensable as the demands for quality become more exacting. A large industry has been reared upon the exploitation and sale of such an alloy and in another plant it is one of the principal products made. The success of Rossi after many years of endeavor is sure to reawaken the latent interest in other of the now more or less rare elements, including boron, calcium, strontium, barium, zirconium and others.

Elemental titanium has not been used to any extent but its alloys have found far-reaching employment in the metallurgy of iron and steel and in nonferrous work. Recent developments in the use of the electric furnace, with its concomitant high temperatures, have encouraged the exploitation of processes for the reduction of titanium from its mineral ores, as well as the manufacture of titanium alloys on a large scale.

Rutile, Ilmenite and Titaniferous Magnetite Are the Commercial Sources of Titanium

Titanium is a constituent which is characteristic of certain pyrogenetic compounds. The commonest occurrences are as ilmenite, $FeTiO_3$; rutile, TiO_2; titanite, $CaTiSiO_5$; and perofskite, $CaTiO_3$; and it is often concentrated in beds of titanic iron ore. The source of commercial titanium is confined exclusively to the titanium ores, namely rutile, ilmenite and titaniferous magnetite, the most important of which at present is rutile. The known distribution of rutile in commercial deposits is limited indeed; the more important ones are confined to two localities in Virginia and one each in Canada, Europe and Australia. In Norway the mineral is found as a large aplitic dike near Kragero on the southeastern coast. The only commercial occurrence of rutile in Australia is near Mt. Crawford, but other non-commercial occurrences are known. The rutile deposits of Virginia are described at length by T. L. Watson and S. Taber in a bulletin, "The Titanium and Apatite Deposits of Virginia." These deposits are of particular interest because of their scientific and commercial importance and are at present the only known workable rutile deposits in the United States. Practically the entire production of rutile in Virginia has been turned out by the American Rutile Co. in its mill at Roseland.

A large number of binary and a few ternary alloys of titanium have been investigated by metallographic methods but the only alloys on the market for commercial consumption are ferrocarbon-titanium, ferrotitanium, cuprotitanium and manganotitanium. The alloys of titanium with iron were the first to receive marked attention, and of late years their use has increased largely, particularly by reason of their being employed as purifiers in iron and steel metallurgy.

As already stated, the present presence of titanium as an active agent in the iron and steel industry is directly due to the labors of A. J. Rossi, who has devoted some 30 years in this field. Abroad, H. Goldschmidt brought out the first successful practical process for the reduction of titanium from its ore by means of his now well-known alumino-thermic method.

Reduction of Titanium from Ores

Closely related to the subject under discussion may be mentioned the important problem of the reduction on a large scale of titaniferous magnetites which confronts American iron makers. Large bodies of easily mined titanium-bearing magnetites have been discovered from time to time, and a considerable mass of literature is at hand dealing with their geological occurrence and probable economic value. The approach, in the not far-distant future, of the possible exhaustion of the deposits of nontitaniferous iron ores and the present use in blast-furnace plants of lower-tenor iron ores point the way to the necessity of turning to the titanium-bearing material for smelting.

The general feeling among works managers is that iron ores containing in excess of 1% of titanium are difficult to smelt in the furnace in spite of the demonstrations of Rossi and other workers to the contrary. The recent able dissertation[1] by Joseph T. Singewald, Jr., gives the most complete and latest account of the situation. Prominent workers in the titanium field, in addition to those already mentioned, have been Haanel, Forbes, Corse, Comstock, Waterhouse and others.

Rossi's Early Work

For the sake of clearness it is well to distinguish between the two most prominent titanium alloys on the market; these are the ferrocarbon-titanium of the Titanium Alloy Manufacturing Co., Niagara Falls, N. Y. (the Rossi interests), and ferrotitanium, the carbon-free product of the Goldschmidt Thermit Co., New York. Rossi's work, leading to the production of what is now known as ferrocarbon-titanium, is summed up for brevity in the following: He procured a patent in 1892 pertinent to the reduction of titaniferous ores in the blast furnace; shortly afterward he attempted to make an iron-titanium alloy in the blast furnace and crucible but was unable to obtain a product rich in titanium. Experimental work conducted with the electric furnace resulted in the production of a commercial iron-titanium alloy for use in steel and iron metallurgy.

The carbon-free product of the Goldschmidt Thermit Co. contains from 5 to 6% of aluminum alloyed with the titanium. This alloy has been used for a number of years in European steel works as a final deoxidizer in casting practice. The titanium alloys, when made by the alumino-thermit process, are more expensive than those made in the electric furnace, and this is a cogent factor militating against their use.

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[*] By Robert J. Anderson in "Iron Trade Review," Aug. 16, 1917, by courtesy of the publishers.

[1] Bull. 65, U. S. Bureau of Mines, Washington, D. C.

Ferrocarbon-titanium contains from 5 to 8% of carbon, mostly in the form of graphite, the combined carbon being present in small amount. Analyses show the relative amounts of combined and graphitic carbon in four samples of this material to range from 6.234 to 9.601% of graphitic carbon and 0.118 to 0.147% of combined carbon.

The ferrocarbon-titanium has an average analysis as follows, according to the manufacturers: Silicon, 1.41%; titanium, 15.79; carbon 7.46; manganese, 0.11; aluminum, 0.80; phosphorus, 0.05; sulphur, 0.08; iron (by difference), 74.30; total, 100%. The alloy sold is guaranteed to contain at least 15% titanium.

Dr. Goldschmidt has said that carbon-free metals dissolve with greater ease than those same metals containing carbon, because the carbon is present in the form of carbides in the latter. Charles V. Slocum, on the other hand, found that the carbon-free alloy was not at all adapted to the metallurgy of iron and steel in the rôle of a deoxidizer and purifier. Without regard at present as to which view is correct it may be stated that both alloys have found employment. The Goldschmidt alloy has the following average analysis: Silicon, 1 to 1.5%; titanium, 25; carbon, *nil;* manganese, *nil;* aluminum, 5 to 6; phosphorus, 0.05; sulphur, 0.01; and the remainder is assumed to be iron.

MODE OF MANUFACTURE

All of the iron-titanium alloys now made, whether carbon-free or not, are made either by the reduction of titaniferous ore in the electric furnace with carbon, or by the Goldschmidt thermit method, since a method giving 2000° C. or over is required for the reduction of TiO_2. Most of the production is now made by the first-named process. In one of the Rossi processes the reduction may occur in a bath of aluminum, the aluminum, in ingots or any other convenient form, being melted in the electric furnace. Pig iron or scrap iron is then added to the charge, and next rutile is introduced. The temperature of the bath is then raised to a point required to start the reaction whereby the aluminum combines with the oxygen of the rutile. By this reaction

$$3TiO_2 + 4Al = 2Al_2O_3 + 3Ti$$

the rutile is reduced to metallic titanium which alloys with the iron. The product obtained in this manner is practically carbon-free.

In the event that ilmenite or titanic iron ore is used in place of rutile, a much larger amount of aluminum is required to reduce the ferric oxide, thus increasing the cost of manufacture because the iron can be more economically reduced by other methods.

CARBON NOW USED INSTEAD OF ALUMINUM BATH

Where the alloy is prepared by reducing oxide of iron and titanium with carbon in the electric furnace, the product contains from 5 to 9% of carbon, mainly in the form of graphite. Carbon is at present used exclusively by the Titanium Alloy Manufacturing Co., replacing the aluminum-bath method once used. The process is described at length in letters patent, both domestic and foreign. In U. S. Pat. 609,466, Aug. 23, 1898, Rossi specified the reduction of titaniferous ore and rutile by means of carbon in an electric-resistance furnace, with the production of a ferroalloy containing over 5% of titanium and some carbon, the reduction occurring in a bath of molten iron. Titaniferous slag was also to be treated in a similar manner in a like patent. Two years later he patented a process calling for the reduction of titaniferous ores in a bath of molten reducing metal, such as aluminum, in the electric furnace. In 1901 he procured a patent for the concentration of titanium in slag by the reduction of the silicon and iron of a titaniferous ore with carbon, the temperature of the operation being below the fusion point of titanium oxide. Many more patents have been secured by the Rossi interests in recent years.

An iron-titanium alloy is produced at one plant on a commercial scale in a Siemens electric furnace of 500-kw. size. Titaniferous ore, or slag, or rutile is introduced on top of a molten bath of scrap iron or steel. The reduction takes place in the arc, and the product is tapped off. According to Keeney the titaniferous ore charged has this analysis: 34.36% TiO_2; 50.53% FeO; 4.14% SiO_2; and 2.20% Al_2O_3. Slag from the process, if high in titanium, is recharged. The product obtained from the reduction analyzes 10 to 15% titanium; 5 to 8% carbon, and 0.35 to 1% silicon. If this alloy is refined, rutile being employed as a decarbonizing agent, a product is secured analyzing 10 to 15% titanium, 0.35 to 1% silicon, and less than 1% carbon.

USE OF LIME TO REDUCE TITANIUM LOSS

In order to reduce the amount of titanium lost through volatilization, Rossi in a late patent calls for the introduction of lime, CaO, on the molten iron bath, following this with titanic oxide, lime and carbon. This causes a reaction with the metallic titanium according to the following equation which is familiar to all students of this problem:

$$TiO_2 + CaO + 5C = Ti + CaC_2 + 3CO$$

In the Goldschmidt process the metallic oxides, which are to be reduced, are mixed with aluminum in the proper amounts, both oxides and the metal being in a finely powdered state. Ignition with a fuse brings some point of the mixture to the temperature at which aluminum and oxygen combine. Once started, the reaction proceeds to completion with the simultaneous reduction of the oxides.

HIGH ALUMINUM COST IN GOLDSCHMIDT PROCESS

The high cost of aluminum powder and the difficulty of securing a pure product are objections to the process. The reaction which takes place is according to

$$3TiO_2 + 4Al = 3Ti + 2Al_2O_3$$

The reaction may be started over a molten iron bath by the heat thereof. The product given by the Goldschmidt thermit process contains from 5 to 6% aluminum alloyed with the titanium.

In a late United States patent granted to Hans Goldschmidt and O. Weil, Germany, assigned to the Goldschmidt Thermit Co., the methods of making alloys higher in titanium are stated. The purpose of these alloys is to provide a medium for adding a higher percentage of titanium to iron and steel baths, thereby overcoming alleged objections to alloys of low-titanium content. These alloys contain 15 to 35% titanium and 1.5 to 3.5% aluminum, the remainder being iron. The aluminum lowers the melting point of titanium by combining therewith to form an aluminum-titanium alloy, the alloying qualification being thereby increased, so it is stated.

For some reason there has existed a considerable skepticism as to the influence exerted by titanium when used as an additive agent in iron and steel metallurgy. That titanium does not have a profound effect upon steels so treated is shown by the incontrovertible evidence brought out by actual experiment and that gleaned from the apparently trustworthy literature. In general it may be stated that the addition of titanium to steel exerts an important influence on its properties, and its use is to be recommended to steel makers who have regard for the quality of their product.

Titanium's Deoxidizing Power

In the form of one of its ferroalloys titanium is used rather widely at present, and its use bodes to increase although there has been some falling off in its employment for the treatment of bessemer-rail steel. As a final deoxidizer and denitrogenizer in the metallurgy of steel, it follows the usual treatment for these objects with ferromanganese, or spiegeleisen, and ferrosilicon. Leading metallurgists seem to agree that titanium achieves its remarkable results by reason of its strong deoxidizing powers, together with its effect of giving the slag sufficient fluidity to separate it completely from the metal. The presence of titanic oxide, TiO_2, lowers the fusion point of occluded slags in iron and steel, thereby imparting a fluidity which will account for their removal. The statement that occluded oxides and gases, such as Fe_2O_3, FeO, free oxygen and nitrogen, are undoubtedly the real causes of many of the difficulties of steel makers need scarcely be made. The intense affinity of oxygen and titanium is a sure means for completely deoxidizing a steel, the advantage of which calls for no comment. It has been proved that an ingot of steel containing only a little titanium is practically free from segregation. Bessemerized and Tropenas-converted steels are known to contain the largest amounts of occluded oxides and gases, with openhearth, crucible and electric-furnace steels following in the order named, the reason for this being in their mode of manufacture. Titanium has a strong chemical affinity for oxygen and will remove even traces of it from a bath which otherwise would not be affected by the ordinary deoxidizers. Its property of removing occluded oxidized substances by causing them to separate readily is unique. In removing nitrogen, titanium stands as one of the very few elements which unite with this inert gas. The fact that titanium lessens segregation should not be unexpected in view of the well-known influence of agents which deoxidize and thus quiet a wild metal.

Titanium seems to have but little direct effect upon the constitution or structure of steels. It is known to lower the position of the Ar_3 point but it exerts little influence upon the positions of Ar_2 or Ar_1. Steels containing high percentages of titanium exhibit normal pearlite under the microscope.

The modern method of employing titanium is to augment the incompleted cycle of deoxidation by using one of the iron-titanium alloys after the other deoxidizers have been added. The other deoxidizers may be added either in the furnace or in the ladle, but it is best to add the titanium in the ladle and to give sufficient time for the titanium to complete its scavenging action. Thus the ladle will be held for from 5 to 10 min. prior to pouring so that the entrained slag, which is thus made more fusible, may have time to rise to the surface. There is no opportunity for the bath to chill as the titanium reaction with oxygen is exothermic, giving rise to 215,000 calories. The amount of titanium alloy to be added is normally small and should be proportional according to the quantities of impurities present.

The titanium alloys are added preferably in the ladle of steel after tapping from the furnace but before the slag has commenced to run. For soft, mild steel an addition equivalent to 0.03% titanium is sufficient under normal conditions and, in general, larger amounts may effect increased benefits, but not always.

Titanium in Openhearth Work

In acid openhearth practice ferromanganese and ferrosilicon are added to the ladle as soon as the ladle bottom is covered with hot metal from the tap, as is normal American practice. The titanium addition follows then as soon as possible. As already stated, the titanium addition is to be made before the slag begins to run, otherwise it is difficult to force the alloy down through the layer of slag on top of the bath. The ladle is to be held for 5 to 10 min. so that the impurities scavenged out may have sufficient time to rise to the surface and join the slag. In the event that the titanium alloy is added in the furnace considerable care should be exercised to prevent its contact with the slag, and it should be quickly rabbled into the bath. Tapping of the heat should follow at once, as delay will defeat the object in view. In basic openhearth work it appears expedient to add about 75% of the ferromanganese in the furnace and the remainder in the ladle with the ferrosilicon. The titanium alloy should then be added to the ladle in the manner already described, proper precautions being observed.

Removal of Dissolved Oxygen

In the bessemer process the titanium alloy should be shoveled into the stream of metal as it is being poured into the ladle, the steel having been first recarburized in the converter prior to pouring, as is normal procedure. Since the titanium reacts with vigor with molten silicate slags, the alloy should be given a thorough stirring into the metal before the slag flow starts, otherwise much of it will be wasted and its effect lost. The ladle is held for from 3 to 5 min. before teeming so that the titanium may have time to complete its action and remove as much of the dissolved oxygen, nitrogen and entrained oxides and slag as possible.

Some writers state that the alloys should not be preheated before adding to an iron or steel bath, while others urge the necessity of heating them red hot before using. Practical experience shows that it does the work cold as well as hot, and the general tendency is toward cold use. Whether or not the alloys should be used in conjunction with aluminum has not been fully determined.

Of all the appliances used for the production of liquid steel, the electric furnace admittedly does give a thoroughly deoxidized metal. Whether or not the steel has been deoxidized in the furnace, it will be somewhat reoxidized on tapping into the ladle, and slag will also become entangled with it during this time. For electric-furnace practice, whether acid or basic, it is well to add the titanium alloy during the tapping of the steel into the ladle in the same way as in bessemer and openhearth work, and the ladle is held as usual. In crucible practice the best results have been secured by adding the alloy to the pots before they are removed from the furnace and allowing time for the reactions to take place before the contents of the crucible are poured.

Effect on Cast Iron

The effect of titanium on cast iron has been the subject of much discussion; not a great amount of data is at hand for the accurate solution of the question, but the probabilities are that the element has quite contradictory effects. This is presumed to arise from its varying action with the different impurities present. In an extensive paper, in 1912, before the American Institute of Mining Engineers, Bradley Stoughton recorded data pertinent to the effect of titanium on cast iron, and one particular point to be noted from his findings is that titanium unquestionably reduces the chill. This should not be totally unexpected in view of the action of the metal as a deoxidizer and denitrogenizer. The elements oxygen and sulphur (and probably nitrogen) are productive of chill, and titanium, by removing them, consequently removes their chilling action.

It appears on the whole that not much benefit can arise from using titanium in the metallurgy of iron, but recently its use has been recommended by Dr. Moldenke as worthy of employment for the removal of nitrogen and oxygen where special irons are to be produced. Some metallurgists held for a long time that titanium rendered cast iron tough, probably because the well-known pig iron of Upper Styria contains a small percentage of the element.

Time Allowance for Reactions

In iron-foundry practice, the usual method of employing titanium is to scatter a predetermined amount of a titanium alloy along the runner prior to tapping. Upon tapping, the titanium alloy is washed into the ladle with the stream of iron. As in steel practice, time should be allowed for the chemical reactions to complete themselves, so that the ladle should be held for about 3 min. before pouring. As in steel practice, care should also be taken that the alloy does not come into contact with the slag, as slag attacks the alloy with great avidity, thus destroying its function. Iron may also be treated in the ladle by adding the titanium alloy to the ladle before or during tapping. In small hand ladles it is an easy matter to stir the iron with a rod in order to thoroughly incorporate the alloy. For usual deoxidizing purposes, about 2 to 4 lb. of a 15% alloy per ton of iron proves satisfactory.

L. Treuheit experimented with the effect of additions of 10 to 15% titanium and 25% titanium alloys on iron and arrived at the conclusion that the benefit derived from their use is small. The chief, and seemingly the only, value of titanium in the treatment of iron lies in its ability to deoxidize the metal. The element undoubtedly scavenges from the product of the cupola or air-furnace oxides and occluded gases, as well as nitrides. On this basis a certain given amount of titanium will cleanse any given iron; any less will be insufficient, while any more will not make the iron better.

Experiments by Dr. Moldenke show that the addition of titanium is beneficial in the case of gray iron, but that larger additions do not result in any additional benefit. Only a small advantage appears to have been secured in treating white irons with the element. Dr. Moldenke insists that the titanium addition is of advantage if no more is used than is required for the purpose of deoxidation. The use of iron-titanium alloy in the production of white iron for conversion into malleable castings, however, is considered to be still in the experimental stage.

Practice at the Mt. Champion Mill

By L. P. Weld[*]

The mill of the Mt. Champion Mining Co. is situated about 18 miles southwest of Leadville, Colo., at an elevation of 12,000 ft. It is connected by aërial tramway with the mine, which is at over 13,000 ft. elevation. Deep snow, scarcity of water and difficulties of freighting in supplies make winter operation hard at these altitudes. During the winter of 1915, however, the mill ran steadily, with only one shutdown, lasting a week, which was due to the blowing over of one of the tramway towers by an unusually severe storm.

The mine produces both low- and high-grade ore. The latter is freighted direct to the smeltery, likewise the mill concentrates, only the low-grade ore being milled. The principal value in the ore is gold, with a little lead and silver. The mill heads are extremely variable, making close extraction difficult. During one month the assay fluctuated from 0.16 to 0.62 oz. Au per ton. Of the total recovery about 70% is by amalgamation and 30% by concentration. The ore yields about 4% of iron-pyrite concentrates running from $60 to $90 per ton. The gold seems to be associated with the lead, for as the latter increases in the ore and concentrates the gold in the concentrates also increases.

The system of milling is simple, as will be seen in the accompanying flow sheet. Coarse crushing is accomplished by a No. 4 Samson jaw crusher. Intermediate crushing is done in a 24-in. Symons disk crusher and a 24 x 14-in. set of rolls. The Symons crusher and rolls are in closed circuit with a trommel, only the —3 mesh going to bin C. Both coarse and intermediate crushing are looked after by one man per shift. After running the Samson crusher until bin B is full he shuts it down and starts up the Symons crusher and rolls, running these until C is full. Three hours' run with the Samson crusher and four hours with the Symons crusher keep both bins supplied all the time.

Final crushing is effected by a 5 x 14-in. tire-type tube mill and an 8-ft. Hardinge ball mill. The discharge ends are adjacent, and the discharged pulp flows over three amalgamating units. Each unit consists of two 4 x 4 ft.-6-in. plates, making a total plate area of 108 sq.ft. The plates have a grade of 2¼ in. per ft. which in my estimation is insufficient. The heavy sulphides build up unduly on them and necessitate too thin a pulp and additional wash water to keep them clear. After leaving the plates the pulp passes to a Pierce amalgamator and is then elevated to a six-compartment Richards pulsator classifier, followed by two 8-ft. Callow cones.

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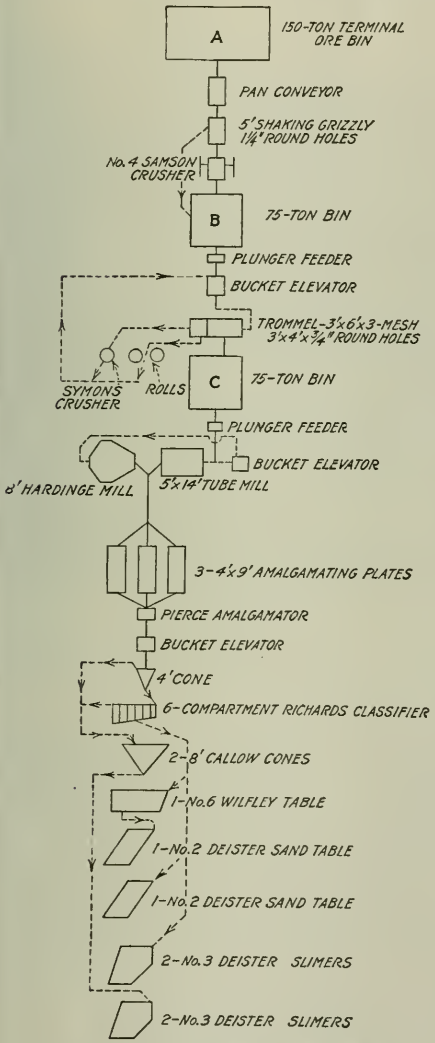
[*] Box 194, Lead, S. D.; formerly head amalgamator, Mt. Champion Mining Co., Leadville, Colorado

Concentration is made upon one No. 6 Wilfley table, two No. 2 Deister sand tables and four No. 3 Deister slimers. Middlings from the Wilfley are retreated upon the first Deister sand table. The tails flow to a 20 x 6-ft. Dorr thickener, which is in a separate building, and a 4 x 6-in. triplex pump returns the overflow to a 6 x 6-in. auxiliary mill-storage tank. The main water supply is from a small creek below the mill, and a 5 x 8-in. triplex pump throws the water into a 7 x 8-ft. mill tank.



FLOW SHEET OF THE MT. CHAMPION MILL

Motors are all of a 440-volt, 60-cycle, alternating-current type, as follows: Samson crusher, shaking grizzly and elevator, one 25-hp. motor; trommel, rolls and Symons disk crusher, one 35-hp. motor; tube mill, one 50-hp. motor; Hardinge ball mill, one 50-hp. motor; seven tables and two elevators, one 15-hp. motor; one 5 x 8-in. and one 4 x 6-in. triplex pump, one 15-hp. motor; one 20 x 6-ft. Dorr thickener, one 7.5-hp. motor. There are thus seven motors in all, having a total of 197.5 horsepower.

One feature, although it is not a new one, is worth mention. This is the use of commercial sal ammoniac upon the plates after the morning cleanup. A small quantity, not over 10 grams, is sprinkled over each plate which is rubbed vigorously with whisk brooms; plates are then washed off with a hose and dressed with quicksilver in the usual manner. Before the introduction of the ammonium chloride, potassium cyanide had been used, and the plates were hard, discolored and nearly bare in spots. Recovery was very low. After the introduction of the chloride, plates quickly assumed a clear mirror-like surface, and recovery increased over 200% on the same grade of ore.

The mill has a capacity of 80 tons per 24 hours and regularly has a crew of 11 men, as follows: One foreman, one amalgamator, three table men, three crusher men, one tramway terminal man, and two roustabouts.

Ray Consolidated Quarterly Report

The report for the quarter ended Sept. 30 of the Ray Consolidated Copper Co. shows a gross production of 21,656,342 lb. of copper, as compared with 22,255,598 lb. in the previous quarter. The monthly production was: July, 7,398,500 lb.; August, 7,281,694 lb.; September, 6,976,058 lb.; the average being 7,218,781 lb. per month.

In addition to the copper obtained from concentrating ores, there was a total of 1,315,814 lb. from ores sent direct to the smeltery. This, combined with the copper in the concentrates, brings the total gross production for the quarter up to 22,972,156 lb., as compared with 23,532,119 lb. for the previous quarter.

During the quarter there was milled 901,300 dry tons, averaging 1.629%. The underground development was 16,159 ft., making a total to date of 624,555 ft. Milling cost was 88.46c. per ton, comparing with 74.69c. for the previous quarter. The average mining cost of ore milled was reported as $1.16898 per ton, of which 5.163c. was the cost of coarse crushing, leaving the net mining cost $1.11735 per ton, as compared with a net cost of 98.257c. for the previous quarter. The higher unit costs are due to higher wages, the increase in cost of supplies and higher state and Federal taxes.

The average cost per pound of all net copper produced is given in the report as 12.795c., compared with a cost of 11.272c. for the previous quarter, and includes a charge of 12.5c. per ton of ore milled, for the retirement of mine development expense and credits to operating costs of dividends from the Ray & Gila Valley railroad, gold and silver produced and all miscellaneous income. A Red Cross dividend of 20c. per share was paid July 25 and on Sept. 30 the regular quarterly distribution of $1 was declared.

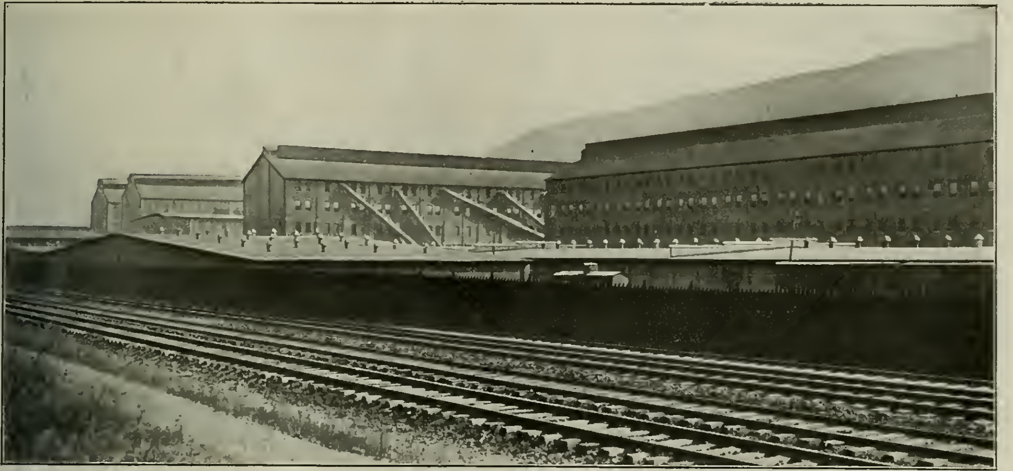
The New Jersey Zinc Company's Ea

SPIEGEL DEPARTMENT OF THE NEW JERSEY ZINC CO.'S WORKS AT PALMERTON, PENN.

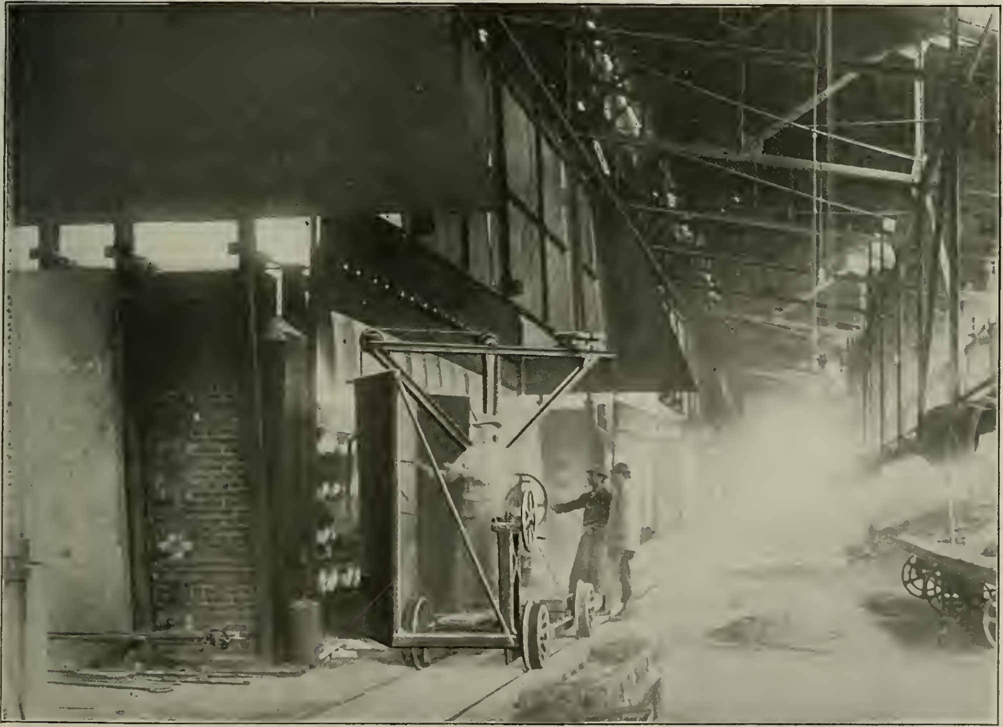
FURNACE BUILDING OF THE EAST PLANT OF THE NEW JERSEY ZINC CO

At its two great plants, the East and West, at Palmerton, Penn., The New Jersey Zinc Co. produces zinc oxide, spelter, spiegeleisen, and a variety of byproducts. The main source of the raw material is the mine of the company at Franklin Furnace, N. J., the ore of which is separated magnetically into one product that is essentially willemite and another product that is mainly franklinite

nd West Plants at Palmerton, Penn.



GENERAL VIEW OF BAG ROOMS OF OXIDE DEPARTMENT, WEST PLANT, PALMERTON, PENN.



DISTILLATION FURNACES AT PALMERTON, PENN., SHOWING OPERATION OF METAL DRAWING

Foreign Trade in Copper

Exports of copper from the United States in July, August, 1917, and the first eight months of the year, are reported by the Department of Commerce as follows:

	July Lb.	Aug. Lb.	Jan.-Aug. Lb.
Ore and concentrates, contents	293,200	351,420	3,855,808
Unrefined, in bars, pigs, etc	277,980		4,146,799
Refined, bars, etc	54,275,337	95,733,812	728,828,592
Old and scrap	2,240	29,752	885,387
Plates and sheets	2,302,153	1,642,529	21,117,561
Pipes and tubes	2,782,255	2,289,320	*a*5,071,575
Wire	1,773,447	1,425,638	18,331,240
Composition metal, copper chief value	7	8,400	*a*8,407
Total	61,726,919	101,480,871	782,536,360

a Figures cover period beginning July 1

The weight of ore exported in August was 4910 tons; no concentrates.

Imports of copper in July, August and the first eight months of 1917 were as follows:

	July Lb.	Aug. Lb.	Jan.-Aug. Lb.
Ore and concentrates, contents	8,686,134	11,814,430	98,368,249
Matte and regulus, etc	797,982	1,632,918	12,890,760
Unrefined, in bars, pigs, etc	10,122,230	34,546,504	249,753,857
Refined, in bars, etc	46,865	1,395,268	5,404,868
Old, etc., for remanufacture	2,488,410	464,068	15,263,845
Composition metal, copper chief value	492,092	161,376	353,075
Total	22,633,713	50,014,564	382,034,654

Importation in August, 34,043 tons ore, 18,158 tons concentrates and 1668 tons matte and regulus, etc.

Ore-Dressing Engineer To Be Appointed at Lake Superior Station

An open competitive examination for ore-dressing engineer is announced by the U. S. Civil Service Commission to fill a vacancy in the U. S. Bureau of Mines, at the Lake Superior station, Minneapolis, Minn. The salary ranges from $2400 to $3600 a year, depending on qualifications. The duties of the appointee will be to conduct investigations having for their object improving conditions in ore-dressing and metallurgical operations of the district, especially with a view to preventing unnecessary waste of resources, the beneficiation of low-grade iron ores, the utilization of manganese ores, especially those high in phosphorus, and otherwise contributing to the advancement of these industries.

Competitors will not be required to report for examination at any place, but will be rated on the following subjects, which will have the relative weights indicated, on a scale of 100: (1) Education, 30; (2) professional experience, 50; (3) publications, reports, or thesis (to be submitted with application), 20. Applicants must have been graduated in a course in mining engineering or metallurgy in a college or university of recognized standing, and have had at least five years of responsible experience in mining engineering, two years of which must have been in connection with ore-dressing operations. Applicants must be under 50 years of age on the date of examination and must submit with their applications their photographs, taken within two years.

The examination is open to all male citizens of the United States who meet the requirements. Applicants should at once apply for Form 2118, stating the title of the examination desired, to the Civil Service Commission, Washington, D. C.; the secretary of the U. S. Civil Service Board, Customhouse, Boston, Mass., New York, N. Y., New Orleans, La., Honolulu, Hawaii; Post Office, Philadelphia, Penn., Atlanta, Ga., Cincinnati, Ohio, Chicago, Ill., St. Paul, Minn., Seattle, Wash., San Francisco, Calif., and Old Customhouse, St. Louis, Mo. Applications must be filed by Dec. 18, 1917, with the Commission at Washington.

Foreign Trade in Lead and Zinc

Imports of lead and zinc during July, August and the first eight months of 1917 are reported by the Department of Commerce as follows:

Articles and Countries	July Contents, Lb.	August Contents, Lb.	Jan.-Aug. Contents, Lb.
Lead Ore:			
Canada	317,759		7,972,527
Salvador	1,700		3,117
Mexico	1,092,526	748,462	11,363,214
Chile			1,194,749
Peru	149,569		348,072
Italy			46,719
England	8,528,583		8,609,804
German Africa			4,405,145
France	55,410		120,102
Panama	6,084		6,084
Others			2,491
	10,151,631	748,462	34,072,024
Lead—Base Bullion and Bullion:			
Dutch East Indies		505,064	607,938
Peru	8,730		50,385
Canada			1,165,931
Mexico	6,214,098	13,046,929	52,465,111
	6,222,828	13,551,993	54,289,365
Lead—Pigs, Bars, etc.:			
Panama	3,710	14,688	60,138
Barbados			2,814
Colombia			3,155
Haiti	1,000	211	38,713
Canada	10,024	2,632	330,414
Guatemala			52,400
England			80,188
Mexico		1,221,930	3,509,739
Peru		8,936	18,948
France			89,086
Chile			8,769
British West Indies	13,446	13,867	27,313
Others	3,832		7,086
	32,012	1,262,264	4,228,763

The gross weight of lead ore imported in July was 10,260 long tons, and in August, 5136 long tons. The actual tonnage of zinc ore imported in July and August amounted to 13,767 and 15,876 tons, respectively. The countries of origin and the metal contents were as follows:

Countries:	July Contents, Lb.	August Contents, Lb.	Jan.-Aug. Contents, Lb.
Canada	878,962	1,672,827	6,426,789
Australia			23,427,162
Mexico	6,531,129	8,343,275	72,077,660
Spain			12,166,840
French Africa			1,245,000
Italy	2,822,400	2,000,000	4,822,400
	10,232,491	12,016,102	120,165,851
Zinc in Blocks, Pigs, etc.:			
Costa Rica	783		7,003
Panama	1,688	4,281	28,774
Cuba	31,913	12,817	246,752
Mexico			3,318
Ecuador			7,580
Canada		14,619	31,805
Brazil			5,513
Colombia			6,000
Jamaica	2,165		2,165
Others	274	2,273	4,035
	36,823	33,990	342,945

Imports of zinc dust amounted to 92,796 lb. in July, 135,714 lb. in August, 1917, and to 645,347 lb. during the first eight months. Of the August imports, 470 lb. came from Panama and 135,244 lb. from Japan.

Exports of lead and zinc were as follows (in pounds):

Lead	July Contents	August Contents	Jan.-Aug. Contents
Pigs, bars, etc., produced from domestic ore	6,270,671	3,810,021	68,513,475
Pigs, bars, etc., produced from foreign ore	179,369	178,301	12,242,959
Zinc			
Pigs, etc., produced from domestic ore	15,289,279	18,322,974	208,068,206
Pigs, etc., produced from foreign ore	4,480,007	1,515,071	66,772,084
Sheets, etc	2,436,590	4,242,651	19,422,955

Correspondence and Discussion

War Taxes on Mining Companies

In the letter on this subject by T. O. McGrath, published in the *Journal* of Nov. 17, he falls into two errors. In the first place he fails to either read, or rather to quote, all of the provisions in the circular letter, T. D. 2446, issued from the Office of Commissioner of Internal Revenue, Treasury Department, dated Feb. 7, 1917. The last sentence in paragraph 2020 says:

> The value contemplated herein as the basis for depletion deductions, authorized by this title, must not be based upon the assumed salable value of the output under current operative conditions less cost of production, for the reason that the value under such conditions would comprehend the earning capacity of the property.

Paragraph 2021 continues:

> Neither must the value determined as of Mar. 1, 1913, be speculative, but must be determined upon the basis of the salable value *en bloc* as of that date, of the entire deposit of minerals contained in the property owned, exclusive of the improvements and development work; that is, the price at which the natural deposits or mineral property as an entirety in its then condition could have been disposed of for cash or its equivalent.

After having determined this value *en bloc*, paragraph 2022 goes on to say:

> The value *en bloc* having been thus ascertained, an estimate of the number of units (tons, pounds, etc.) should be made. The *en bloc* value divided by the estimated number of units in the mine or mining property will determine the per unit value, which, multiplied by the number of units mined and sold during any one year, will determine the sum which will constitute an allowable deduction from the gross income of that year on account of depletion.

Paragraph 2024 states:

> The precise detailed manner in which the estimated fair market value of mineral deposits as of Mar. 1, 1913, shall be made must naturally be determined by each individual or corporation interested, and who is the owner thereof, upon such basis as must not comprehend any operating profits, the estimate in all cases to be subject to the approval of the Commissioner of Internal Revenue.

It is difficult to reconcile the statements in paragraph 2020 and paragraph 2024 unless one may leave out the words "based upon" in paragraph 2020, which would then indicate that the value cannot be arrived at by subtraction.

Tentatively my solution of the problem of the *en bloc* value of the property as of Mar. 1, 1913, would be by the application of one of Hoover's factors. Take the supposed mine to which Mr. McGrath refers and which he says on Mar. 1, 1913, has 1,000,000 tons of 5% ore. In it he assumes the net operating costs per pound as 10c., and the market price of copper 15c. In this case, however, he has not given all the factors. The value of that ore in the ground certainly is not $5,000,000, because it cannot be taken out in a day, nor is there anything to indicate that a plant is erected for the purpose of converting the copper in the ore into merchantable form.

Therefore, add to Mr. McGrath's factors the following: An ultimate yield of 90% of the copper contained in the ore is to be expected, or 90 lb. per ton; the mine has a plant erected worth $750,000 for the purpose of treating the ore, and the ore can be exhausted in 10 years. Under these assumptions the mine will treat 100,000 tons of ore a year and will produce 9,000,000 lb. of copper at a profit of 5c. per lb., or a gross annual profit of $450,000.

If it be assumed that the purchaser of the mine is satisfied with 7% net on his investment, and can invest a sum annually at 4% to return him his capital, then according to Hoover's tables the present value of an annual dividend of $1 over 10 years at 7%, and replacing capital by an investment of an annual sum at 4%, is $6.52. Multiplying $450,000 by 6.52, the then value of the property, as equipped, is shown to be $2,934,000. To ascertain the value of the ore there must be deducted from this the value of the plant, which has been placed at $750,000, thus leaving the *en bloc* value of the ore as of Mar. 1, 1913, as $2,184,000. To determine then the unit value as per paragraph 2022, divide by 1,000,000, giving $2.184 as the unit value of a ton of ore, or, expressed in terms of copper, 2.247c. per pound.

Whether the above calculation will meet with the approval of the Treasury Department it is hard to say, out in my opinion it is as close as one can follow the department's very conflicting statements.

New York, Nov. 20, 1917. J. PARKE CHANNING.

Put the Water Power to Work!

The great war in which our nation is engaged will be won not alone by food and men, but by mechanical power as well. Without mechanical power we could not make or move the weapons with which we fight—guns, ammunition, ships, and supplies. Our national resources of power, whether from coal, oil, or water power, are national war necessities. We need them to win the war. In this gigantic struggle our security requires us to use all these great resources, and to use them wisely and well.

The people of the United States own about fifty million undeveloped water horsepower, or about enough to run every train, trolley, factory, mill, mine, and electric power plant we have. For ten years the friends of conservation have urged the development of public water powers in the public interest. But development has been held back by a little group of water-power magnates and their friends in Congress, who have blocked all legislation which would not give them these valuable properties forever and for nothing. Today, when the nation needs all its resources, the same men who have been blocking reasonable water-power legislation own and are holding millions of water horsepower, undeveloped and out of use, while clamoring for more.

The time has come when such obstruction threatens the nation's safety and success. We need the development of these powers in war even more than in peace.

At the coming session of Congress sound water-power legislation should be enacted as a war measure, based upon principles fair to all sides. These principles I believe to be briefly as follows:

(1) The thing to do with water power is to develop it. Whatever retards or restricts the development of public water powers on terms fair to the public is against public policy and hostile to the general welfare. (2) Water power belongs to the people. The sites where it is produced should always be held in public hands, for only so can effective control in the general interest be secured. (3) Where public development is not desired, the right to use water-power sites should be leased for periods long enough to permit sound, attractive, and profitable investment, but never longer than 50 years. At the end of each lease all rights should return to the people who gave them. (4) In order to protect the consumer against extortion, rates and service should be regulated by Federal authority when state or local authorities fail to do so. (5) Reasonably prompt and complete development and continuous operation, subject to market conditions, should be required. Already millions of water horsepower are held out of use to further monopoly by private corporations. (6) Corporations or individuals who make money out of rights granted by the people should share their profits with the people. (7) The public has a right to complete information about every business based on the use of public property.

These are the principles for which the friends of conservation have been contending. Many water-power men believe them to be fair and sound. They will, I hope, commend themselves to the *Journal* as wise and reasonable. I am writing to ask support for immediate legislation, based upon them, when Congress meets. This is no time to give away public assets necessary for the welfare of our people both in the war and after the war, and we should no longer tolerate the selfishness of private interests which take the dog-in-the-manger position that they must have these water powers on their own terms, or no one shall use them at all.

As the President has said: "The supreme test of the nation has come. We must all speak, act, and serve together." GIFFORD PINCHOT.

Milford, Penn., Nov. 12, 1917.

Rights of a Miner Who Resumes Work on Abandoned Claim

To decide a good-natured argument, will the *Journal* please publish the answer to the following question: *A* locates a claim and does work on it as required by law. For various reasons he abandons it. Several years later he returns to the same ground, and, finding no intervening rights, resumes work without locating again. He opens an orebody, whereupon *B* then covers the claim with a new location and claims the ground. Whose rights are valid? SUBSCRIBERS.

Salt Lake City, Utah, Oct. 4, 1917.

[The apparent difficulty in this case lies in the matter of abandonment. The courts have held consistently that abandonment involves intention and that the burden of proof rests with the party who asserts that a claim was abandoned. A peculiar analogy may serve to emphasize this point. A mother leaves her infant in a field, with intent to abandon it, and goes to some other locality to work. She thinks of the child as a weakling, or unattractive, or a nuisance, but after a lapse of time she goes back and finds the child. Others may have seen it, but no one has taken any action to alter the status of the child or of her relation to it. She nurses the child and continues as if nothing had happened, having reconsidered her decision to abandon it. If the child thrives, any stranger who had observed the infant in the field and had passed by without taking any action would find it a hard task to convince a court that the child had been abandoned and should be surrendered to the claimant offering to adopt.

Forfeiture of rights in a mining claim, however, involves the question of whether the locator has complied with the law. But forfeiture does not become an accomplished fact until a third party has intervened. If it becomes a matter of public knowledge that a claim has been abandoned, or if for any other reason it becomes lawfully subject to forfeiture, the ground is open to location by another, in the same manner as if no location of the same had ever been made. When forfeiture is once established, the original locator has no further legal standing in connection with the ground in question.

In the case propounded it is clear that forfeiture was never made effective. The mining law stipulates that upon failure to comply with the required conditions, the claim shall be open to location, "provided that the original locators, their heirs, assigns, or legal representatives, have not resumed work upon the claim after failure and before such location." In commenting on this phase of mining law Lindley[1] cites, among others, the case of Belk vs. Meagher:

> *A* located in 1864, and the location was valid and subsisting when the act of May 10, 1872, was passed. No work was performed, however, after that date until June, 1875, when *A* resumed work upon the claims and *did enough to reëstablish his original rights*. *B* attempted to relocate on Dec. 19, 1876. It was held that *A's* resumption protected the claim from relocation until Jan. 1, 1877. There could be no forfeiture until that date. *B's* relocation was therefore void and did not take effect on Jan. 1, 1877, although *A* failed to perform any work during the year 1876.

In the case propounded, if *A* made no public record of abandonment and worked continuously after resumption of work, *A's* rights are valid. If *A* did make a formal declaration of abandonment, then *B's* rights are valid or he at least has a good chance in court. If *A* resumed work and stopped again before he had performed the labor making up one year's delinquency, and *B's* location was made after a reasonable period of time had elapsed since said stopping, then *B's* rights are valid. The validity of the "declaration of abandonment" and the duration of "a reasonable period of time" would be matters for a jury or a court to decide.—Editor.]

Release From Assessment Work

Referring to the article "Release from Assessment Work," in the *Journal* of Nov. 17, I should like to know if claimholders can obtain patent on a mining claim on three years' work performed, and two years' tenor of claim, without work, under the recent act passed by Congress?

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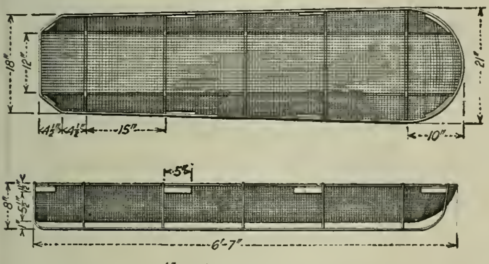
[1] Lindley on Mines, 1914, p. 1638.

Details of Practical Mining

Underground Basket Stretcher

A type of underground stretcher that has given good service on the Mesabi range and conforms to all requirements is shown in the accompanying sketch. A rigid frame is made of ½-in. half-round iron, riveted at the joints. The longitudinal supports are bent up at the ends and the lateral supports are U-shaped, varying from 18 in. at the lower end to 21 in. at the upper; their depth is 8 in. An oval-shaped retaining rod of ½-in. half-round iron serves as a brace for the supports and gives rigidity to the frame. Eight hand holes are provided so that the stretcher may be carried in a horizontal position. These are formed from ½-in. half-round iron riveted to the frame at the required points.

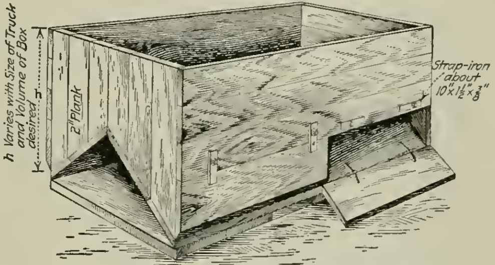


BASKET STRETCHER FOR UNDERGROUND USE

The frame is covered on the sides and bottom with wire screen of ⅜-in. mesh which is stretched tight, the edges being turned around the half-round iron. Eight ferrules of $\frac{3}{16}$-in. wire are provided and fastened to the frame at points so that leather straps may be used for either tying in or suspending the patient. Two straps are attached to the upper edge and these pass under the armpits. Farther down one strap is used across the chest. Two straps are suspended at the middle and are used for crotch support, and the lower strap serves to tie in the legs. The straps should be padded where they touch the patient and particularly at the points of suspension. The basket is of sufficient depth to permit the patient to lie comfortably when the stretcher is being carried horizontally, and the suspension can be evenly adjusted when in a vertical position.

Hopper-Bottom Truck Bodies Used for Rapid Unloading

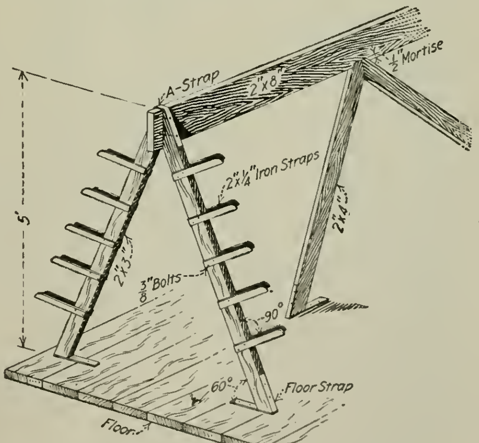
Contractors who contemplate the use of removable hopper-bottom truck bodies, to secure rapid unloading of loose materials and ability to employ the truck on various services, will be interested in the side-dump boxes described by J. B. Rogers in *Engineering News-Record.* The scheme is shown in the accompanying sketch. One of the good points of this box is the bottom-hinged side door which falls down as soon as the catch button is released, and serves as an apron to throw the material clear of the wheels. Each side has a divided door, so that quadruple control of the dumping is secured. The box ends are solid and with the inverted V-bottom make possible a rigid unit that can be easily put on and taken off the truck.


h Varies with Size of Truck and Volume of Box desired
h
2" Plank
Strap-iron about 10"x1½"x⅜"

HOPPER-BOTTOM BODY THAT IS EASILY REMOVED

Rack for Sharpened Drill Steel

A simple and convenient rack for sharpened drill steel is shown in the accompanying illustration. It consists of a series of A-bents to the legs of which are bolted at 90° a series of iron straps in pairs. The legs are set at 60° to the floor of the shop, to which they are screwed firmly by means of 60° angle straps and meet at the apex on each side of a 2 x 8-in. board running "edge up" the whole length of the rack and to which both legs are firmly held by a 60° iron strap. To brace the rack longitudinally a 2 x 4-in. A-brace is mortised at the center of the apex board, the legs being strapped to the



SECTION OF RACK FOR DRILL STEEL

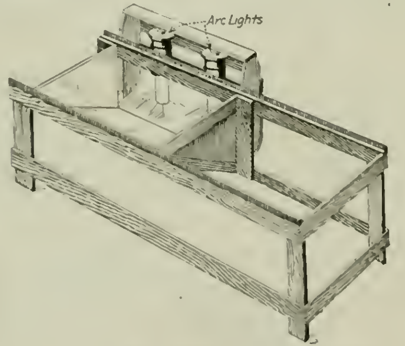
floor in a plane at 90° to the planes of the bents. Such a rack is in use in underground drill-sharpening shops in the Joplin district, where hollow steel drills up to 18- and 20-ft. lengths are employed. The various lengths are laid on the projecting straps between bents and can be readily sorted and made up into sets by the drillers; and inspection of bit and shank is readily made.

Blueprint Machine

Where blueprints are needed frequently, but there is not sufficient work to pay for an automatic printing machine, the one described by G. F. Wetzel, in *American Machinist*, of Nov. 15, 1917, will answer the purpose. Any carpenter can put it together, and the material needed is inexpensive and easy to obtain.

The machine frame is made of ¾ x 4-in. boards and is about 6 ft. 6 in. long, 27 in. wide and 36 in. high. On the upper edge of both front and back top strips is screwed a 1 x 1 x ⅛-in. angle, with vertical flange outward. This serves as a track for the printing frame, which has a small grooved pulley and shaft fastened on each side near the corner. A standard 24 x 36-in. printing frame is used.

One end of the machine frame contains the light well, which is 3 in. long and bounded on each end by a triangular sheet of aluminum, polished on one side, of about No. 16 gage, B. & S. A plate-glass mirror, approximately 30 x 32 in., slants down at 30 deg. from the top front member, and at the back is a sheet of aluminum. The light is furnished by two arc lamps, spaced about 15 in. on centers and in front of the rear reflector sheet. The lamps are supported by wooden braces, as shown in the figure. The rear reflector is bent at the bottom to come around and meet the lower edge of the mirror, where two pins in the frame engage in holes in the sheet. At the upper edge of the sheet two round holes, with radial short slots at the top, slip over two wood screws with round heads. Thus by raising the sheet it can be removed for access to the arc lamps. About an inch space is left around the rear sheet for ventilation.



AN EASILY MADE BLUEPRINT MACHINE

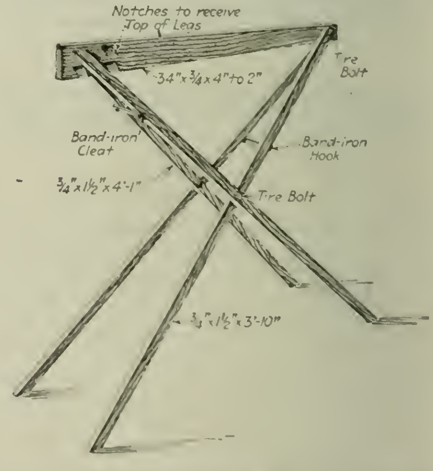
In using the outfit, the printing frame is in a horizontal position, with the glass side down, on the tracks. The felt pad and back are heavy enough to hold the tracing and paper flat. Ordinarily, the frame is left over the light well; but for wiping dust off the mirror or inspecting the lamps, it is pushed to one side. As the field of illumination is only 30 in. wide, when a longer print is desired expose only one half and then the other one by rolling the frame along. If larger prints than 30 in. are standard, three lamps will be needed.

Good, evenly colored prints can be made in about 5 min., using electric rapid blueprint paper, without moving the frame. In shops where this machine would fit in, ordinarily the draftsman can stop long enough to start the print, go back to his desk and then remove the print without interfering appreciably with his work.

Another way in which the machine can be used is tracing through sketches or prints. By removing the pad and back of the printing frame, the light will show through a heavy print or sketch made on drawing paper, so that it can be easily traced.

Folding Trestle for Drafting Table

A drawing table trestle which will take up a space only 4 in. square and 4 ft. long when stored would prove a great convenience to many engineers who do not need a drawing table continually, or whose work sometimes requires one where ordinarily there would not be proper facilities. According to H. A. Sitterley in *Engineering News-Record*, Sept. 27, 1917, the trestle in the accompanying drawing has been used for the last two years at the Low Moor Iron Co., of Virginia, and has proven to be convenient, rigid, light and capable of being easily transported and stored in a small space.



ADJUSTMENT FOR HEIGHT AND SLOPE OF BOARD EASILY MADE

The following is a bill of necessary materials:

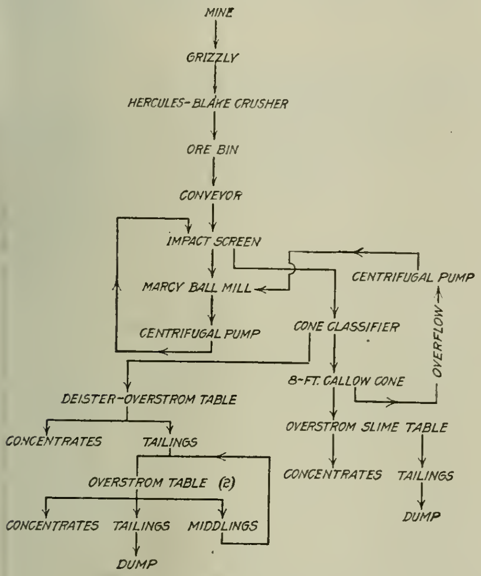
2—¾ x 1½-in. hardwood strips, 4 ft 1 in. long, front legs.
2—¾ x 1½-in. hardwood strips, 3 ft 10 in. long, back legs.
1—¾ x 4-in. hardwood board, 34 in. long top piece
6—1-in. shothead screws
2—2-in. tire-bolts and washers
1—2½-in. tire-bolt and washer
1—¾-in. band-iron strip, 7 in. long, drilled for screws on 6-in. centers and one hole cut out to serve as a hook
1—¾-in. band-iron strip, 4 in. long, drilled for screws on 3½-in. centers

The method of assembling is perhaps sufficiently illustrated in the drawing. By placing the top ends of the longer legs in the different notches, in the top piece, the top of the trestle can be made either level or sloping and the height adjusted from 34 to 42 inches.

Details of Milling and Smelting

Flow Sheet of Round Valley Tungsten Mill

The Round Valley Tungsten Co., of Bishop, Calif., is milling 100 tons of scheelite ore per day, using the accompanying flow sheet. The ore contains about 1% WO_3 and the company is making 20 to 30 tons of 63 to 64% concentrates per month.



CONCENTRATION OF TUNGSTEN ORE

The mining is done by the gloryhole and shrinkage system, and the mill has been in operation since the middle of August. Cooper Shapley is general manager and H. C. Miller is superintendent. Shipments were begun about two months ago.

Babbitting Without a Mandrel[*]

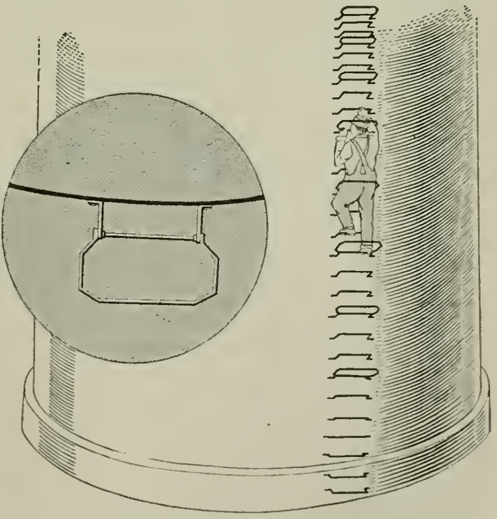
BY W. F. SCHAPHORST

I once ridiculed the idea of using a special mandrel for babbitting bearings, and in most instances I am still against such practice, because in my experience I have never had a failure by using the shaft itself as a mandrel, pouring the babbitt directly around it. The way to do it properly is to do it quickly. Take all the time desired for preparing the moulds, and prepare them in such a way that the babbitt can be poured almost instantly. By pouring quickly, all sides of the shaft are heated simultaneously and expansion is the same all over. The danger that must be overcome is the danger of warping, which will occur when the babbitt is poured slowly and on one spot on the shaft. That spot becomes highly heated, expands, and springs the shaft in such a way that the hot spot will be on the convex side. Before the shaft can spring back, the babbitt solidifies and holds the shaft in a bent condition. Sometimes this bend is slight, so slight that the shaft can be turned any way, due to the clearance allowed, but the bend can be actually "felt" with the hand, because in one position it turns more easily than in any other.

To prepare the shaft for the mould it is a good plan to burn some oily waste and create an oily soot on the shaft. This soot serves a double purpose. It provides the necessary clearance medium, and it is a good insulator against heat. If the soot isn't thick enough, wrap a thickness or more of thin paper around the soot. This will make a double insulator. A string tied around the paper may be utilized to form oil grooves.

Safety Ladder for Smoke-Stacks

Ladders built on the outside of smoke-stacks have little attraction for the fellow who has to climb them occasionally. The man who has climbed an ordinary ladder to the point where he keenly realizes that his "dear life" depends entirely on his muscles, and has then climbed on to the point where he realizes that his muscles are failing and quivering from sheer exhaus-



LADDER PROVIDED WITH SAFETY GUARDS

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[*] Copyright, 1916, by W. F. Schaphorst, Woolworth Building, New York.

tion appreciates the value of a ladder inclosed in guards, the description of which is given by H. B. McDermid in a recent issue of *Power*. It is almost impossible to fall from this ladder, as the enveloping hoops or guards are not more than three feet apart, so at no time is a man's body entirely devoid of protection. The hoops are large enough to give plenty of clearance when climbing, yet small enough so that one can lean back against them in perfect safety while resting hands and arms. A fall from such a ladder is practically an impossibility.

Use of Building Paper in Merrill Presses

By R. Wheeler*

The frames of the Merrill triangular precipitation presses are generally covered with canvas and a light, cheap twill—the latter being removed and burned, or dissolved in the sulphuric-acid treatment, to recover any precipitate on it. With the increasing cost of cloths during these times a lower priced and efficient substitute was sought. The practice of the Alaska-Treadwell company of putting a filter paper next to the twill was adopted. At Hedley, B. C., one sheet of unglazed building paper of good grade is used next to the twill. The cost of the paper sheets is not over 2c. a piece, while the cost of the twill is from 17.5 to 22.5c. The twills will last several months when thus protected by the building paper.

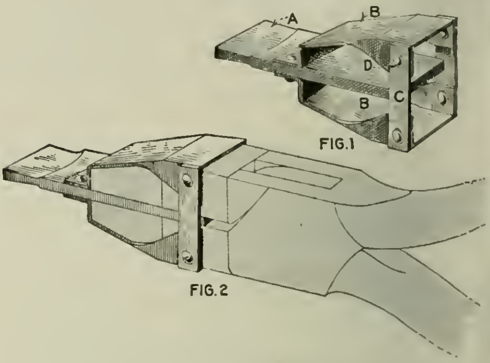
At each cleanup, the paper with all the precipitate clinging to it drops into a cloth suspended under the entire length of the press and above a tray for added protection. The twills are left in place, clean and untouched. The cloth containing the precipitate and papers is removed to the acid vat where the contents are dumped into the vat and the cloth kept for future cleanups. When it becomes too rich with precipitate it is also placed in the acid vat to be dissolved. The method is clean, quick, and inexpensive where the acid treatment is used for zinc-dust precipitates.

Treatment of Metallurgical Smoke in Japan†

Taking care of smelting smoke has been an important problem for Japanese metallurgists. At the Hidachi copper works, according to Tetsurow Komakine, an aircraft (perhaps it is better to say a sack filled with hydrogen) was recently utilized to examine the air currents at great heights above the smelting plant, and is expected to furnish much needed data to aid in solving the smoke question. At present the smoke is ejected from a stack over 500 ft. high built on a mountain about 700 ft. above sea level. It has been found that the gases are not equally dispersed and that a great proportion may follow certain "channels," which vary from time to time. Mr. Komakine further states that the 1000-ft. stack projected for some time at this works is now being built with the idea of passing the gases out to sea before they fall. He adds that at the Ashio works, the Cottrell electrostatic process precipitates the solid particles in the smoke but that additional processes are being developed to catch or render the SO_2 harmless. Neutralization by lime has been practiced for years in Japan.

Screwdriver Attachment for Use on Cutting Pliers

Since pliers and screwdrivers are the tools most frequently used by the electrician, they should be in such a form that they can be easily carried around. Pliers with a screwdriver forged at the end of one of the handles are common, but the screwdriver is unhandy and is seldom used.



SCREWDRIVER ATTACHMENT FOR PLIERS

After considerable experimenting, the screwdriver attachment shown in the illustrations was developed and has proved very useful to me and to other workers who have made one, writes M. P. Bertrande in *Power*. In Fig. 1, *A* is made of tool-steel and hardened. The jaws *B* are bent from 1/16-in. soft sheet iron and held together by the two straps *C* and rivets *D*. Dimensions cannot be given, as curves and shapes change in accordance with the shape of the pliers used. The form is obtained by bending the sheet iron around the pliers and riveting it to the tool-steel blade *A*. The device is so small that it can be easily carried in the vest pocket. Fig. 2 shows the screwdriver attachment in place ready for use.

Powdered Coal for Steam Plants

The composition of powdered coal used in heating and puddling furnaces must come within certain restrictions in order to be used successfully. C. J. Gadd, writing in the *Journal of the Franklin Institute*, says that coal for this purpose should not have less than 30 per cent. volatile matter, nor less than 50 per cent. fixed carbon. Its moisture should not exceed 1.25 per cent., its ash 9.50 per cent. and its sulphur 1 per cent. The requirements for openhearth furnaces are more rigid. The volatile content should be higher and not under 36 per cent. The fixed carbon should be at least 52 per cent. The moisture and sulphur may still be 1.25 and 1 per cent. respectively, but the ash must fall below 6 per cent. In powdered coal sulphur when present only in small quantities has no ill effect in heating and annealing furnaces, but it should be given careful attention when used in the reduction and refining of metals or ores.

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*Mill superintendent, Hedley Gold Mining Co., Hedley, B. C.

† Met. and Chem. Eng., Oct. 15, 1917.

Events and Economics of the War

The Italians are holding the Teutons at the Piave River, after flooding the approaches to Venice; Austrian detachments that succeeded in crossing have been driven back; an attempt to outflank the Italian line in the north is in progress. In Russia the Kerensky government has been defeated and Kerensky has disappeared; the Bolsheviki, though seemingly victorious, apparently lack wide popular support. In France, Clémenceau is again premier, after Painlevé's fall, and has picked a radical cabinet. In England, a storm of discussion has arisen over the question of centralized control of the war; the proposal to make Northcliffe air minister has caused Cowdray to quit the cabinet; the British have captured Jaffa in Palestine and, in a fight off Helgoland, crippled two German ships.

In this country, new rules for classifying drafted men have been issued by the War Department and all exemptions canceled. The labor convention at Buffalo has backed Gompers in voting to support the Government; railroad brotherhoods have assured the President that they will not strike. A board of excess-profit advisers has been created by Secretary McAdoo; the U. S. Bureau of Mines will be assisted by a board of chemists in all matters pertaining to explosives. Daniel Willard has been appointed chairman of the War Industries Board and Henry Ford has joined the staff of the Shipping Board as assistant to Charles Piez.

Coal Miners Accept to Penalty Clause

The recent decree of the Government assessing a penalty of $1 per day upon miners who refused to work, which was the cause of the abrupt ending of negotiations recently conducted in Washington between representatives of coal miners and operators of the Southwestern field and Dr. H. A. Garfield has been agreed to by the miners. The penalty was imposed by the Government as a war necessity when miners in the West and South walked out. The latter's representatives thereupon informed Dr. Garfield that the miners insisted upon the right to adjust their own working conditions. The Fuel Administrator maintained, however, that the penalty was just and necessary as a war measure and insisted that the clause be inserted in every contract between the operators and workmen. The miners' representatives thereupon quit the conference, first deciding to meet in Kansas City on Nov. 12. At this meeting they accepted the clause.

Wage increases sought by the Southwestern miners are based on increases agreed on recently by operators and union heads in the central competitive field. The central field contract contained provisions for automatic penalties and was approved by Dr. Garfield, who recommended to President Wilson the 45c. coal-price increase. Under the penalty provision miners who struck without cause would be fined $1 a day each and operators locking men out without cause would pay a fine of $2 a day for each man not working.

Excess Profits Advisers Appointed

The appointment of an advisory board of nine members to be known as the "excess profits advisers" has been announced by Secretary McAdoo. It will act as a board of appeals for the Internal Revenue Bureau on all questions connected with the interpretation and execution of the excess profits section of the new war-tax law.

The members of the board are: Representative Cordell Hull, a member of the House Committee on Ways and Means; T. S. Adams, economist of Yale University; Wallace D. Simmons, President of Simmons Hardware Co., St. Louis and Philadelphia; J. E. Sterrett of Price, Waterhouse & Co., accountants, New York; S. R. Bertron, of Bertron, Griscom & Co., bankers, New York; E. T. Meredith, editor *Successful Farming*, Des Moines, Iowa; T. W. McCullough, editor *Omaha Bee*, Omaha, Neb.; Stewart W. Cramer, of the National Council of Cotton Manufacturers, Charlotte, N. C., and Henry Walters, chairman of the board, Atlantic Coast Line, and Louisville & Nashville roads.

War-Savings Plan Summarized

The war-savings plan provided for in the last bond act, of Sept. 24, 1917, goes into operation on Dec. 3. Stamps, which are the Government's certificates of indebtedness, are to be sold in two denominations—thrift stamps, which will cost 25c. each, and war-savings stamps, costing from $4.12 to $4.23 each according to the month in which they are purchased. With the first thrift stamp the purchaser is given a thrift card with spaces for 16 stamps. When 16 thrift stamps have been purchased and affixed, the thrift card can be exchanged for a war-savings stamp by paying the difference between the $4 the thrift stamps represent and the current value of a war-savings stamp, which in December, 1917, and January, 1918, will be $4.12, and thereafter 1c. more for each succeeding month during the year 1918.

With the first war-savings stamp obtained by purchase or exchange the owner is given a war-savings certificate containing spaces for 20 war-savings stamps. If these are filled during December, 1917, or January, 1918, the cost to the purchaser will be $4.12 for each stamp, or $82.40 for the full certificate, and on Jan. 1, 1923, the Government will redeem the certificate at $100, giving the holder a net profit of $17.60 for the use of his money. Although these investments do not mature until Jan. 1, 1923, provision is made whereby upon 10 days' written notice after Jan. 1, 1918, such certificates will be redeemed by postmasters at their cost to the purchasers plus 1c. a month on each war-savings stamp on the certificate.

The thrift stamps do not bear interest, but the war-savings stamps bear 4%, compounded quarterly. The certificates will be dated Jan. 2, 1918, and mature Jan.

1, 1923. Under the plan an amount as small as 25c. can be invested in a Government security, and as soon as $4 has been thus invested an interest-bearing certificate of the United States Government can be secured. The stamps and certificates can be obtained from post offices, banks, or trust companies, at most railroad stations, stores, factories, and many other public places.

Outlook in Steel Industry

As the Government program of steel requirements develops, the steel consuming trade in various lines is feeling the first cleavage between essential and nonessential industries, says *Iron Age*. As priority rulings multiply, the disturbance from steel scarcity in certain minor lines increases and it becomes clearer that the list of affected businesses will grow. Inability of certain manufacturers to count on steel supply promises to figure more and more in the war toll. The automobile industry is much disturbed by the announcement that alloy steel will be largely withheld from it, yet there is nowhere any definite knowledge as to the amount of such steel Government needs will require.

Government shell steel now under inquiry amounts to 1,500,000 tons. The Government's requirements are counted on to be 100% of ship-plate output, after due allowance of plates for war and food industries and railroad upkeep. Many plate users must resort to universal plates and a larger use of rivets. For the destroyers for which contracts were recently let, 60,000 to 70,000 tons of steel has been given out, largely plates. A measure of the scarcity of plates is found in the estimate that Government merchant ships, representing entirely new demand, will take in each of the next two years 1,500,000 tons of plates. The total production of sheared plates, ¼ in. and thicker, was not quite 2,500,000 tons in 1916.

To Burn Toluol or To Shoot It

"When the spring drives of 1918 begin, American soldiers will be participants in great numbers. If they are to prove equal in effectiveness to our British allies, if their casualty lists are to be held down to relatively small numbers, they must be supplied with the maximum possible amount of high explosives for barrage fire.

"Of the several high explosives now in use, the War Department has pronounced tri-nitro-toluol (T.N.T.) as best," says Dr. Charles H. Herty, editor of the *Journal of Industrial and Engineering Chemistry*. "It is the easiest high explosive to make, and the safest to transport. For its manufacture toluol is required. At the present time there is produced annually approximately 11,000,000 gal. of toluol from byproduct retort coke ovens, which have increased rapidly in number since the war began. This quantity, however, is under contract for the supply of the Navy and the Allies. At least a year is required for the construction of a large battery of byproduct ovens. For the new army the only quickly available source of toluol is the gas plants. A statement to that effect was made recently by Brig. Gen. William H. Crozier, chief of the Bureau of Ordnance of the War Department. Gas plants can be equipped within three to four months, some more quickly, to remove the toluol from gas."

General Crozier further stated that the mobile artillery alone would require by September, 1918, at least 22,000,000 gal. of toluol. Statistics show that during 1916 approximately 220,000,000,000 cu.ft. of gas was produced in this country. Assuming an average recovery of 0.05 gal. of toluol per 1000 cu.ft. of gas, we should be producing from the gas plants within the next four months, if immediate steps are taken everywhere, at the rate of 11,000,000 gal. of toluol annually. Even at this, the recovery of toluol would amount to only half of the requirement for an army of a million men. It is possible, however, by a more complete stripping of gas, to increase the yield beyond 0.05 gal. per 1000 cu.ft., thus more nearly meeting the requirements.

Each day's delay means a sacrifice of T. N. T. sufficient for 150,000 3-in. shells. Is it not time, therefore, for a getting together on the part of Government officials, gas companies, Public Service Boards, commissions, and the public at large? Toluol is of advantage in illuminating gas only for an open-flame burner. As most people use gas mantles and as over 90% of gas is used for cooking, let there be an end to the old question of candle power and consideration of a sound basis of heat units. By so doing the first step toward recovery of the much needed toluol will be taken.

Chemist Board Appointed

A special board of chemists to investigate explosives and the use of gases in warfare has been appointed by Secretary Lane to act as advisers to the U. S. Bureau of Mines. The members are: Dr. William H. Nichols, of the General Chemical Co., New York, chairman; Prof. H. P. Talbot, head of the chemical department of the Massachusetts Institute of Technology; William Hoskins, of Chicago, a consulting chemist; Prof. H. P. Venable, of the University of North Carolina, E. C. Franklin, of Leland Stanford University and Dr. Charles L. Parsons, of the Bureau of Mines. The board will consider plans for increasing the production of materials used in explosives manufacture and will advise the bureau on the operation of the recently enacted Explosives Law.

Electrically Controlled Boats Old

Several electrically controlled boats operated by the Germans off Belgium have been destroyed by the British. These boats, which are not controlled by wireless, are described in an Admiralty report as being twin petrol engine vessels, partly closed in, which travel at a high speed. They carry a drum with between 30 and 50 miles of insulated single-core cable, through which the boat is controlled electrically. The forepart carries a considerable charge of high explosives, probably from 300 to 500 lb. The method of operating is to start the engine, after which the crew leave the boat. A seaplane, protected by a strong fighting patrol, then accompanies the vessel at a distance of from three to five miles, and signals to the shore operator of the helm. These signals need only be "starboard," "port," or "steady." The boat is zig-zagged while being steered into a ship, and the charge is exploded automatically.

The device is an old one. A boat similarly controlled was used by H. M. S. Vernon, a torpedo experimental ship, as far back as 1885. The only new features in the German boat are the petrol engines and wireless signals, neither of which existed then.

Highways Transport Committee Is Named

Greater use of highways and inland waterways for short hauls to relieve the burden placed on railroads by the war is sought by the Council of National Defense in the appointment of a highways transport committee. The members are Roy D. Chapin, of Detroit, chairman; Logan Waller Page, Federal director of public roads; Henry G. Shirley, chief engineer of the Maryland State Roads Commission, and George H. Pride, of New York. Coöperative work with the various departments of the Government interested in the utilization of roads for military purposes will be started at once by the committee, which later will coördinate its work with that of the railroads and assist local highway authorities in maintaining the roads.

All forms of transportation are now represented in the Council for carrying on the war. Coöperation among transportation agencies, and not competition, is expected to be the outcome of the combined work of the committees. As the task of hauling freight long distances naturally falls to the railroads, it is planned by the Council to encourage the use of motor trucks for shorter distances, especially the movement of farm produce. Inland waterways will be relied on where available. Relief for congestion in railroad yards and at terminals will be one of the problems to be worked out in coöperation with the railroads.

What Industries Are Non-Essential?

"Before a conclusion can be reached as to what industry is non-essential during the war," says a bulletin of the U. S. Chamber of Commerce, "there must be known what is needed from abroad and what we may send in exchange, for what is apparently a non-essential here may be productive of most important materials for the war by being sent abroad in exchange for essential materials.

"For example, we need nitrate and copper from Chile. These are essential to the production of munitions of war. We may, however, procure this nitrate and copper by shipping jewelry or automobiles to Chile. Again, we need from Argentina wool, wheat and hides, and these necessities may be obtained by shipping in exchange sewing machines or typewriters. Thus the manufacture of a limousine or a typewriter may be in fact the means of producing nitrate or wool.

"What may be shipped to foreign countries depends upon what they are willing to receive from us and, therefore, it may be impossible to secure what is needed by shipping non-essentials. Cases may arise where we must draw upon our store of much-needed raw materials and finished products in order to procure raw materials which are in even greater demand. Thus, we may have to send coal or agricultural implements to Argentina in order to procure wool, wheat or hides. The extent to which we can afford to reduce our own much-needed supplies of coal and agricultural implements would depend upon the extent that we needed wool, wheat or hides. These are relative questions to be settled only after careful consideration of all the circumstances.

"Behind all this is the question of our gold supply—the great balance wheel of our foreign trade. This aspect of the situation may be illustrated by citing the situation with India. Among other things we need jute and burlap from India; in return we can send clocks and watches, typewriters, cloth and general merchandise, iron and steel pipe and fittings, etc. But this is not enough. The balance of trade is against us. To India we can send silver in settlement of this balance, but if this is not sufficient we must send gold or else allow American exchange to be at a great discount. The extent to which our gold supply may be drawn upon to settle foreign exchange balances raises all the questions of domestic finance—the Government's borrowing, the protection of our currency, and in fact our entire financial structure."

J. Leonard Replogle Appointed Director of Steel Supply

Appointment of J. Leonard Replogle, of New York, chairman of the Wharton Steel Co., and president of the American Vanadium Co., as director of the steel supply for the United States and the Allied nations, has been made by President Wilson upon the recommendation of Mr. Replogle's associates on the priority committee of the War Industries Board. Every requisition for steel for any of the Allied governments must be vised by the new director, who will determine to a great extent, the priority of orders placed by the Allies. Mr. Replogle's appointment is one result of the decision of the Allies to centralize and coördinate their activities.

Will Not Seize Deposits of Germans Living in United States

A. Mitchell Palmer, alien property custodian, has issued the following statement:

> Some misapprehension seems to exist relative to the status, under the Trading-with-the-Enemy Act, of citizens or subjects of Germany and its allies resident within this country. Such persons are not included within the term "enemy or ally of enemy" as employed in the act. Deposits in the postal savings banks of the United States belonging to such persons are not liable to seizure by the Government and will not, therefore, be taken into the possession of the alien-property custodian or be interfered with in any way whatever.

Canadians To Make Shells for United States

Negotiations conducted by the Canadian Imperial Munitions Board at Washington have resulted in the placing of a large order of shells for French 75s, to be produced at Canadian plants for the U. S. Government. Six to seven and one-half million shells will be turned out in the first seven months of 1918. The Imperial Munitions Board will act for the American authorities in placing the contract and supervising the production of the shells. The American Ordnance Department will supply steel and component parts and the Canadian manufacturers will forge the steel and machine and assemble the shells.

Industrial News from Washington

By Paul Wooton, Special Correspondent

Possession of Explosives Now Illegal Without License

Any person in the United States found with explosives in his possession and who does not have a license issued by the Federal Government showing the purpose for which the explosives are to be used, will be arrested at once and fined up to $5000 or sent to prison for one year. If the circumstances warrant, the person may be fined $5000 and in addition given the one year in prison.

This is the principal clause in a war measure passed by the last Congress which became effective Nov. 15. The manufacturer, the importer and exporter must likewise have licenses issued by the U. S. Bureau of Mines in Washington. The seller and the purchaser of explosives must also secure them. The licenses will be issued generally by county clerks, or other local officers who are authorized to administer oaths. There will be at least one licensing officer in each county, and more agents will be designated if the county is sufficiently large to warrant it. If a state has laws providing for a system of licensing persons manufacturing, storing, selling or using explosives, the state officials authorized to issue such state licenses shall be designated as Federal licensing agents; also city officials qualified to issue city explosives licenses will be given authority to issue Federal licenses. A Federal license will not relieve any person from securing such additional license as may be required under state laws and local ordinances. In each state there will be appointed a state explosives inspector, who will represent the Bureau of Mines in the administration of the law within the state.

Only citizens of the United States or of countries friendly to the United States and the Allies may obtain licenses. Contractors, mining companies, quarrymen and others using large quantities of explosives, which are handled by employees, may issue explosives to their employees only through those employees holding a license, called a foreman's license.

The purchaser of explosives, in obtaining a license, must state definitely what the explosive is to be used for and will be held accountable for its use as stated and the return of any that may be left. With the strict enforcement of this law, the Federal authorities hope to prevent explosives falling into the hands of evilly-disposed persons and put a stop to further dynamite plots.

It having proved impossible to license all users of explosives prior to Nov. 15, Francis S. Peabody, assistant to the Director of the Bureau of Mines in charge of explosives, has urged that "business as usual" be continued, to the end that there may be no loss of coal or metal production as a consequence. He says in part:

> On and after Nov. 15, all manufacturers, vendors, foremen, exporters, importers and analysts who deal with explosives or ingredients of explosives shall keep an itemized record of sales, issues or other disposition made of explosives and ingredients, pending receipt of detailed instructions and the securing of necessary licenses required by law.

More than 2000 persons have been designated to issue licenses. In most counties it has been necessary to designate only one person for this duty, but in some counties many more have been designated. In several Pennsylvania counties 15 have been found necessary.

Detailed instructions to licensors are to be sent out within a few days. A few of the paragraphs from these rather extended instructions are as follows:

> 13. Appearance in Person—Every applicant for a license must appear in person before the licensor. In the case of firms, associations, societies and corporations desiring a license for purchasing or vending explosives, or in the case of educational institutions applying for the analyst's, investigator's or educator's license, the application may be presented by and the license issued to the properly qualified officer of such firm, association, society, corporation or institution, and the license shall be made out in the name of the firm, association, society, corporation or institution; but a foreman's license shall be issued upon presentation of the application of the foreman in person and shall be issued to the foreman in person, as foreman of the designated individual, firm, association, society or corporation. A corporation official applying for the license for a corporation and a foreman applying for a foreman's license should present proper credentials to show his official capacity. The word "foreman" as used in the regulations designates the person actually issuing explosives from the explosives magazine and any other person who may be designated by his company to see that explosives are taken by a workman only to points necessary to the carrying on of his duties and that unused explosives are returned to a safe place, whether or not this man is known at the mine or plant or carried on the payrolls under the title of "foreman."
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> 14. Citizenship—The law specifies that an applicant "shall state under oath his place of birth, whether native born or naturalized citizen of the United States of America; if a naturalized citizen, the date and place of naturalization." In the case of corporations, firms and associations, the nationality of the controlling stockholders must be indicated. Licenses will not be issued to enemy aliens or to subjects of a country allied with an enemy of the United States; or to a corporation, firm or association where its controlling stockholders or members are enemy aliens or subjects of a country allied with an enemy of the United States.

Sulphuric Acid Situation Acute

Faced with the certainty of an increase of 1,500,000 tons in sulphuric-acid requirements in 1918, intensive efforts are being made by several Government agencies to insure its production. The situation is particularly acute with regard to high-gravity acids. The War Industries Board has found it necessary to add a sulphuric-acid specialist to its staff in the person of M. F. Chase, of the Commercial Acid Co., of St. Louis, who will report to Mr. Baruch. Mr. Chase formerly was with the Mineral Point Zinc Company.

At present, the sulphuric-acid problem is receiving consideration by the War Industries Board, War Minerals Committee, Department of Agriculture, War Trade Board, Department of Commerce, National Research Council, Committee on Chemicals and the Committee on Fertilizers. In addition, the Shipping Board has under its jurisdiction the allotment of ships for importing Spanish pyrites. To date, the activities of these different agencies have not been successfully coördinated. It is apparent from Government investigations that pure sulphur must be used to obtain results quickly, and

Spanish pyrites. To date the activities of these different agencies have not been successfully coördinated. It is apparent from Government investigations that pure sulphur must be used to obtain results quickly, and that some industries must rely more upon the sulphur obtained from pyrites. Consumption of strong acids by certain industries can also be reduced, it is believed.

Manganese Output in Arkansas District Affected by Labor Shortage

After preliminary survey of Batesville manganese district of Arkansas, D. F. Hewett, of the U. S. Geological Survey, has concluded that, although the aggregate quantity of ore in the district is probably large, at present there is little prospect that the output can be doubled in the near future. Mr. Hewett just has returned to Washington from Arkansas.

Among the deposits examined by Mr. Hewett were those near Cushman, which are yielding high-grade ore. This is in the form of hard nodules ranging in size from that of walnuts to masses that weigh as much as five tons. Most of the high-grade ore near Cushman is found in solution cavities in the Izard limestone. The nodules are of psilomelane and braunite imbedded in the chocolate-colored clays that fill the cavities. These ores commonly range from 45 to 52% Mn and from 3 to 7% Fe. Much of the lower-grade ore, as well as some of that which runs over 40% Mn, is derived from deposits represented by weathered Cason shale. Deposits of this type are worked by opencut methods and at the Montgomery mine a washer has been installed to treat weathered material, which is the only one in the district. The area in which the deposits are known and indicated is about 15 by 25 miles, about one-fourth larger than outlined by Penrose in 1890.

For the last nine months the district has yielded 550 tons monthly of ore running more than 40% Mn; 700 tons monthly from 15 to 40% Mn and 100 tons monthly from 5 to 15% Mn. The limiting factors are the tedious method of mining, the distance of most of the deposits from the railroad, poor roads within the district and the scarcity of labor. Few shafts can accommodate more than four miners at work.

The output of the district bears a close relationship to the number of men employed. In October, during the cotton-picking season, the ebb of production for the year was reached, when it was two-thirds normal. Until recently the prevailing wage in the district has been $1.75 for surface men and $2 for miners per 10 hours. Wages have been advanced, however, so that surface men now receive $2 and miners $2.25 per nine hours. This has not drawn labor from the outside.

Manganiferous Iron Deposits at Silver City, N. M.

The old silver-producing area near Silver City, N. M., has recently become the most productive source of manganiferous-iron ore in that state. Since April, 1916, he Moses and Kirchman lease has shipped 31,000 long ons from several opencuts, none of which is over 15 ft. deep. The ore averages about 16% Mn, 35% Fe, 6% SiO_2, and 0.012% phosphorus. It is shipped to the Colorado Fuel and Iron Co. at Pueblo, Colo. The deposits were recently examined by Joseph B. Umpleby, of the U. S. Geological Survey, who says that even more ore is available on an adjoining group of claims owned by C. A. Stevens, of New York. These claims are not being worked. Dr. Umpleby said:

> The manganiferous-iron deposits crop out on the hill southwest of the town of Silver City and extend westward and northward along the south and west sides of Chloride Flat. The deposits are thus scattered over an area shaped somewhat like a fish-hook, open northward, with the point near the town limits of Silver City. The deposits are confined to areas of Ordovician limestones, and most of the ore is in the upper members.
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> The ore-bearing beds dip eastward at low angles, and in the immediate vicinity of Silver City are cut off by a mass of quartz monzonite porphyry. Several normal faults which cross the range offset the beds westward on the north. Parallel to these larger displacements are innumerable other faults too small to be traced at the surface. The orebodies are irregular replacements principally of lenticular outline and oriented parallel to the bedding. In a few places the manganiferous-iron ore occurs along the sides of narrow quartz veins, but in general there is no observed regularity in the distribution of orebodies. The largest mass developed is on the Stevens group of claims. It is exposed throughout the extent of an open cut 6 ft. deep and 300 ft. long, which crosses beds dipping 15° east. Smaller openings show that ore continues for 300 ft. farther west and 200 ft. farther east. Ore crops out at the surface on the slope above the line of open cuts to an elevation 60 ft. higher. As development of the manganese-iron ores has not reached deeper than 40 ft. below the surface anywhere in the area, and as the ores seem to have been leached from the overlying shales, tonnage below the level of exploration cannot be estimated with assurance. Nevertheless it seems safe to conclude that in this mass more than one-half millon tons of ore, apparently of a grade similar to that already shipped from the area, is available. Several other parts of the district show surface exposures of comparable extent and quality, but development on them is less advanced and an estimate of tonnage is more hazardous. It is apparent to one examining the outcrops and their wide distribution, however, that a very large tonnage of ore suitable for spiegeleisen can be easily developed in the Silver City area.

Mining in Tolovana District

After an exhaustive examination of the gold placers in the Tolovana district of Alaska, which is producing gold at the rate of $1,000,000 annually, J. B. Mertie, Jr., tells of some of his observations as follows: "Underground conditions for mining are excellent. The ground is solidly frozen from top to bottom. No water is present in the workings because so far no thawed ground or underground water-courses have been encountered. Little or no timbering is necessary. Examinations of untimbered workings a year old, from which all the gravel has been removed, show no tendency of the roof to cave. These favorable conditions have rendered mining much more economical than in the Fairbanks district. The gold found on Livengood Creek is high-grade, due evidently to the small content of silver; the mean proportion is 76 parts per thousand, compared with 82 to 172 parts per thousand in Fairbanks gold."

Mineral Survey of Idaho Completed

A mineral survey of Idaho, which has just been finished by Thomas Varley and E. K. Soper, of the United States Bureau of Mines, is to be the subject of a complete report now being prepared. A preliminary statement covering the more important features of the survey will be issued soon.

Editorials

The Labor Problem

THE extensive record of disturbing strikes all over the country, the recent threat of the railway men, the admonitions of the members of the labor division of the British Ministry of Munitions, who are visiting us, the address of the President to the American Federation of Labor, these and other things have caused us to awake to the realization that the labor problem is the most serious of all of our troubles in prosecuting the war. One British authority has remarked that if Great Britain had had so much labor trouble as we have had it would long ago have been out of the war. So widespread has been the unrest in the United States, and so virulent its manifestations that it is clear that the country must treat it in a different way than heretofore.

The fundamentals of the situation are these: Out of a male population of 20,000,000 above the age of 16 in gainful occupations other than agriculture and railway operation, about 2,000,000 have been called into the military services. This is not a clear subtraction, for a small portion of the 2,000,000 were previously in service. Even so, the subtraction is a large one. On the other hand there are offsets, especially the more extensive use of the labor of old men and of women, the forcing to work of the habitually idle (a surprising large number), and the diversion into productive work of men who previously served purposes of luxury. These figures give us no more than the general idea of labor shortage, and not of productive capacity. Involved with the latter are the questions of efficiency of labor and of administration, which are not easy to gage.

However, it is clear enough that there is a shortage of labor not only in the United States, but also all over the civilized world, and that is at the bottom of the general rise in prices for commodities. Individually prices rose in different degrees, especially in the earlier years of the war. Thus, some commodity might soar far above others, reflecting not only shortage of labor but also shortage of plant, the latter being indeed the immediate factor, and such extravagances of price were the inducement to capital to provide the additional plant. This was greatly to the benefit of certain classes of skilled labor, lead burners, for example. But in the course of time the increased cost of all commodities tended to approach the increase in the general average, which may be regarded as about 1.6 times the figure before the war. The cost of living has probably increased that much. Labor should have enjoyed a similar increase in wages. Has it? This is an extremely difficult question to answer, but before we condemn workmen for demanding more pay, let us consider whether they be not entitled to it. This is a concession that the employing class should make in their views and manner of thought. While on the subject of concessions by this class, let us say, moreover, that this is no time to advocate any policy of anti-unionism, or to seek to deprive labor of any of the rights that it has won. We preach to employers the principles of fair-mindedness and generosity, in short the square deal.

This is not to say that during the last three years labor on the whole has not got what it ought to, that a good deal of its present complaint may not be due to what the late James J. Hill characterized as the cost of high living as against the high cost of living. The situation is not sufficiently indicated by statistics. Undoubtedly there are disparities. We conjecture that the wages for common labor may not have risen so high, or so rapidly, as they ought to have done. On the other hand the wages for highly skilled labor have probably risen disproportionately high in some parts of the country, especially the East. In other parts the opposite may be the case.

Any consideration of this subject is confused by the matter of the decreased efficiency of labor that is reported from all quarters. In one important mining district it is said that while wages have been increased 40% the unit of work has decreased 40%. From another district comes the report that since wages have been increased the men have been working only five days a week, being able in that time to earn money enough. From metallurgical plants the reports are common that not only have costs of smelting increased but also extraction of metals has decreased owing to the indifference and carelessness of the men. If the net result were as bad as these things indicate the outlook would be black indeed. The partially redeeming feature is that administrators have been able under the prick of necessity to introduce economies in operation that have offset the wastefulness of labor both in work and material to more or less degree. The most striking example of this is to be found perhaps in the running of the railways, which would be in a far more desperate situation had it not been for the remarkable feats in increasing car loading and decreasing unnecessary travel during the last six months.

There is no more loyal citizen than Samuel Gompers. The labor leaders who are less well known are loyal. Labor itself is loyal, we are convinced. But labor does not see clearly what it has to do to help win the war. It is the duty of its leaders now to lead if ever they are going to lead. Let them preach that the man who does an honest day's work of any kind is doing his bit. Let them preach that there should be waste of neither time nor material. If the energy of eight hours of work can be made to produce more by being properly exerted let the instruction of the managers be obeyed, not resisted and nullified. If a man can earn enough to satisfy himself in five days of the week let him not idle on the sixth, but let him work and subscribe the proceeds to liberty bonds. Let there be thrift in the expenditure of money for living expenses, cutting out the luxuries.

Another thing that may well be borne in mind by the dissatisfied is this: Large dividends by great corporations do not necessarily represent profiteering, and not even excessive war profits. If the cost of commodities, the cost of living and the wages for labor have risen on the average about 1.6 what they were before the war the share of capital ought to rise in the same proportion. A dividend of 8% on capital means no more now than 5% used to. Bear in mind, too, that things are often not what they seem. There are companies that thought they were earning enormous sums in 1916, and so represented, that have had to pass their dividends in 1917, for they were not really earning what they thought they were.

When the United States entered the war the precept that was commonly preached was "Reduce consumption and increase production." That was good advice and conformity to it would have put the country further ahead than it is now. We have reduced consumption, partly by the natural check of high prices and partly by the strong-arm tactics of the Government in forbidding it. But we have also reduced production, for which the subtraction of men is partly responsible, though much blame must fall on both capital and labor. If we are going to win the war quickly there must be a revision of policy.

Capital must be more broadminded and generous and must not seek advantages for itself.

Labor must also be more broadminded and must do full-time work, with the maximum possible efficiency, and must be thrifty.

If Capital and Labor can unite on these principles with Brains as the third leg of the stool, the United States will build aëroplanes, and ships, and guns with such celerity as to startle the Huns and will produce enough food and other things to be comfortable in the meantime.

The Twenty-Seventh Engineers

ONE of the plans to help win the war is to adopt a soldier, to look out for him, make him happy and thus improve his efficiency. In behalf of the mining industry we have adopted a regiment, the 27th Engineers, which is a mining regiment. The officers of this regiment are well-known mining engineers. We are helping them recruit their ranks from the miners of the country. We have asked mine managers and mining companies to assist. Everybody wants this to be a very fine and very efficient regiment.

Naturally the mining industry should take care of its own. We want these men to know that the industry in which they have worked, of which they are a part, appreciates what they do when they risk all for the service of their country. Let them know that their industry stands back of them, ready to aid them in their troubles, with constant thought of them; let them know that there is someone, like a godfather, to whom they may look for friendly help.

We propose to organize a Comfort Club for the 27th Engineers, a club that will subscribe a fund out of which may be furnished cigarettes, pipes and tobacco, sweets and such other comforts as may be needed and the resources of the fund make possible. These things will be needed now and they will be needed continuously. In administration the officers of the regiment will coöperate.

We ask our readers to subscribe to this fund, drawing check to the order of the *Engineering and Mining Journal*. Subscriptions will be reported promptly in our columns. None will be too small to be thankfully received and none will be too large. From time to time reports will be made of what is done with the money. Now is the time to subscribe. The *Engineering and Mining Journal* starts the list with a subscription of one thousand dollars.

The Prospects of the Copper Companies

UNTHINKING people received rather a shock last Friday when the Jackling companies came out with their statements showing a deficit in the third quarter of 1917, i.e., they had failed to earn their dividends. Their explanation was overlooked, although it was clear and simple. During that quarter they had sold only a part of their copper and had inventoried the unsold part at 13½c., thus greatly reducing gross earnings on their books. In reality there was no such great reduction, for the inventoried copper was subsequently sold at 23½c., the delay being due to the negotiations with the Government. These reports were misinterpreted as forerunners of a decline in the copper industry, reduction of dividends, etc.

But what are the real prospects of the copper companies? In the first place they are receiving by agreement with the Government 23½c. for their copper until the end of January, 1918. This is only about 1½c. per lb. less than they averaged in 1916. There has been talk about the price being raised or lowered after the end of next January. In fact, that matter has not yet been considered between the contracting parties. We do not anticipate a lowering, for there is a shortage of copper and there will hardly be any action deliberately to restrict production.

However, apart from the matter of selling, the position of the copper companies depends upon how much they must pay in taxes. Some brokerage houses and statisticians have issued computations purporting to show what the several companies will have to pay. These have been guesswork and rather foolish. Among the managements of the principal companies no one yet knows how to figure the tax, and until there have been decisions by the Bureau of Internal Revenue it will be a waste of time to try to do so. The chief items of uncertainty are: (*a*) What is capital, (*b*) what is earned surplus employed in the business, and (*c*) what shall be the deduction from gross earnings for depletion of the mine? Although there is uncertainty about the last it is clear that it will give mining companies, and properly so, a large exemption.

Amid all of these uncertainties it is impossible to think safely of anything but general principles, which may be summarized as follows: Owing to the allowance for depletion, no mining company will have to pay so much as might appear from first sight. Allowance for depletion having been deducted, companies with a large capitalization are in a more favorable position than those earning about the same amount but having a relatively small capitalization. Thus, there can be no doubt about Anaconda being much better off than Utah.

But Utah, which has accumulated a great surplus, is in turn better off than other companies of relatively small capitalization which have distributed in large dividends the bulk of their great earnings in 1915-17.

As to future dividends the prospects are generally proportional to the conservatism exhibited during the boom years. Some companies that have tripled and quadrupled their dividends, disbursing the bulk of their earnings, will probably have to cut them considerably. Those that have been conservative will probably keep on at the present rate. There will be many in an intermediate position. Considering the two largest producers, Utah, which paid $4 per share before the war, raised its rate finally to $14. That was not quite so extravagant as it looks superficially, for in 1914 Utah was still a young company, which was earning a great deal more than it was distributing in dividends, it being still engaged in accumulating an adequate working capital. Having accomplished that it was entitled to increase its dividend and would have done so under normal conditions, but the eventual increase to $14 undoubtedly reflected the division of war profits. Utah will continue to earn a great deal of money, but we anticipate that the payment of war tax will cause its directors to be somewhat less lavish and we conjecture that its dividend rate may be cut to $10 per annum.

Anaconda was the most conservative of all the companies, its rate before the war having been $6 per share and its increase during the war having been only to $8, which it probably would have been able to maintain, war or no war, on any decent copper market by virtue of its improvements in mining and metallurgy and its expansions. Its great earnings above its relatively modest dividend have been put back into the business and used for payment of its notes. Anaconda has become, in fact, a great industrial company, like the American Smelting and Refining Co., with important mining interests, and so differs from the mining companies pure and simple, like Utah. Anaconda, owing to its large capitalization, will not have to pay a large tax in proportion to its earnings and its prospects for maintaining its present dividend rate are unblemished. Indeed, Anaconda's increased earnings from silver and zinc ought nearly to offset its war profit tax.

The American Smelting and Refining Co., which is often classed among the "coppers," and is indeed the largest seller of copper, is not an original producer except to a slight extent. It buys copper in crude form from producers or receives it for smelting and refining on toll and sells the refined product. The American Smelting and Refining Co. is essentially an industrial company—the magnitude of its business being measured fundamentally by the tons of ore and crude metal it can smelt and refine—but it has also important mining interests. Considered broadly there is a good deal of similarity between the natures of the business of the American Smelting and Refining Co. and Anaconda, both being metallurgical companies with mining interests, the difference being that Anaconda's are larger and are mainly in copper, while those of the A. S. & R. Co. are in lead. From the angle of the war-tax law, the American Smelting and Refining Co. has the benefit of a large capitalization and surplus employed in the business, but it is not clear how its capital may be figured under the terms of the law. Moreover, its capital is divided among bonds, preferred stock and common stock, wherefore the onus of the tax falls on the last. The earnings of this company are so large, however, that it is not believed that the tax will necessitate any reduction of the 6% dividend on the common stock, but it will probably check expansions in business for which surplus earnings have been largely employed.

The Porphyry Reports

ANOTHER misconception that arose from the statements of the porphyry companies pertained to the light that they were considered to throw on the copper market previous to the consummation of the agreement with the Government. "If these companies could not sell their copper the market must have been in a parlous state and the Government's price was a generous relief to the producers," it has been said. This is quite erroneous, especially in its implication that unsold stocks of copper had been accumulating.

The porphyry mines deliver their product in crude form to smelters and refiners, who are not ready to deliver the refined copper to consumers until 90 to 100 days later, but expecting to make such delivery normally they sell it ahead, and the producers, knowing what they are going to receive, can take such sales into the quarter of original production. When the porphyry companies said that they had not sold their third quarter copper they meant that they had not sold what they would have ready for delivery in the form of refined copper in October, November, December and January.

This followed from the great contraction in buying in August and September, and even earlier, when the negotiations with the Government were in progress. Reference to the weekly market reports for that period makes this quite clear. Europe did not buy, nor did domestic consumers, except in cases of urgency, it being well known that the Government's action would determine the market, no matter what that action might be. It was clearly foreseen by producers, even at that time, although not by consumers, that when the fourth quarter actually arrived there would not be copper enough and the porphyry companies would have been justified in writing up their third quarter production to a higher figure, but they preferred to enter the uncontracted part of it at the nominal price of 13½c., which they adopted as their inventory valuation when they first engaged in business, years ago. The whole thing was, therefore, simply a matter of bookkeeping, which will cause the correction to be made in the accounts for the fourth quarter.

However, the arrangement with the Government terminates with the end of January and unless extension is made sufficiently early the companies that keep their accounts in this way will not know how to compute their fourth quarter production, which will not be fully available for delivery until, say, April, 1918. Incidentally, it may be remarked that copper-producing companies differ in their methods of keeping their accounts in this respect, and it may be pointed out that the arrangement of Sept. 21 between the producers and the Government abolished the old trade custom of selling for future delivery and put the market upon a spot basis, which prohibits business by many concerns that formerly bought copper in crude material out of which they could not deliver the refined until months later.

The Army Behind the Army

THE "army behind the army" will win this war. Victory is assured to that side which can keep its industrial army mobilized at highest efficiency, which can keep its soldiers at the front supplied with the necessary munitions and supplies.

Shall we who stay at home let our soldiers sacrifice their lives needlessly? Shall we let victory slip from our grasp because the industries behind the line fail to do their part?

The poster supplement mailed as a part of this issue of the *Engineering and Mining Journal* is intended to remind every citizen of the importance of supporting to his fullest capacity the men under fire. "Is this my boy?" should bring home to every one of us the necessity of supplying the boys in the trenches with all they require in the way of food, clothing, metals, explosives and the myriad accessories of modern warfare. Every mine, every farm and every shop engaged in the production of essential war materials should be operated steadily at such capacity as may be specified by the needs of the Government, and no internal dissensions should be allowed to interrupt the steady flow of munitions during the next three or more years that may be required to restore international law. We can steadfastly concentrate on the production of the supplies needed by our soldiers and win the war as certainly as we outmeasure Germany in resources.

Shall we think in time? Or shall we wait until our army has had to relinquish hard-won ground because of a shortage of some of these essential supplies and then have to regain, with the sacrifice of thousands of lives, territory that might easily have been held had we, behind the lines, done our part?

Regard for a moment Russia and think what she might be capable of if properly unified, munitioned and ed; think of the lives and territory that have been ost because of disorganization behind the lines. Look at Italy, who has relinquished her hard-earned victories and now is in a critical condition because she temporized with her pacifists and reduced her munition output while the Germans prepared their sledge-hammer blows against the inadequately equipped Italian army. These two catastrophies, with their attendant loss of territory and men, should be an object lesson to us and cause us to put our shoulders unitedly to the wheel and keep our boys supplied with the maximum requirements for successfully bringing the war to its speediest close. Let us win the war first; settle our petty differences afterward.

Silver

IT WAS reported in the papers this week that Great Britain and the United States had agreed to fix the price for silver, there being several versions as to how his was to be done. These reports were incorrect. However, it is true that there are negotiations pend-ng. Until these are consummated and the plan has been published, comment is useless.

BY THE WAY

By a recent transaction in the Cripple Creek district of Colorado, the surface rights of four mining claims were transferred to a farmer for grazing purposes. The Cripple Creek district, before the discovery of gold, was only summer pasture land. "It is to be hoped," writes the engineer who sent in this information, "that this deal does not inaugurate a general return to the former industry, but that the famous gold-producing section may continue to produce gold instead of beef for a long time to come, no matter how badly we may need the beef, for some of us need the gold before we can get the beef."

The Quicksilver Mining Co. of California, one of the oldest companies in the state and at one time the largest producer of quicksilver, has made application through its directors for the appointment of receivers and the dissolution of the company. It has been organized over 60 years and at one time did a profitable business, but for some years past its mines have produced nothing and the assets listed in the application are less than the liabilities, leaving nothing at all for the $10,000,000 stock. There has been no production for several years and the New Almaden tract—the main asset of the company—is valued in the present statement at only $10 per acre. All of which goes to show that mines are not everlasting and that it pays to practice amortization when profits are going.

In the days before the adoption of safety measures which characterize the mining of today, little attempt was made to protect the men underground. Every man was expected to look out for himself. It was the misfortune of a "Cousin Jack" miner in one of the Michigan iron mines to walk inadvertently into an open raise, with the result that he was picked up on the level below, a short time afterward, with both legs broken. He was conscious, however, and offered the following explanation of his mishap: "Damme, boys, never 'ad anything like that 'appen befoor. 'Ere I was walkin' 'long they bloody drif' an first thing I nawed there was bloody shaf'. Started out to step on plank, an' damme, plank wasn't there. So down comes I, shaf', plank and all. What's think on it?"

A group in a downtown club were discussing the recent mayoralty election, says the *Wall Street Journal.* "What we need in New York is a general manager," said a prominent lawyer. "The people should elect directors. They in turn would elect a president and other officers. The president in conjunction with the directors would appoint a general manager. He would run the city. The people could elect a new board of directors annually, but they would have nothing to say about the general manager, and——" "Wait a moment," interposed a director of one of the largest railroads in the country. "Tell me where in the world New York would get a man capable of running it? If such a genius could be found we would offer him the presidency of our road at five times the salary any city would pay him."

Ferrotungsten and Ferromolybdenum Production in Colorado

Boulder Correspondence

Several elaborate plants for the production of ferrotungsten, tungstic acid (yellow powder), and ferromolybdenum have been built within the last two years in Colorado, near Boulder and Denver. They are somewhat similar to the Eastern plant of the Primos Chemical Co., of Primos, Penn. Local capital was used, generally supplied by men who had made money in mining and milling tungsten during the boom. Small electric furnaces were built, copying Swedish practice, for producing the ferroalloys. The tungstic acid is being made by chemical processes, one of the most successful of which and one that yields an extremely pure product, being devised by John B. E. Riley, professor of chemistry at the University of Colorado, who is interested in a small plant utilizing the process at Boulder. A good deal of secrecy has been maintained in the operations of rival companies.

The electric furnace used for making the ferroalloys is about 4 ft. high, cylindrical, vertical, and lined with a mixture of ground coke and tar which is tamped about 8 in. thick between two sheet-steel forms, after which the inner form is removed. The vertical electrode, 3 to 7 in. in diameter, descends through a hole in the firebrick top, forming an arc with a bottom electrode surrounded by coke and fixed in the floor. Feed wires supply current to each; the arc is drawn out several feet in length after the furnace is well in operation. The electrode is usually water-cooled, and is raised and lowered by a cable and worm-wheel windlass.

The charge consists of tungsten concentrates, lime, fluorspar, coke and charcoal, and is added slowly after the arc has been formed, a piece of metal first being put on the lower electrode to start the arc. About 75 to 90 kw. are maintained at the wattmeter. After three or four hours the metal begins to settle. If the mixture boils high, more fluorspar is added.

An iron bar is stuck into the mixture to test it. If the slag cools black and glossy, lime is added; if brown and smooth, coke; if smooth gray-green, the slag is ready to be tapped. After tapping the slag, another charge is added, and so on until the furnace shows signs of breaking. The furnace is then shut down and cooled, preparatory to breaking into pieces for removing the button of ferrotungsten in the bottom, which weighs several hundred pounds.

To continue smelting, a new furnace must be constructed, because the tungsten is so difficult to melt that it will not run like copper or lead. The button is put through a crusher and rolls, and assayed. To remove surplus carbon, it is refined in a refining furnace, and then is shipped to the East. Of course, sulphur and phosphorus are kept as low as possible; the tungsten content of the final product is usually about 80%.

For the most part, these smelting and chemical operations have been developed by the typical American method of pragmatical "try and see." Mixed successes and failures ensued, as ability and money were brought to bear on the problem. Many young chemists have had to devise methods of testing substances for which there are no rules in the book. Molybdenum is coming into use more and more, and tungsten operators are beginning to fear its effect. Many of the excesses of the tungsten boom have passed, and no longer do hopeful prospectors stick at minute veins of dark-colored valueless minerals waiting for them to turn to tungsten.

Nevada Consolidated Quarterly Report

The report of the Nevada Consolidated Copper Co. for the quarter ended Sept. 30, 1917, shows a production of 20,217,673 lb. of copper, as compared with 20,817,356 lb. in the previous quarter. The monthly production was: July, 7,253,337 lb.; August, 6,439,984 lb.; September, 6,524,352 lb.; average, 6,739,224 lb. During the quarter 1,014,031 dry tons of Nevada Consolidated ore, averaging 1.46% copper, was milled, comparing with 1,021,990 dry tons, averaging 1.46% copper, for the previous quarter. In addition to the above 69,762 tons of Consolidated Coppermines ore was milled in the quarter. The cost of copper produced, including the Steptoe plant depreciation and all charges except ore extinguishment and after crediting all miscellaneous earnings, is reported at 11.78c. per lb., as compared with 11.02c. for the previous quarter. Excluding the item of depreciation, the cost was 10.93c., as compared with 10.19c. for the previous quarter. A Red Cross dividend of 15c. a share was declared on July 25, and on Sept. 29 a dividend of 50c. a share and a capital distribution of 50c. a share were paid.

Chino Quarterly Report

The report of the Chino Copper Co. for the quarter ended Sept. 30 shows the gross production of copper contained in concentrates from milling operations was 21,887,496 lb., comparing with 20,546,593 lb. in the previous quarter. The average monthly production was: July, 7,343,767 lb.; August, 6,824,127 lb.; September, 7,719,496 lb.; average, 7,295,797 lb. per month.

The total amount of ore treated was 966,000 tons, averaging 10,500 tons per day, and is a record amount for any quarter since the beginning of operations. The average copper content was 1.609%, comparing with 1.704% in the second quarter. The recovery per ton of ore milled was 22.658 lb. gross, as against 23.986 lb. gross for the previous quarter. There was produced 75,121 dry tons of concentrates averaging 14.568% copper, compared with 66,764, averaging 15.38% copper, during the second quarter.

The cost per pound of net copper produced, after allowing for smelter deductions and crediting all miscellaneous income, was, according to the report, 12.14c., as against 9.65c. for the second quarter. The net returnable copper for the third quarter was 20,888,408 lb. The copper content of the ore treated was about 2 lb. per ton of crude ore less than for the second quarter and the higher cost per pound is chargeable, first, to smaller amount of net returnable copper, second, to a higher cost of labor and supplies, and third, to inclusion, beginning in August, of a monthly depreciation charge. A quarterly dividend of $2.50 per share was paid to the stockholders on Sept. 30, in addition to a Red Cross dividend on July 25 of 40c. per share. During the third quarter, a total of 1,372,741 cu.yd.

of material was removed by steam stovels at Santa Rita, as against a total of 1,419,494 cu.yd. for the second quarter. Of the total material removed, 887,326 cu.yd. were stripping, the remainder being equivalent to 963,477 tons of ore averaging 1.612% copper.

Utah Copper Quarterly Report

The report for the quarter ended Sept. 30, 1917, of the Utah Copper Co. shows the total gross production of copper in concentrates amounted to 54,762,554 lb., compared with 56,403,465 lb. for the previous quarter. The monthly production was: July, 18,127,154 lb.; August, 18,796,012 lb.; September, 17,839,378 lb.; monthly average, 18,254,181 lb. In addition, 236,924 lb. of copper in ore was shipped direct to the smeltery, making the total gross production for the quarter, 54,999,468 lb. as compared with 56,845,059 lb. for the previous quarter. During the period 3,439,400 tons of ore was treated, being 141,000 tons more than for the preceding quarter. The average grade of the ore was 1.309% copper, as compared with 1.3881% copper for the second quarter, and the average extraction was only 60.96%, owing to the unsettled operating conditions while improvements were being made and the comparatively low copper content in the headings. A total of 1,230,677 cu.yd. of capping was removed, as compared with 1,219,198 cu.yd. in the second quarter.

The average cost of copper produced from concentrates as stated in the report, after allowing for smelter deductions and crediting miscellaneous income from Utah operations only, including Bingham & Garfield Railway operations, was 10.860c., as compared with 9.464c. in the second quarter, the increase being due partly to increased state and Federal taxes, partly to increased wages effective July 1, and partly to the low grade of ore. The regular quarterly cash dividend of $3.50 per share was paid on Sept. 30. During the quarter, there was also paid a Red Cross dividend of 50c. a share.

[The regular quarterly cash dividend of $3.50 as given in the report may include a capital distribution to the shareholders of the company, although such is not stated.—Editor.]

Engineer Service Overseas

Engineers are wanted for early service overseas. The men in the front-line trench need the help and coöperation of skilled men back of the lines, and engineers are wanted at once for the Enlisted Ordnance Corps, National Army.

Uncle Sam is calling on our trade to come across and help his fighting men. There is a lot of work to be done over there, and the call has gone out for engineers between the ages of 18 and 40 who want to do their bit, and who know their job.

Modern war is a tremendous business, and the army that wins is the army which has the best equipment and the best men. The men are over there now—they are ready to go ahead, but they still need experts in our line to repair and maintain their equipment. There is a fine chance for every man who wants to help. Write to the Chief of Ordnance, War Department, Washington, D. C.

Agree on Iron Price Differentials

The following statement has been issued by E. H. Gary, chairman of the committee on steel and steel products of the American Iron and Steel Institute:

By agreement between the general committee on steel and steel products of the American Iron and Steel Institute and the War Industries Board, approved by the President, the base price of No. 2 foundry iron and also basic iron was fixed at $33 per gross ton, f.o.b. cars at furnace.

From these base prices the Sub-Committee on Pig Iron, Iron Ore and Lake Transportation has reported to the general committee a list of differentials, which the general committee believes as fair and reasonable and in accordance with the usages of the trade, and therefore recommends to the iron industry that the same be adopted to take effect immediately. The list of differentials is as follows:

Foundry Iron—No. 2 grade is to be equivalent in analysis to: Silicon, 1.75 to 2.25%; sulphur, not over 0.05%. No. 2 soft Southern iron equivalent to No. 2 foundry of same silicon content. Differentials from the above base price for No. 2 foundry iron are to be made for the following changes in specifications: Forge or mill iron, $1 per gross ton under base; foundry iron running silicon 1 to 1.75%, 50c. per gross ton under base; foundry iron running silicon 2.25 to 2.75%, 50c. per gross ton over base; foundry iron running silicon 2.75 to 3.25%, $1.50 per gross ton over base; foundry iron in excess of 3.25% silicon, $1 per gross ton for each ½% of silicon over the price for 3.25% silicon iron; manganese, sulphur and phosphorus variations to be adjusted as formerly customary in each district having respect to the base price. Where iron is sold by fracture the usual grading prevailing in each district is to continue. Malleable iron, 50c. per gross ton above base; bessemer iron, 10% per gross ton above base; basic iron, base price.

Charcoal Iron—Southern or warm-blast charcoal iron a maximum of $10 per gross ton above base for iron ranging from 0.4 to 0.6% phosphorus, and silicon 1 to 2%; for grades running below these analyses corresponding reductions as usual to the trade to be made; cold-blast charcoal iron a maximum of $22 per gross ton above base with customary reductions for lower grades, as recognized by the trade; Lake Superior iron, $2.50 per gross ton above base for iron averaging 1.25% silicon. Other grades to be adjusted as per the custom of the trade depending upon the silicon, phosphorus and manganese contents of the iron; all of these charcoal-iron differentials to be considered in connection with base price.

High Silicon or Silvery Iron—For iron containing 6% silicon, $7 per gross ton above base; 7% silicon, $9 per gross ton above base; 8% silicon, $11.50 per gross ton above base; 9% silicon, $14 per gross ton above base; 10% silicon, $17 per gross ton above base; $3 per gross ton advance for each 1% silicon for 11% and over.

Bessemer Ferrosilicon—For iron containing 10% silicon, $22 per gross ton above base; 11% silicon, $25.30 per gross ton above base; 12% silicon, $28.60 per gross ton above base.

Low Phosphorus Iron—Iron containing phosphorus and sulphur not exceeding 0.04% and silicon not exceeding 2%: For copper-bearing iron, $17 per gross ton above base; for copper-free iron, $20 per gross ton above base; a sliding scale of $1.50 per gross ton advance for each reduction in phosphorus of 0.005% below 0.04%, and $1.75 per gross ton advance for each 1% of silicon in excess of 2%.

The Republic Iron and Steel Co. reports for the half-year ended June 30 that its total net earnings, after paying operating expenses and repairs, were $15,716,753, against $6,823,026 for the first half of 1916. Rents, depreciation and exhaustion of mines were $635,577; bond interest, $399,189; extra profits tax, $2,204,654; total charges, $3,239,420, leaving a surplus of $11,477,333. From this dividends were paid amounting to $875,000 on preferred and $815,730 on common stock, leaving an undivided surplus of $9,786,703. The total profit and loss surplus as of June 30, 1917, was $27,923,584. Unfilled orders on June 30 amounted to 528,976 tons of material.

Personals

H. C. Wilmot is on a professional trip in Arizona and New Mexico.

G. M. Clark has been elected president of the South African Institute of Engineers

P. B. McDonald is instructor of engineering English at the University of Colorado.

Douglas Muir is superintendent of the Nevada Austin Mines Co., Austin, Nevada.

Robert Sticht was recently in Anaconda, Mont., where he visited the Washoe smeltery.

R. B. Watson, general manager of the Nipissing Mining Co., Cobalt, Ont., has been visiting Arizona.

W. B. Rhodes has returned to Colombia His address is Olimpo del Valle, Mangangue, Colombia, South America

G. W. Laurie of the firm of Drucker & Laurie, 50 Church St., New York, has joined the 23rd U S. Engineers.

Dr. Raymond Brooks has returned to San Francisco after visiting the Flin Flon copper district in northern Manitoba.

R. A. Tregoolog, recently on the engineering staff of the Braden Copper Co of Chile, is visiting his home at Hubbell, Michigan.

J. E. Thropp, Jr., has been appointed superintendent of the blast furnaces of the American Rolling Mill Co. at Columbus, Ohio.

John Seward sailed from New York for Venezuela on Oct. 31, on professional business, to be gone until the middle of January.

William C. Russell, general manager of the Caribou Mines and Mills Co., of Cardinal, Colo., is on a business trip to New York.

Edwin W. Mills was in Vladivostok in October, having returned from an interesting Siberian trip. He then left for Peking, China.

B. C. Austin has resigned his position as manager of the Mountain King Mining Co., and will open an office in San Francisco as consulting engineer.

Philip Berg, recently engineer for the White Pine Extension Copper Co., has been appointed assistant superintendent of the Michigan Copper Mining Company.

Horace V. Winchell, recently returned from Russia, gave an interesting account of his experiences there at a luncheon on Nov. 8 at the Rotary Club at Butte, Montana.

Benjamin B. Thayer arrived in Butte, Mont., from New York on Nov. 9 for his regular tour of inspection of the Montana properties of the Anaconda Copper Mining Company.

Allen Hastings Rogers, Lucius W. Mayer and **Sydney H. Ball** have formed a partnership under the title of Rogers, Mayer & Ball, and have opened offices at 42 Broadway, New York.

C. A. Thomas, who resigned some months ago as resident manager of the Yukon Gold Co., has been appointed assistant to E. B. Braden, president of the Selby Smelting and Lead Co., of San Francisco.

Frank H. Sistermans, mining engineer, of El Paso, Texas, is in Cuba on professional business and will be absent for several months. His present address is Santiago de Cuba, care of the U S Consulate.

Sir Boverton Redwood, director of petroleum research for the British government, has taken charge of the work of coördinating petroleum production and research, and has resigned his position as director of petroleum research

E. J. Carlyle, metallurgical engineer, and **M. B. Hull,** mechanical engineer for the Sissert Mining District Co of Petrograd and London, arrived in San Francisco, Nov 9. They will spend some months in America in the interests of their company

E. H. Whitlock, consulting engineer, Cleveland, Ohio, and director of Wellman-Seaver-Morgan Co of that city, who has been in the Government service several months, is now in the Ordnance Department at Washington with the rank of major

Maurice Vandeputte, formerly preparator in geology at the University of Mons Belgium, now interned in the Camp of Zeist Holland, wishes to communicate with Belgian engineers who were formerly members of the Faculté Polytechnique of the University

Jay C. McLauchlan, of Pickands, Mather & Co, Cleveland Ohio, has been appointed assistant to J Leonard Replogle who has charge of iron and steel matters for the War Industries Board Mr. McLauchlan will give particular attention to the supply of pig iron

Dr. J. G. Davidson of the department of physics, of University of British Columbia, has been commissioned by the Canadian Government to install a plant in eastern Canada for the production of coke-oven byproducts, with the object of securing benzol and toluol for war purposes.

Obituary

Zophar W. Wright, for many years financial manager of the Detroit & Lake Superior Copper Co. and its successor, the Lake Superior Smelting Co., died at Ripley, Mich., on Nov 12, aged 85 years In 1878 Mr. Wright became president of the Houghton National Bank, holding that position for 24 years and retaining his interest and directorship in the bank until his death He was buried at Detroit, Michigan

Daniel Reid Leao died in Pittsburgh, Nov. 15, aged 78 years. Born in Scotland he came to this country in 1869, and soon after took service with the firm of Carnegie, Kloman & Co. as the repairer and liner of blast furnaces. Later he built the first Lucy furnace and other stacks for that firm and its successors. After several years as contractor for the erection of furnaces, he retired from active work, retaining some interests in iron and lumber companies.

A. M. Finlayson, a graduate of the Royal School of Mines, was recently killed in action. He was born in New Zealand where in 1908 he won a research scholarship on which he entered the School of Mines in London. In a short time he received the degree of D Sc., for work on the Rio Tinto (Spain) deposits. He wrote an article on the gold and silver veins of Great Britain and numerous papers on New Zealand geological problems, mainly in connection with scheelite and gold-silver veins. Prior to the war he held a geological position with an English oil company in Burma, but gave this up to enlist early in the war, in which he was commissioned a second lieutenant.

Societies

Engineers' Club of Northern Minnesota held its November meeting at Hibbing on Nov. 17

American Institute of Mining Engineers, New York Section, will hold a meeting on Nov. 26, at the Machinery Club, New York, at 8 p.m., preceded by an informal dinner at 6:45 p.m. Legislation affecting the metal industries will be discussed.

Montana Society of Engineers held a meeting on Nov. 12, in Butte. V. Arthur Walcutt read a paper on the new "Elm Orlu Electric Hoist" and Frank A. Linforth recounted his experiences on a recent examination trip to the interior of Costa Rica.

American Society of Mechanical Engineers, New York section, held a meeting, on Nov. 13, in the United Engineering Bldg., New York. The subject of discussion was the "Development of Mechanical Engineering Problems met by the Designer and Contractor on Concrete Piling," by Maxwell M Upson, chief engineer of the Raymond Concrete Pile Company.

Western Engineering and Technical Headquarters has been opened in the Sheldon Bldg., San Francisco, with George C. Ryno and U R Grant as managers. The organization is planned on the same lines as the Chemists Club of New York, providing comfortable quarters for visiting technical men and assistance in obtaining employment, if desired.

Society of Chemical Industry, New York Section, held a meeting at Rumford Hall, 50 East 41st St., New York, on Nov 23, opening at 8 15 promptly The papers presented were "Disposal of Wool-Scouring Wastes," R S Weston, Boston, Mass., and "Manufacture and Uses of Portland Cement," E. D Boyer, New York The latter was illustrated with lantern slides and moving pictures.

United Engineering Society and the four founder societies held a meeting, on Nov 14 in the United Engineering Bldg., New York, in celebration of the completion of the Catskill Water Supply project George H Pegram, president of the American Society of Civil Engineers, presided Addresses were made by John Purroy Mitchel, mayor of New York, and by Maj Gen. George W Goethals An illustrated description of the work was given by A. D. Flinn, deputy chief engineer of the New York Board of Water Supply

Industrial News

Mark R. Lamb has received orders from Bolivia for a 600-hp. Diesel alternator unit, a switchboard transmission line and transformer equipment.

Boston Belting Co., Boston, Mass., has made a shipment of rubber belting, weighing 22 tons, from its plant at Boston to the Burma Mines Corporation, Tawng Peng, Burma.

Charles E. Newton, who has taken charge of work in ore dressing and metallurgy at the School of Mines of the Oregon State Agricultural College at Corvallis, Ore wishes to receive current trade catalogs of mining, smelting and ore-dressing machinery.

T. L. Smith Co., Milwaukee, Wis., has introduced a new type of concrete mixer, styled the Smith-Chicago mixer with under-slung chain drive. The feature advertised is that the chain, instead of going around the mixer drum, passes under the truck frame, around an idler pulley on the shaft of the rollers supporting the drum and thence back under the drum. The drum thus acts as a constant and automatic tightener. The upward pull on the chain produces a good contact between the chain and the sprocket teeth.

New Patents

United States patent specifications listed below may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

Air Compressor. William Everett Ver Planck, Erie, Penn., assignor to General Electric Co. (U. S. No. 1,245,643; Nov. 6, 1917.)

Alloy. Frederick M. Becket, Niagara Falls, N. Y., assignor to Electro Metallurgical Co., Niagara Falls, N. Y. (U. S No. 1,245,552; Nov. 6, 1917)

Aluminous Ores, Process of Treating Harold A. Richmond, Providence, R. I., assignor to General Abrasive Co., Inc., Niagara Falls, N Y. (U. S. No. 1,245,383; Nov. 6, 1917.)

Atomizing Metals—Process for Atomizing Metals in a State of Fusion. Florencio Comamala Ucar, Madrid, Spain. (U. S. No. 1,245,536; Nov. 6, 1917.)

Car-Dumping Apparatus. George Henry Mueller, Columbus, Ohio, assignor to the Jeffrey Manufacturing Co. (U S. No. 1,245,947; Nov 6, 1917.)

Cement—Manufacture of Acid and Waterproof Cement. Curtis C Meigs, Philadelphia, Penn., assignor to Electro-Chemical Supply and Engineering Co., of Philadelphia, Penn. (U. S. No 1,245,608; Nov. 6, 1917.)

Dump Car. Jay B. Rhodes, Kalamazoo, Mich., assignor to Western Wheeled Scraper Co., Aurora, Ill. (U. S. No. 1,245,382; Nov 6, 1917)

Heat Value of Gas—Method of and Apparatus for Testing Gases. George G. Crewson, Tottenville, N Y, assignor to the Roessler & Hasslacher Chemical Co., New York, N Y. (U S. No. 1,245,688; Nov 6, 1917.)

Metal Treatment—Apparatus for Treating Metals and Their Alloys. Alvin M Craig, New Haven, Conn. (U. S. No. 1,245,687; Nov 6, 1917)

Mold. Solomon Swetzoff, Boston, Mass. (U S No. 1,245,636; Nov 6, 1917)

Openhearth Furnace. Thomas S. Blair, Jr., Chicago, Ill., assignor to Blair Engineering Co., New York, N Y (U S No 1,245,555, Nov 6, 1917)

Ore Concentrators, Feeding Appliance for Edward J O'Connell, Fort Wayne Ind., assignor to Deister Concentrator Co. (U. S No 1,245,611, Nov 6, 1917)

Pulverizing Molten Materials, Method and Apparatus For Wood Freeman, Tacoma, Wash (U S No 1,215,328, Nov 6, 1917)

Pyrites—Method for Treating Burnt Pyrites and the Like Edgar Rouse Sutcliffe, Leigh, England (U S No. 1,245,634, Nov 6, 1917)

Rotary Boring Drill. Howard R Hughes, Houston, Tex., assignor to Hughes Tool Co., Houston, Tex. (U S No 1,215,462, Nov 6, 1917.)

Soldering Compound for Various Metals. William Brierly and Nelson R Moore, Vanderbilt, Penn. (U S No 1,245,862, Nov 6, 1917)

Editorial Correspondence

SAN FRANCISCO—Nov. 17

Seventeen New Oil Wells were started during the week ended Nov. 3; 14 of these are in Kern County fields, one in Montebello field near Los Angeles, two in Coalinga. This makes a total of 879 new wells started since the beginning of the year. In the week, 15 wells reported for test of water shut-off, 21 deepening or redrilling, and three abandoned. In the week ended Nov. 10, the State Mining Bureau reports 16 new wells started, making the total 895. Seven of these new wells are in the southern fields, one in Santa Maria, four in Kern County and four in Coalinga. Twenty-three wells were reported for test of water shut-off, 14 for deepening or redrilling, and six had been abandoned.

Dry-Land Dredge Near Igo, installed a few years ago, has been dismantled, the machinery sold to L. Gardella who is operating dredges on Clear Creek; the motors and other electrical appliances sold to the Northern California Power Co. Creditors received $2064 to satisfy claims of $6950, or equivalent to 31c. on the dollar. This dredge was constructed on a plan which provided for a digging machine, or steam shovel, separate from the washing machine. The washing machine consisted of a revolving screen and gold-saving riffled tables, the whole made portable by being set upon two four-wheel trucks. Both the digging and the washing machines could be moved wherever desired and the water and electricity supplied from near-by plants. The machine was first introduced in Butte County near Oroville. In that operation the gravel was dug by a Marion steam shovel. The theory of washing the gravel was attractive but it was evident that either the digging cost was too great or the yield was too poor to provide a profit on the venture as results have showed.

Atolia-Randsburg Tungsten District is again attracting the attention and active efforts of tungsten miners who apparently have come to the conclusion that whether prices remain high and firm or may vary during the coming year or two, it is better to do their development work thoroughly and with the view of permanency and preparation for continued operation. But n the past there has been too much of the boom spirit in the districts surrounding Atolia and Randsburg, and this disposition to get all there was to be got during the early days of the tungsten boom when prices were high, has caused Randsburg and Atolia a good deal of trouble. Of course, there is a little excitement just now over the fact that a piece of scheelite weighing about a ton and showing a high tungsten assay was extracted whole from the 800-ft. point in the Churchill No. 1 of the Atolia Mining Co.'s property. The disclosure of so large a piece of tungsten ore at that depth in a mine, which is practically flat on the desert, is so rare that t forms the subject of a great deal of comment. It is probable that this disclosure indicates the persistence of scheelite at depth in the Atolia mines, though this heory is by no means established. However, it is encouraging to prospectors and miners who are now more inclined to extend the permanency of the camp to the surrounding portions of the district. The small properties which have been mined for the surface ores are now being deepened r extended with the view of determining whether or not there are other extensive orebodies in the district. The Gypsy group, he Nixon lease and the White Flower, he Windy Weather, Easter and neglected fractions are being developed by F. J. Abbott of Los Angeles. The Atolia Junction new shaft is down 110 ft., the bottom looking good; development of 75-ft. level, 15 ft. east of the shaft disclosed a strong vein believed to be the continuation of the Paradox, exposed on the Atolia, a few hundred feet east. In the Gypsy main haft at the bottom, three veins show tungsten streaks between quartzite; the country rock is gray granite and the vein matter identical with that which marks he surface working of the Union and Churchill on the north and west. In the Gypsy group, the vein filling is reported by F. J. Abbott, mining engineer, to be xposed for a width of 12 ft., with a dip of 40° to the north. The hanging wall is horn-blende granite and the foot wall, granite. Generally speaking, the brief description of the Gypsy group may apply to the eastern extension of the belt of granitic rocks that may be followed across the desert toward Searles Lake. Tungsten possibilities have not been prospected extensively along this belt and, in times when the demand for tungsten was limited, few prospectors paid any attention to this section of the country. However, Charles Churchill, who was the discoverer of the Atolia and the other early tungsten claims in the Atolia district, went over this eastern country several years ago and found that there is such an extension of formation which indicates that scheelite may be found across San Bernardino County and into the State of Nevada for some distance.

BUTTE—Nov. 16

Federal Explosive Measure is welcomed in Butte as an effective aid to the local authorities in their attempt to prevent the use of explosives by persons bent on revenge or mere mischief. Heretofore they have been seriously handicapped by the absence of any law to regulate the sale, use and possession of such explosives. By the new Federal act, the police department is allowed to investigate and anyone found with dynamite or ammunition and without a license, will be arrested and liable to a fine of $5000, or one year's imprisonment. Detectives are now out to see merchants and users of explosives and to instruct them in the provisions of the law. It is also expected that this law will do away with the handling of explosives by incompetent persons.

DENVER—Nov. 17

Shipments from Silverton declined in October; they were as follows: Iowa-Tiger, 33 cars; Sunnyside, 28; Summit Mining Co., 14; Koehler Tunnel, 13, Silver Lake Custom Mill and Pride of the West, 12 cars each; Mears-Wilfley Mill and Barstow Leasing Co., 10 cars each; Mayflower Leasing Co., 9; Dives, 7; Highland Mary and S. D. & G., 6 cars each; Big Giant and Vernon, 5 cars each; North Star, Paul Konisko, St. Paul, and Ohio & Oklahoma Leasing Co., 4 cars each; D. & L. L. Co., 3; Congress, Guadaloupe, Tyler & Shepherd, Hero, W. E. Averill, and Frank Hough, 2 cars each; H. S. Thayer, Precious Metals, Alexander, Jackson & Andren, Gold King, Precious Metals Lessees, Barstow Lessees, Kansas City, and Butler & Erdman, 1 car each; total, 210 cars to outside smelters. The following shipments were made from mines of the district to the Silver Lake Custom Mill; Guston Leasing Co., 15 cars; Colorado Metals Co., 3; Butcher & Curtis, Champion Leasing Co., and Butler Mines, 2 cars each; Hermes Mine and Lackawanna, 1 car each; total, 26 cars. The S. D. & G. Leasing Co. shipped 45 cars to the North Star Custom Mill. The total shipments for September were 324 cars of ores and concentrates, of which 59 cars were sent to the North Star mill, 76 to Silver Lake, and to outside smelteries, 189 cars were shipped.

SALT LAKE CITY—Nov. 17

Coal Transportation in the intermountain section is stated to be showing an improvement from week to week. A comparative statement of percentages of increase in hours of operation as to the movement of coal and coke by the railroads here for the week ended Nov. 10, as compared with the week preceding, as prepared by W. W. Armstrong, fuel administrator for this and surrounding states, shows for the Denver & Rio Grande, this railroad being behind the others, largely owing to the heavy movement of troops over its lines and to some bad luck, according to Mr. Armstrong, an increase of 4% in hours operated the week ended Nov. 10 over the week preceding, the operating-hour efficiency being 57%, based on an eight-hour day; the Oregon Short Line and the Union Pacific each showed an increase of 22% in hours operated and an operating-hour efficiency of 98%, based on an eight-hour day. Orders to the railroads to furnish drop-bottom cars for coal, coke and other forms of fuel for such consignees as are able to handle this type of equipment is working out well, and intensive loading, an example of which is afforded in the Union Pacific report of an increase of five tons in coal per car for the week ended Nov. 10 over the same week of 1916, is improving the situation and affording the equivalent of an additional car for every 10 loosely loaded as formerly. Cars are working more mileage, and not standing idle to any appreciable extent. The operation of the Utah Coal route, now assured almost immediately, as the rolling stock begins to arrive, will materially relieve the coal situation. Two of the six large special type engines ordered have been received and the remaining four are due by the end of the month. Of the 1500 gondola dump cars, 1200 have arrived, and the full number will be made up shortly. It is expected that this road will, by the beginning of next week, be carrying coal from the mines of the United States Fuel Co. at Hiawatha for delivery to the Salt Lake route, the Denver & Rio Grande and the Orem electric roads, with which it connects, and which will carry the output further.

WALLACE, IDAHO—Nov. 17

Uncertainties of Excess-profits Tax law have caused the Hecla Mining Co. to cut its regular monthly dividend from 15c. per share to 5c., payable Nov. 20. Like most mining companies, Hecla is "up in the air" as to what its tax will be, but as there is no doubt that it will be heavy, the reduction in the dividend is the first step toward preparation to meet it. Hecla is capitalized for $250,000, divided into 1,000,000 shares of the par value of 25c. The company has paid in dividends, during the 10 months of this year, $1,500,000 and up to two months ago, the market value of the stock was $9 per share. Owing to the uncertainties of the law, and particularly that part of it which undertakes to define "invested capital," it has been impossible to form an estimate with any degree of accuracy as to the amount Hecla will have to pay, but it is expected to be upward of one million dollars.

Star Mining Co. vs. Federal Mining and Smelting Co. case, the hearing of which, before Judge Deitrich, of the United States District Court, began in this city on Oct. 25, closed so far as taking testimony is concerned on Nov. 3. Judge Deitrich will hear the argument on Dec. 3 at Coeur d'Alene. The contention of the respective litigants as developed in the trial is substantially this: The Federal company admitted in the beginning that in the operation of the Morning mine it had removed some ore from the ground within the boundaries of the Evening Star claim, but maintained that in doing so it was acting within the law of extralateral rights, and that the vein from which the ore was extracted has its apex on the Grouse and Iron Crown claims, owned by the Federal company, in substantiation of which maps and models were submitted, showing practically a continuous raise on the vein to the surface. Against this showing, the Star company contended that the alleged vein that has its apex on the Grouse and Iron Crown is an integral part of the great Evening Star-Morning lode, which projects through the common end line of the Evening Star and Morning claims and which apexes on the Evening Star ground. An excellent model and elaborate maps were submitted in support of this contention.

MARQUETTE, MICH.—Nov. 17

Mine Valuations for Taxation purposes as determined by averaging the stock market prices, have been attacked in a suit originally started in 1915 and now being tried. In 1915, F. W. Denton, then general manager of the Copper Range Consolidated mines, protested against the valuation placed on the Baltic mine, one of its subsidiaries. Mr. Denton was supervisor of Adams township at that time. He continues as supervisor of the township, although he is not now general manager of the mines but is still connected with the corporation as consulting engineer and a director. The valuation which he placed on the Baltic mine, as assessing officer of the township, was increased by the equalization committee of the board of supervisors by $2,200,000. This action was sustained by the board and later by the state tax commission. when Mr. Denton appealed to that board. Then he started suit, which is being tried before Judge O'Brien, both sides waiving the jury. The case is fairly certain to go to the Supreme Court. The amount of taxes involved is $56,021, paid by the Baltic under protest. The peculiar feature of the present suit is that the directing head of the corporation has an action in court against the township of which he is supervisor. The case has aroused general interest because of the fact that a decision in favor of the Baltic company not only would throw out all of the taxes of 1915 in the county, but would make necessary a change in determining mine valuations. Attorney Stone, in his opening statement for the Copper Range—the Baltic mine having since gone out of legal existence—said that market valuations were not dependable for taxation purposes. Claim is also made that Osceola and Calumet townships were undervalued. St. Mary's Canal company, half owner of the Champion mine, included in the Copper Range, is an intervening party to the suit. Mr. Denton contended that in 1915 each square foot on the dip of the Baltic lode, extending through the thickness of the lode, contained 30 lb. of copper, and that the life of the mine was 10 yrs. Mr. Denton, Manager MacNaughton, of the Calumet & Hecla, chairman of the equalization committee, and several of the supervisors were witnesses. Stone, Wieder & Schulte, of Houghton, and D. H. Ball, of Marquette, represented the plaintiff; Rees, Robinson & Petermann, of Houghton, the St. Mary's Mineral Land Co. and South Range Mining Co., as intervening defendants; M. T. Sherwood, of Marquette, Adams township, and T. B. Baillie, of Lansing, the state tax commission. Judge O'Brien reserved decision.

JOPLIN, MO.—Nov. 17

Home for Mine Operators' Club of the Oklahoma section of the district of a temporary character has been nearly completed at Picher, Okla., and the first meeting will be held there this week. It is planned to have 200 operators pay $25 each to erect a permanent club house on top of hill known as Blue Mound.

Eagle-Picher Lead Co. Smeltery at Galena has had its capacity doubled, and the plant is now the largest of its kind in the world. There are now eight furnaces instead of four, and between two and four million pounds of ore can be handled weekly. In place of the four 5-ft. goosenecks formerly used, there are now eleven 4-ft. goosenecks and a cyclone. The bag room did not require enlargement. Several new fans have been installed, and also several improvements in the way of providing comfortable and sanitary change rooms for the employees.

Drainage of Sheet Ground in North Webb City field is being considered. Since so many of the companies operating in this section have closed down, it is feared the burden of keeping the ground free from water will be too heavy for those that remain. Consequently a movement is on whereby the landowners interested will pay for the installation and operation of a battery of pumps with the idea of draining the ground at a greatly decreased cost over that of the pumping plants now operating.

HIBBING, MINN.—Nov. 16

Taxes on Iron Mines will be increased despite record-breaking shipments of ore during the past year from this state. The assessed valuation of mining properties for 1917 is $18,021,697 higher than in 1916, as determined by the Minnesota Tax Commission. This is the largest increase ever made by the commission in any one year with the exception of 1907, the year of the organization of the commission, when the 1906 assessment of $64,486,409 was increased to $194,428,298. As announced by the commission, the total assessed value for 1917 is $295,353,692, as compared to $277,331,995 in 1916. In accordance with the classified assessment law in 1913, iron ore, mined or unmined, is assessed at 50% of true and full value.

Known Tonnage of State Mines according to the Minnesota Tax Commission will amount to 146,298,952 tons. The total known tonnage of all ore lands in the state, according to the commission, is 475,620,233. This total includes all unmined ore, both that in mines owned by mining corporations or private parties, and that in the mines owned by the state. The state-owned iron mines are on state lands, that is, on school, university and swamp lands belonging to the people and held in trust for them. The state does not operate its own mines but leases them for 50 years duration at a royalty of 25c. per ton. At present there are 97 state mineral leases in force. On 50 of these, merchantable ore has been developed, on eight others ore has been found in large deposits, but not of commercial grade, and on the remainder little or no development work has been done. The size of the leases runs from 160 acres, the largest, to the smallest, which is 36½ acres. Of the 50 leases on which merchantable ore has been discovered there are still a dozen which have yet to be developed into mines. The total output of all the state-owned iron mines, from the time of the enactment of the mining-lease law in 1889 up to date, is about 18 million tons. The largest shipper is the Missabe Mountain mine at Virginia, with a record of three million tons, closely followed by the Leonidas, Grant and Poole mines, each of which has produced over two million.

EL PASO—Nov. 17

Conditions in Chihuahua are much upset and plans formulated by the American Smelting and Refining Co. for reopening its properties are discarded for the present at least, and no idea can be had when they can be put into effect. The reason presumably is the activity of Pancho Villa and his followers. The Villistas are in control of the district to such an extent that it is declared resumption of operations now is impossible. The Mexican committee which arrived in this country for the purpose of purchasing gold is expected to be reinforced by Luis Cabrera, whose arrival is shortly expected from Mexico. This committee has no official status according to a statement given out by the Mexican Embassy in Washington.

TORONTO—Nov. 19

Royalties on Flotation Process charged by the Minerals Separation North American Corporation, against which complaints have been made by Cobalt mine owners, will be investigated by the Patent Branch of the Canadian Department of Agriculture. It is understood that the mine owners were advised to ask for this investigation without pressing the charge that alien enemies were interested in the Minerals Separation corporation or its patents.

Labor Situation in the Northern Ontario mining camps, especially Porcupine, is steadily improving, many workers being attracted by the high wages paid and the prospect of steady employment. The enforcement of conscription, which is severely felt in some other industries, has little effect as regards the mines, as a large proportion of the laborers are Germans, Austrians or other alien enemies, who are not subject to the draft. It is believed that production has reached its lowest point and will henceforth show improvement.

Exports of Canadian Raw Asbestos to Great Britain, as reported by J. E. Ray, Canadian Trade Commissioner at Birmingham, England, show remarkable increases of late years in both quantity and stated value. In 1902 the imports were 74,043 cwt., valued at $200,750, and in 1916 they had advanced to 244,932 cwt., valued at $922,590. The high mark, however, appears to have been reached in 1915, with a total quantity of 349,863 cwt., of the value of $1,048,500. The aggregate imports of 1916 into Great Britain from all sources were the highest on record, being 634,237 cwt., valued at $2,687,000. The main source of supply continues to be the Canadian mines, though supplies from the United States, Portuguese East Africa and the Cape of Good Hope have considerably increased.

The Mining News

ALABAMA

Calhoun County

ALABAMA (Gadsden)—Repairing North Gadsden furnace to put second stack in operation by spring; capacity being increased from 400 to 150 tons daily; $200,000 expended.

Jefferson County

WOODWARD IRON CO. (Woodward)—Erecting modern emergency hospital at its red-ore mines, near Bessemer.

INDIA GRAPHITE CO. (Birmingham)—Incorporated with authorized capital of $125,000. W. A. Watts, president and treasurer; W. S. Douglas, vice president; D. W. Inman, secretary.

ALASKA

COPPER SHIPMENTS from Alaska in October amounted to 2[illegible]11 tons of ore, containing 10,763,500 lb. copper.

CANADIAN KLONDYKE MINING (Dawson)—Temporary receiver appointed. Judgments were obtained against company for default in payment of bond interest and also for construction supplies. F. P. Burrell, of Dawson, an engineer, has been appointed by court to make inventory of assets.

ARIZONA

Gila County

GIBSON CONSOLIDATED COPPER (Miami)—Organized to purchase Gibson mine; property consists of 16 claims, covering 300 acres. Developed to 500-ft. depth and lateral work is reported as extending 23,000 ft., with considerable tonnage of ore exposed.

Maricopa County

QUEEN CREEK COPPER (Phœnix)—Report of Sept. 29 shows development work consisting of 2487 ft. of diamond drilling and shaft 256 ft.; crosscutting.

Yavapai County

UNITED VERDE (Jerome)—Production for October estimated at 7,350,000 lb. of copper; expects to increase this amount in November.

UNITED VERDE EXTENSION (Jerome)—Shipments of copper ore decreased slightly in October, owing to car shortage; production may reach 6,000,000 lb. of copper in November.

CALUMET & JEROME (Jerome)—Established record footage in October for crosscuts, drifts, etc. Grade of ore from winze improving and crosscut will be made at 80 ft. instead of 100 ft. unless conditions change.

ARKANSAS

Marion County

CAR SHORTAGE on White River division of Missouri Pacific and Missouri & North Arkansas prevents full production of the field being moved. Relief in sight in December after cotton crop is moved.

A. & S. C. (Rush)—Remodeling mill and increasing capacity.

LONNIE BOY (Rush)—Three tunnels being driven show rich run of blende and carbonate. Drilling machinery installed.

BEULAH (Rush)—Lately taken over by Continental Mining Co.; milling plant half completed. Work underground will start soon.

Searcy County

MAYS-REDWINE (Marshall)—N. Howard, of Treese, La., purchased Mays-Redwine mine near here. Also purchased Evening Star-Churchill mines. Shipped four cars recently, three more awaiting shipment; producing high-grade zinc carbonate.

CALIFORNIA

Amador County

HARDENBERG (Jackson)—Mine closed down, after opening of small rich orebody. Undecided regarding future development.

Calaveras County

ANGELS MINING CO. (Angels Camp)—James V. Coleman, manager and owner, developing property on Democrat Hill, west of the Mother Lode. New two-compartment shaft down 70 ft. on vein. Formerly, gold nuggets were mined on surface.

Eldorado County

IN THE NASHVILLE DISTRICT the Montezuma mine will have stamp mill; development by 1000-ft. shaft and drifts north and south at 100-ft. points below 500 ft. J. C. Heald, owner. Havilia, south of Montezuma, developed by San Francisco men who are reconstructing stamp mill. Washington and California Co., of Seattle, starting work on Mother Lode property; recently developed 5-ft. vein of good ore. Grant Busick property, north ot Nashville, being developed by Anthony Crafton for Seattle men, who have option.

Inyo County

IN REVENUE CANYON DISTRICT the Revenue copper mine is being developed. Trail being opened in Knights Canyon district and when completed will commence work. Reported high-grade copper ore opened by H. J. Robinson. Silver and lead properties on north and east of Revenue attracting attention. Reported that A. E. Glace, geologist, recorded some locations. Several men from Trona will work silver prospect on northeast side of canyon when supplies received. In Snows Canyon, reported Jack Cress completed transfer of St. George mine to New York men; ore is gold.

MINNIETTA (Johannesburg)—In operation after being reorganized and making repairs, while motor trucks were unavailable for hauling ore to Trona.

ROUND VALLEY TUNGSTEN CO. (Bishop)—Shipped 20 tons tungsten concentrates last week in October Building new bunkhouse 32 x 44 ft.; some portable buildings being received.

Los Angeles County

UNION OIL CO. (Los Angeles)—Montebello well No. 1, brought in Nov. 1, at depth of 2050 ft.; flowed at rate of 1100 bbls. an hour, but being adjusted for pumping. Oil is 22 gravity. Situated within 1000 ft. of Standard gusher, recently brought in; latter was first in the field and was believed to be evidence of a gusher district.

Nevada County

NORTH STAR MINES CO. (Grass Valley)—Reported full force of men underground in Champion mines of Deer Creek; 40-stamp mill completed. Concrete concentrating floor put in and cyanide plant has been enlarged.

Sacramento County

CALIFORNIA POTASH CO. (Sacramento)—Authorized to exchange 24,999 shares with Edwin Oliver for formula for manufacture of potash and for transfer of contract for extraction of potash from municipal incinerator with the city of Sacramento.

Solano County

ST. JOHN QUICKSILVER (Vallejo)—Old brick condensers being dismantled and replaced by modern wooden type. Bricks being broken up and run through furnace; estimated they will yield about 100 flasks of quicksilver.

San Bernardino County

OZARK (Victorville)—Treating 50 tons of ore a day successfully.

San Francisco County

WESTERN FUEL CO. (San Francisco)—Reported that in accordance with Government's prices on coal from Utah, Wyoming and New Mexico, this company will refund overcharges innocently made.

PRESIDIO MINING CO. (San Francisco)—Demurrer denied by court in case brought by W. S. Overton for removal of Wm. S. Noyes and directors and $2000 damages. Case will now go to trial.

Shasta County

AFTERTHOUGHT (Ingot)—During run of flotation plant, concentrates hauled by motor truck to Bella Vista and shipped by rail; zinc to Oklahoma and copper to Tacoma; was first production since 1900, when mine shut down because of inability to treat copper ore with large zinc content. Flotation solved problem; ore reported to be 8% copper and 44% zinc.

Storey County

JACKET (Gold Hill) — Surface tunnel raise extended 15 ft. and 27 cars low-grade ore saved. Mill working with new equipment; ball mill and tables operated 111 hours during week; old cyanide plant operated; 322 tons of ore put in mill bins.

OPHIR (Virginia)—Reopened old main lateral drift on 2000-ft. level; 618 ft. now in repair. On 2100-ft. level extracted four tons, sampling $11.23, face showing 14-in. quartz, sampling $18. Extracted five tons, sampling $6 from west crosscut No. 2. Ore shipped to Mexican mill.

UNION (Virginia) — Drifts on 2300-ft. level extended; saved 47 tons of ore, sampling $21. On 2400-ft. level, 67 tons of ore extracted, sampling $31.60; high-grade streaks near hanging wall exposed. In another crosscut 111 tons of ore extracted, sampling $21.60. Ore saved in cutting out for ore chute was 138 tons, sampling $22.10 at one point, and 137 tons from another point sampling $10.75.

COLORADO

Boulder County

CONSOLIDATED LEASING CO. (Eldora)—Mill being constructed.

UP TO DATE (Boulder)—Will be operated all winter.

DANA MINING CO. (Boulder)—Will reopen Hoosier mine, near Summitville, an old silver producer.

Chaffee County

STONEWALL (St. Elmo)—This old lead mine being reopened.

PARAMOUNT REDUCTION CO. (St. Elmo)—Mill resumed operations with new steam engine. Treating custom ore from Flora Belle, Molly and other mines.

Clear Creek County

ARGO LEASING CO. (Idaho Springs)—Building 50-ton mill.

SCEPTER TUNNEL (Idaho Springs)—Main adit retimbered and raise completed to Sunburst adit. Considerable good-grade ore opened. Aerial tramway, 6000 ft. long, to railroad to be built, and electric-driven compressor to be installed.

PRIMOS CHEMICAL CO. (Empire)—Grading for new 200-ton molybdenum mill at Camp Boericke. Treatment will consist of crushing, grinding in ball and tube mills, and concentration by flotation. Main adit in 500 ft., will be driven 2000 ft. Aerial tramway to be used until adit completed, when electric haulage will be used.

Gunnison County

BRANDT INDEPENDENT (Gunnison) Will resume driving of tunnel.

IDA MAY (Pitkin) — Sold recently to Rare Metals Production Co., of Denver, with plants at Rollinsville and Utah Junction. Developing. Molybdenum and tungsten ores to be produced.

Lake County

LACKAWANNA BELLE (Twin Lakes)—Good-grade ore opened in development.

FIDELITY MINING CO. (Twin Lakes)—Contracted for driving tunnel.

ANCHOR (Twin Lakes)—Lease and bond taken by Denver men. Developing.

SILENT FRIEND (Leadville)—Lessees opened lead-zinc sulphide ore; shipping 50 tons daily.

GREEN BACK (Leadville)—This Graham Park property again operating to full capacity.

LINCOLN HIGHWAY (Granite) — Being developed. Surface showing of gold ore is good. Plan to build 20-ton mill next spring. M. D. Gilder and Harry Huntley, of Cripple Creek, owners.

La Plata County

SAN ANTONIO TUNNEL AND MINING CO. (Bayfield)—Recently incorporated with capitalization of $3,000,000. Company owns 200 acres above Emerald Lake.

Park County

KANSAT (Montgomery) — Good-grade gold ore being shipped.

SHELBY (Alma)—Being worked by lessees.

WHEELER (Alma) — Lessees shipping ore.

Summit County

MINNIE (Breckenridge)—Lessees shipping lead-silver ore.

ELLA (Breckenridge)—Shipments of oxidized lead-silver ore being made.

GOVERNOR (Breckenridge)—Reopened by leasing company.

WELLINGTON (Breckenridge)—Steam-heating plant for boarding and bunk houses to be installed.

BUNKER HILL (Breckenridge)—Being worked by lessees. Shipment of oxidized ore made.

IRON MASK (Breckenridge)—Shipping carbonate and sulphide ores. Operated by Midwest Metal Mining and Holding Co

BALD MOUNTAIN (Breckenridge)—Operating Carbonate mine, making shipments of gold-silver-lead ore. Tunnel will be driven to cut vein at greater depth.

Teller County

AJAX (Victor) — Lessees making shipments.

CAMP BIRD MINING, LEASING AND POWER CO. (Cripple Creek)—Sinking Rose Nicol shaft, now 800 ft. deep.

GOLD DOLLAR (Cripple Creek)—Lessees shipping from Mable M shaft, on Beacon Hill.

OCEAN WAVE (Victor)—Shaft is 350 ft. deep. Lateral development when 400-ft. level is reached.

MODOC CONSOLIDATED (Victor) — Good-grade ore broken on 11th and 15th levels of old incline shaft. Production curtailed until new vertical shaft ready.

EXCELSIOR MINING AND LEASING CO. (Denver)—Sinking shaft now down 575 ft. Development will be done on 500- and 600-ft. levels to connect oreshoots opened from same levels of Golden Cycle shaft.

UNITY MINING AND LEASING CO. (Cripple Creek)—Operating south one-half of Nightingale claim under long-term lease from Stratton's Cripple Creek Mining and Development Co. Vertical shaft now down 450 ft., will be sunk to 800 ft. level, working two shifts.

ROOSEVELT DRAINAGE TUNNEL (Cripple Creek)—Drifting north in Funeral dike toward Cresson mine. Drift is in Big Banta claim of United Gold Mines Co., and will connect with Cresson workings. Tunnel will be continued across Portland territory; heading is now beyond Rose Nicol shaft.

IDAHO

Shoshone County

EAST CALEDONIA (Wardner)—Shaft being sunk 200 ft. from 400-ft. level. Exploration of 200-, 300-, and 400-ft. levels shows improvement in ore. Property is equipped for development, electric power being used for all purposes.

JACK WAITE (Murray)—New ore shoot in raise from upper tunnel. Shipping average of 300 tons per month, hauling 10 miles to railroad. Ore averages 50% lead with low silver contents. Contemplates building mill in spring from treasury surplus.

RED MONARCH (Wallace)—Reported encountered 3 ft. of shipping ore in east drift from long crosscut tunnel. Vein is 40 ft. wide with considerable zinc-lead ore of milling grade. Crosscut beng extended to second vein now in over 3000 ft. Electric motors will soon replace mules.

NATIONAL (Mullan) — Mill started on Oct. 14, at half capacity. Shipped six carloads of concentrates; expects to ship two more by end of first month. Ore averages a little above 1% copper and about 3 oz. of silver. Concentrates run 20% copper and 55 oz. of silver. Operations a year ago proved unprofitable. Since, an orebody has been opened on 1500-ft. level of better grade. Has modern mill of 500 tons capacity, using flotation.

KANSAS

IN OIL FIELDS of Butler County, 50 I. W. W. workers were arrested on Nov. 20. It is stated this is the initial step by state and Government officials to round up 3000 members of the organization. Another raid is planned in Towanda and Eldorado fields.

MICHIGAN

Copper

HANCOCK (Hancock) — Has lost some trammers; tonnage will show falling off.

WYANDOT (Houghton)—Stockpile will be sent to Winona mill during first half of December.

FRANKLIN (Demmon)—The 30th level on Pewabic amygdaloid lode is in north 1300 ft.; last 400 ft. showing good copper.

MAYFLOWER-OLD COLONY (Houghton)—Replaced hand drilling with three air drills in sinking shaft.

WINONA (Winona) —. Shipping nearly 400 tons daily, taking some rock from Nos. 3 and 4, the hoisting crew being transferred.

NEW ARCADIAN (Houghton)—Passed through hanging-wall branch of New Arcadian lode; heavy copper in width of 8 ft.; expect to strike main lode within a few feet.

SENECA (Calumet)—Construction work advanced rapidly, being favored by two weeks of good weather; last concrete for machinery poured Nov. 16; sinking will start in another month.

OSCEOLA (Osceola)—Loss of trammers will cause drop in tonnage. Tailings sands have extended so far into Torch Lake that a pumping station is being built to carry them out into lake for years to come.

SOUTH LAKE (Lake Mine) — Special meeting on Dec. 14 to authorize doubling present issue of stock to 200,000 shares, par value, $25, to purchase SW¼, Sec. 30, the northern extension of mine. New issue will be sold to stockholders.

CALUMET & HECLA (Calumet)—Contracted with W. J. Gleason & Co. of Aitkin, Minn., to excavate drainage canal, 3000 ft. long and 20 to 30 ft. deep, in Swedetown Swamp, west of mine, and over its workings into which water seeps, causing expensive pumping. Water will go into regular sewer system.

Iron

PLYMOUTH (Wakefield)—Reported will be taken over Jan. 1 by recently organized Plymouth Mining Co.; Pickands, Mather & Co. will operate and sell the ore. Lackawanna Steel Co., Youngstown Sheet and Tube Co., Midvale Steel and Ordnance Co., Steel Co. of Canada, and Allan Wood Iron and Steel Co., interested.

HUMBOLDT DISTRICT is showing activity. Exploration has been commenced at Hungerford property by the Williams Iron Co. Two boilers, small hoist and small compressor installed, pumps lowering water in shaft, small shaft house and ore and rock trestles have been built, three buildings are up and making preparation for underground work. Captain Peck, of Marquette, is in charge. This is the only company on Marquette range which made public sale of stock, other companies being close corporations.

MINNESOTA

Mesabi Range

HOLLAND (Biwabik)—Stock pile accumulated three years ago by local men being loaded by steam shovel and shipped to Two Harbors Docks.

RUDDY (Biwabik)—Owned in fee by Yawkey estate of Detroit being reopened by Michigan men after two years of idleness. New shaft to be sunk on western side.

BALKAN MINING CO (Coleraine)—Opening Washoe mine near here; received permission from county commissioners to remove part of road between Bovey and Taconite, providing new road is constructed to serve same purpose.

OLIVER (Hibbing) — Announced by Duluth officials that on account of orebody underlying part of village, north of Great Northern Ry. tracks buildings will be moved. Company is purchasing buildings in this section and platting a new addition to Hibbing near the suburb called Alice.

MISSOURI

Joplin District

JAMOT BROWN (Joplin)—Will reopen Rebecca mine, west of Chitwood.

BEN B (Joplin)—Completed 150-ton mill on 40-acre lease west of A. W. C. plants. To operate two shafts; ore at 150 ft. O. Longacre, Joplin, owner.

ONCE MORE (Joplin)—Homer Seals has taken lease on this sheet-ground property, west of city, and will operate. Repairing mill; will sink shaft deeper.

TULSA-SAPULPA-MIAMI ASSOCIATED (Miami, Okla.)—Sinking shaft in new territory, near Wyandotte, Okla. Drilling indicated ore run at 150 ft.

BLACK EAGLE (Quapaw, Okla.)—Will build 300-ton mill on lease just east of St. Louis, Okla. Tract has just been thoroughly drilled; orebody with 30-ft. face proved.

COAHUILA LEAD AND ZINC (Webb City)—Have taken leases and starting drill prospecting on virgin lands east of Waco, Okla.

TENNESSEE (Joplin)—Sinking new shaft, north of mill, at Klondike. Will connect with present field shaft by surface tramway. Drilling shows indications of rich ore.

CARTER COUNTY LEAD AND ZINC (Joplin)—Will build 400-ton mill on American land, near Smelter Hill, northwest of Joplin, following drilling campaign. M. G. Brady, Joplin, manager.

MISSOURI ZINC (Joplin) — Renewed lease for 10 years on Quick Seven mine at Neck City. Acquired also Lost Indian lease. Quick Seven mined as open-cut property all year successfully.

ONAMENA (Webb City)—Two of three plants at Duenweg shut down, but getting good results from No. 4 mill, recently started in operation. Ore running about 3% and giving high-grade concentrates.

LIVE WIRE (Joplin)—Purchased from H. E. Gerke, of Joplin, by company of Tulsa oil operators. Shaft on this lease is in new territory, southwest of Joplin, encountering ore at 135 ft. Reported consideration was $50,000.

MONTANA

Deerlodge County

INDEPENDENCE (Anaconda)—Situated at head of Warm Springs Creek, being worked by leasers; three carloads high-grade copper ore ready for shipment when enough snow for sleighing. Recently located by Robert Lindberg of Anaconda.

Fergus County

BARNES KING DEVELOPMENT (Kendall)—Report for quarter ended Sept. 30 shows final payment on Shannon option, amounting to $61,412, leaving treasury balance on June 30, amounting to $121,374. Bullion from North Moccasin was valued at $53,739; from Piegan-Gloster, in Lewis and Clark County, $48,587; from Shannon, $177,071. Results of October operations as follows: Bullion from North Moccasin, $18,000; from Piegan-Gloster and Shannon, $52,000.

Lewis and Clark County

COFFEE-BYRNES (Helena) — Shipped two carloads silver ore averaging $2.50 per ton.

HELENA (Helena) — Shipped 21 carloads; smelter returns about $18,000.

MARYSVILLE GOLD SYNDICATE (Marysville)—Acquired Bald Mountain and Belmont mines. Agreement with Marysville Gold Co. for milling 30 tons a day. Syndicate financed in Duluth, Minn.

Silver Bow County

VANDOR MINING CO. (Ringling)—Filed articles of incorporation Nov. 9, with recorder of Silver Bow County. Capital stock of $50,000 divided into shares of $1 each. Object is a general mining business. Directors are James Dougherty et al.

ANACONDA (Butte)—On Nov. 13 over 9100 miners at work hoisted 12,544 tons, of which 793 was zinc ore. Never-Sweat mine started operations Nov. 12 with 345 men; expect immediate operation of Tramway mine, where crew was engaged in fireproofing shaft recently. On basis of normal force of 10,500 men, company is now working at nearly 86%.

NORTH BUTTE (Butte)—Filed notice Nov. 14 with clerk of district court, stating intention to move for judgment on pleadings in several damage suits resulting from fire on June 8 last. Because of similarity of cases only one will probably be argued as a test case. Company claims compensation laws fully covers its liability.

NEVADA

Nye County

TONOPAH ORE PRODUCTION for week ended Nov. 10 was 9901, valued at $173,267, comparing with 10,223 tons the previous week. Producers were: Tonopah Belmont, 2438 tons; Tonopah Mining, 2500 tons; Tonopah Extension, 2380 tons; Jim Butler, 850 tons; West End, 1154 tons; MacNamara, 487 tons; Halifax, 54 tons; Belle-helen, 38 tons.

MANHATTAN CONSOLIDATED MINES (Manhattan)—Exposed east orebody from 4th level; east drift extended 200 ft. from shaft encountered blue crystalline limestone, which is the footwall; at point 175 ft. from shaft started south crosscut to tap orebody.

UNION AMALGAMATED (Manhattan)—Working two shifts in raise extended from 600-ft. level to connect Earl shaft; advanced total of 37 ft. above level; expect to hole through in about 12 days. Three shifts employed in Earl shaft; 84 ft. of shaft enlarged and repaired.

OREGON

MANGANESE PROPERTIES in Lake Creek district, north of Medford, have been purchased by the Manganese Metal Co., of Tacoma, Wash.

GOLD RIDGE (Gold Hill)—This gold and silver mine, three miles west of here, on Kanes Creek, leased by Clarke & Webb of Medford. Operating a three-stamp mill; developing 20-ft. vein.

RED OAK (Gold Hill)—This gold mine, three miles southwest of here, on Galls Creek, being reopened by John Ralls and Claude Lawrence. Produced $40,000 from 60-ft. level, 25 years ago; idle since on account of litigation. The 300-ft. level will be reopened.

UTAH

Juab County

CHIEF CONSOLIDATED (Eureka)—Report for quarter ended Sept. 1 shows 13,075 dry tons of ore—9592 tons, lead; 3215 tons, other ore; and 268 tons, zinc produced, for which $414,850 received after payment of smelting charges, freight, and sampling. Net profit for period was $96,041. Content of ore was: Gold, 2458 oz.; silver, 382,802 oz.; lead, 2,083,587 lb.; zinc, 194,508 lb. Production decreased by inability of smelters to take entire possible output.

Salt Lake County

UTAH COPPER (Bingham) — October production estimated at 18,100,000 lb. copper.

SELLS (Alta)—Material for new tramway received, and work on line begun. Expected to begin operating in December. Shipping two cars weekly.

EMMA CONSOLIDATED (Alta)—Molybdenum sulphide ore opened, making arrangements for treatment. Other Alta properties have ore carrying molybdenum, among them the Alta Gladstone.

COLUMBUS-REXALL (Alta) — During three months shipped 35 cars or about 1900 tons; net monthly profits about $10,000. Considerable difficulty from labor, haulage, etc., besides work of putting up new buildings for winter operation.

WEST TOLEDO (Alta)—Main Frederick tunnel in 3000 ft.; drifting to east at 2200 ft. from portal. Drifting for Flagstaff or Haskell fissure; some manganese encountered. According to A. L. Jacobson, manager, expects to have power drills at work in two places in November.

MONTANA-BINGHAM CONSOLIDATED (Bingham)—Control of Fortuna acquired through sale of treasury stock. Capitalization, 3,000,000 shares, par value, $1; $240,000 set aside for redemption of bonds and payment for Tiawaukee and Valentine properties. Controls also Montana-Bingham ground and large drainage and development tunnel, in which electric railroad to be installed. C. G. Valentine, of Honolulu, president and managing director; L. R Eccles, of Ogden, vice-president; John Pingree, president Merchants Bank, Salt Lake City, treasurer.

Tooele County

MONOCCO (Gold Hill)—Lessees shipped first car during week ended Nov. 9, and another expected soon. Ore from surface workings carries copper.

SEMINOLE COPPER (Gold Hill)—Recent shipment was high in tungstic acid; preparing for another shipment of similar ore and one of molybdenum ore. Fifty-ton mill recently purchased to treat low-grade tungsten ores on property.

Utah County

BELLEROPHON (American Fork)—Ore successfully tried out in new Pacific mill of Fissures Exploration, which owns lease.

COTTONWOOD COPPER (Provo) — Articles of incorporation filed Oct. 30. Capitalization, $50,000; shares, par value of 5c. Thomas C. Wright, president.

CANADA

Ontario

NEWRAY (South Porcupine)—Consists of 320 acres; acquired by Crown Reserve Mining Co.

MURRAY MOGRIDGE (Bourkes Station)—Shaft down 224 ft.; timbered to 200-ft. level.

KERR LAKE (Cobalt)—October production amounted to 213,802 oz., being highest record since May last.

BURNSIDE (Kirkland Lake)—Comprising about 120 acres adjoining Tough Oakes, taken over by Aladdin Cobalt Co.

THOMPSON-KRIST (Timmins) — Will be explored by crosscut on 400-ft. level from underground workings of Vipond.

HAYDEN (Timmins)—Diamond drilling reported satisfactory. Depth of 500 ft. reached; intend to drill to 1000 ft.

ASSOCIATED GOLD FIELDS (Larder Lake)—Shaft down nearly 500 ft.; results of last 50 ft. reported satisfactory; capacity of power plant at Raven Falls increased.

CANADIAN KIRKLAND (Kirkland Lake)—At depth of 35 ft. in shaft sunk on main vein, orebody is 16 ft. in width with free gold showing across a 2-ft. width. Another promising vein is 12 ft. in width.

MINING CORPORATION OF CANADA (Cobalt)—Has secured option on gold property recently discovered in Rickard Township. Main vein stated to vary from 20 to 40 ft. in width.

NIPISSING (Cobalt)—Mined ore during October with contents estimated at $306,167, and shipped bullion from Nipissing and custom ore with estimated net value of $335,386.

DAVIDSON (South Porcupine)—Electric power line will be extended through this property. Sulphides in finer state at 300 ft. than on upper levels. Acquired additional claims in Northeast Tisdale, now controlling about 500 acres.

LA ROSE CONSOLIDATED (Cobalt)—Special shareholders' meeting in Augusta, Maine, on Dec. 10 to ratify dissolution of the American holding company to escape American in addition to Canadian taxes; also to reduce capitalization from $6,000,000 to $1,500,000.

WEST DOME CONSOLIDATED (South Porcupine)—Arranging for development of southern end of property through workings of Dome Lake; some Dome Lake veins dip and continue into West Dome ground. Also planning for use by West Dome of part of Dome Lake mill.

MEXICO

NEW DENOUNCEMENTS of mining claims are forbidden in a circular issued to all mining agencies by Alberto J. Pani, Secretary of Commerce and Industry.

SALVADOR

BUTTERS SALVADOR MINES (San Sebastian)—In August, tonnage crushed amounted to 3675, averaging $11.66; tailings loss, $1.69. Value of bullion available for shipment, $36,000; expenses, $28,000; profit, $8000. September tonnage crushed was 3025, averaging $14.77; tailings loss, $1.60. Value of bullion available for shipment, $41,000; expenses, $27,250; profit, $13,750.

The Market Report

SILVER AND STERLING EXCHANGE

Nov.	Sterling Exchange	Silver New York, Cents	Silver London, Pence	Nov.	Sterling Exchange	Silver New York, Cents	Silver London, Pence
15	4 7515	85¾	43½	19	4.7515	85½	43⅜
16	4 7515	85¾	43½	20	4 7515	85¼	43¼
17	4 7515	85½	43⅜	21	4.7515	85¼	43¼

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

DAILY PRICES OF METALS IN NEW YORK

Nov.	Copper Electrolytic	Tin Spot.	Lead N. Y.	Lead St L.	Zinc St. L.
15	*23½	74½	6¼	6.20 @6 25	7¾ @8
16	*23½	74½	6¼	6 20 @6 25	7¾ @8
17	*23½	74½	6¼ @6⅜	6.25 @6 30	7¾ @8
19	*23½	75	6.25 @6 50	6 25 @6 30	7¾ @8
20	*23½	76	6.25 @6 50	6 25 @6 30	7¾ @7⅞
21	*23½	77	6 25 @6.50	6 25 @6 30	7¾ @7⅞

* Price fixed by agreement between American copper producers and the U. S. Government, according to official statement for publication on Friday, September 21, 1917.

The above quotations (except as to copper, the price for which has been fixed by agreement between American copper producers and the U. S. Government, wherein there is no free market) are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

The quotations for electrolytic copper are for cakes, ingots and wirebars.

We quote electrolytic cathodes at 0.05 to 0.10c. below the price of wirebars, cakes and ingots.

Quotations for spelter are for ordinary Prime Western brands. We quote New York price at 17c. per 100 lb. above St. Louis.

Some current freight rates on metals per 100 lb. are: St. Louis-New York 17c.; St. Louis-Chicago, 6.3c.· St. Louis-Pittsburgh, 13.1 cents.

LONDON

Nov.	Copper Standard Spot	Copper Standard 3 Mos.	Copper Electrolytic	Tin Spot	Tin 3 Mos.	Lead Spot	Zinc Spot
15	110	110	125	277	276	30½	54
16	110	110	125	276½	275½	30½	54
17							
19	110	110	125	276¼	275½	30½	54
20	110	110	125	279½	278¾	30½	54
21	110	110	125	284¾	283½	30½	54

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2,240 lb. For convenience in comparison of London prices, in pounds sterling per 2,240 lb., with American prices in cents per pound the following approximate ratios are given, reckoning exchange at $4 7515. £30½ = 6.4696c.; £54 = 11.4545c.; £120 = 25.4544c.; £137 = 29.0605c.; £240 = 50.9089c. Variations, £1 = 0.2121205c.

Metal Markets

NEW YORK—Nov. 21

All of the markets were quiet this week, without any noteworthy features of major character. Lead was firm and dull. Zinc was dull and easy. The spectacular rise in tin continued, but was more nominal than representative of business.

Copper—Under the direction of the Copper Producers' Committee things are moving along very smoothly. There is not at present enough copper to go around. It is certain that the month of November will end with producers owing a great deal of copper that ought to have been delivered. Occasionally some manufacturer has evinced a desire to secure more than his share of copper in order to keep his plant running full, but the Copper Producers' Committee has no favorites and nearly all of the manufacturers have cheerfully recognized the situation that exists and have done their part to make things fair to everybody and as easy as possible.

There is nothing in the agreement between the Government and the producers that prevents the latter from selling copper for delivery later than January, 1918. An interesting feature this week was some selling to consumers for February and later delivery at 23½c.

The National Conduit and Cable Co. in its last circular says: "With cost of producing and marketing copper decidedly increased, it is highly important to stimulate production by permitting all branches of the industry to operate on a profitable basis. Expansion under present rather onerous regulations will be more pronounced when the price permits reasonable profits and the payment of highest wages. It is of utmost importance just now that production be enormously stimulated. If 2 or 3c. a pound more for copper will serve to accomplish this purpose it would be an unwise policy to begrudge an advance that will swing every one of the producing properties into line. War conditions demand an expanding output of copper. Curtailment now would be an egregious blunder, and we go on record as sounding a warning note against the peril that may be involved in going to sleep over the situation."

Copper Sheets are quoted at 33c. per lb. for hot rolled, and 1c. higher for cold rolled. Wire is quoted at 28@29c. per lb. f.o.b. mill.

Tin—The market rose from day to day, but quotations were of nominal character rather than indicative of transactions. In fact, very little, if any, business was done in either Straits or Banka, supplies not being available.

Exports of Bolivian tin ore and concentrates for the nine months ended Sept. 30 included 13,489 tons to Great Britain and 4606 tons to the United States. The shipments reduced to tons of fine tin show an increase of 3400 tons this year.

Sales of Billiton tin in August were 4430 pikuls. Unsold stocks of Banka tin held by the Netherlands Trading Co. on Sept. 30 were 864 gross tons.

Lead—Transactions in this metal dwindled very materially as compared with the previous week. Indeed, the transactions this week were rather light, our reports not amounting to any more than 2000 tons. However, the market, although dull, was very strong and became stronger during the later part of the week, when prices as high as 6½c. for spot lead in New York were realized on 100-ton lots. The principal producer continued to sell at its published price, 6¼c., but apparently exercised some choice respecting the business it would accept. An interesting feature of the week was some round lots sold to domestic consumers for December-March delivery, this business being booked at 6¼c., New York. The St. Louis market also was strong.

There was an increased demand for antimonial lead. This is sold at the lead value plus the antimony value, both at market prices, less a discount of 0.25c. per lb. from the combined prices. Thus, if the combined prices figure 7.25c. per lb., the price for antimonial lead is 7c. The discount on this alloy ranges from 0.25 to 0.50c. per lb. The use of the minimum discount at present reflects the good demand.

Zinc—This market was very dull and toward the close was just a shade easier. There were sellers at 7⅞c. St. Louis for prompt, and 7¾c. for futures. Conferences among the producers with respect to supplying the Government are still going on.

Sales of zinc dust were made at 13c., f.o.b. works, in the Middle West.

Zinc Sheets—Price of zinc sheets has not been changed. Market is still at $19 per 100 lb. f.o.b. Peru, less 8% discount.

Other Metals

Aluminum—This market continues dull with small transactions taking place at 36@38c. per lb. for No. 1 ingots at New York.

Antimony—Transactions were reported at 13½c. for spot, which we quote as the market. We quote futures at 12¾@13c., c.i.f. in bond. The Chinese and Japanese houses continue out of the market.

Bismuth—Unchanged at $3.50 per pound.

Cadmium—This metal is quoted at $1.40 @1.60 per pound.

Nickel—Steady at 50c. per lb., premium of 5c. per lb. for electrolytic.

Quicksilver—Firm at $100. San Francisco reports, by telegraph, $100, firm. Late on Wednesday a sale was reported at $105, this being the first advance in price in several weeks.

Gold, Silver and Platinum

Gold—Shipments of $4,200,000 in gold bars were made to Valparaiso, Chile, on Nov. 15 and 17. It is understood that they were made in settlement for purchases of nitrate of soda.

Silver—Market has been quiet and steady. There is some suspense in the situation owing to the tentative proposition of our Government to take over for a period of six months or more the silver output of our country at 85c. per oz. New York delivery for redistribution for coinage purposes here, in England and in India. Nothing definite has yet developed.

Indian currency reserves at the close of October were 29 crones, 14 lakhs of rupees (291,400,000 rupees) silver, a decrease of 36 lakhs rupees during the month.

Stocks of silver in Shanghai at the end of October were 15,200,000 "dollars" and 25,200,000 oz. sycee; a small increase during the month.

Mexican dollars in New York: Nov. 15, at 65½c.; 16, 65½c.; 17, 65½c.; 19, 65½c.; 20, 65¼c.; 21, 65¼ cents.

Price of Silver, Nov. 8, in London was reported erroneously last week; it should have been 43¾d.

Platinum—In brisk demand, with sales at $105.

Palladium—In good demand at $125@130.

Zinc and Lead Ore Markets

Joplin, Mo., Nov. 17—Blende per ton, high, $73.60; basis 60% Zn, premium ore, $72.50; medium to low, $65@55; calamine per ton, 40% Zn, $35@38; average selling price, all grades of zinc, $57.51 per ton.

Lead, high, $76.30; basis 80% Pb, $75; average selling price, all grades of lead, $74.91.

Shipments the week: Blende, 8191 tons; calamine, 677 tons; lead, 1032 tons. Value, all ores the week, $587,280.

Some of the ore reported out this week has been under shipment for the last three weeks, but not reported until settlement was made. For this reason the shipments as shown by the record are out of proportion to the actual shipment of the week, which was notable for a deplorable lack of cars.

Platteville, Wis., Nov. 17—Blende, basis 60% Zn, $62 for premium grade down to $57 base for second grade. Lead ore, basis 80% Pb, $65 per ton. Shipments reported for the week are 2886 tons of zinc ore, 32 tons of lead ore, and 451 tons of sulphur ore. For the year to date the figures are: 128,026 tons of zinc ore, 6397 tons of lead ore, and 25,149 tons of sulphur ore. Shipped during the week to separating plants, 4038 tons of zinc ore.

Other Ores

Antimony Ore—Quoted nominally at $1.50 @1.75 per unit.

Chrome Ore—An important buyer of chrome ore in California is purchasing on the following schedule: For ore assaying 40% or more chromic oxide, 70 to 85c. per unit, according to grade and point of shipment; for ore assaying 35 to 40% chromic oxide, 60 to 70c. per unit.

Manganese Ore—Metallurgical ore is unchanged at $1.20 per unit.

Manganese-ore exports from Brazil, which were 183,630 tons in 1914, increased to 288,671 tons in 1915 and 503,120 tons in 1916. The increase was mainly in shipments to the United States.

Molybdenum Ore—Sales reported at $2.20 per lb. on the basis of 90% molybdenum sulphide.

Pyrites—Spanish lump quoted at 15c. per unit, on basis of 10s. ocean freight, buyer to pay excess freight and war risk, except that concession of 2% of war risk is allowed. Ocean rates remain at 35s. for Northern, 40s. for Southern and 42s. 6d. for Gulf ports.

Tungsten Ore—Conditions continue about as we reported last week. Prices remain unchanged.

Iron Trade Review

PITTSBURGH—Nov. 20

Conditions as to production of iron and steel have become still more unsatisfactory. While there is less idleness at steel plants on account of lack of coal than there was a fortnight ago there is still considerable restriction and the coal supplies that are obtained are secured only with the greatest difficulty, by priority orders and personally conducted shipments. Coke shipments in the last 10 days have been the poorest for a long time and many furnaces may have to bank. Many of the railroad divisions are badly congested and there are many embargoes.

Offerings of steel at the set prices are greater, and producers are in many instances evidently not as well filled up as they led the trade to believe, before the Government prices were set. In the majority of commodities it is possible to buy for early deliveries. In sheet and tin plates, contracts for the next half-year can be placed by regular customers of the mills, while in tubular goods sales are not being made so far ahead, and the same is largely true of bars, shapes and plates.

Much interest is manifested in the Government's prospective list of unessential industrial activities, as this may shut off some steel consumption. On the other hand, Government orders for steel are increasing.

Bristol furnace, Bristol, Va., owned by the Virginia Iron, Coal and Coke Co. and idle since 1908, has been sold to a Philadelphian. It will be dismantled and the ironwork and machinery shipped to Japan.

Electric furnaces in Canada produced 18,797 tons of steel in the first half of 1917. This compares with 19,639 tons for the entire year 1916.

Pig Iron—The market is quieter. There is less demand and furnaces have less to offer. Last week the Fuel Administration instructed coke operators to ship furnace coke to the exclusion of foundry, and while this may help the furnaces a trifle, those that are making foundry iron are fearful it will result in the consumption of foundry iron being decreased. We quote the market at the set prices: Bessemer, $36.30; No. 2 foundry and basic, $33; malleable, $33.50, f.o.b. valley furnaces, 95c. higher delivered Pittsburgh.

Steel—There are scarcely any offerings of unfinished steel, except occasional odd lots. We quote the market at the set prices: Billets, $47.50; small billets, $51; slabs, $50; sheet bars, $51, f.o.b. mill, Pittsburgh or Youngstown. Ingots have sold at above the billet price and are very scarce.

Ferroalloys

Ferromanganese — The market is more clearly defined than for some time past, quotations having settled down to a basis of $250 delivered, for prompt or forward, while sales when effected are usually at cuts of from $1 to $4 a ton below this figure. A few days ago a steel interest inquired for 1500 tons for first half, but being able to shade $250 only a trifle concluded to buy only 250 tons.

Coke

Connellsville—Car supplies were particularly poor last week and are no better this week, shipments being estimated at between two-thirds and three-fourths of the average rate of the last few months, which rate was not sufficient to supply the furnaces fully. Beehive coke remains at the set prices of $6 for furnace, $7 for 72-hour selected foundry and $7.30 for crushed, over 1-in. size. The Fuel Administration has just set byproduct-coke prices at the same levels, except that crushed is $6.50, all prices being per net ton at ovens.

STOCK QUOTATIONS

N. Y. EXCH.†	Nov. 20
Alaska Gold M	2¾
Alaska Juneau	2¼
Am.Sm. & Ref.,com	75½
Am. Sm. & Ref., pf	101½
Am. Sm. Sec., pf., A	‡92
Am. Sm. Sec., pf. B	‡96
Am. Zinc	13
Am. Zinc, pf	42
Anaconda	57½
Batopilas Min	1
Bethlehem Steel	82½
Bethlehem Steel, pf	85
Butte & Superior	16½
Cerro de Pasco	32
Chile Cop	14¼
Chino	41¼
Colo Fuel & Iron	34½
Crucible Steel	56¾
Dome Mines	6¼
Federal M. & S	12
Federal M. & S., pf	34
Great Nor., ore ctf.	26
Greene Cananea	34
Gulf States Steel	85¾
Homestake	92¼
Inspiration Con	43¼
International Nickel	22
Kennecott	33¾
Lackawanna Steel	77½
Miami Copper	28½
Nat'l Lead, com.	44¼
National Lead, pf	100¼
Nev. Consol	17¼
Ontario Min	4
Quicksilver	75
Quicksilver, pf	1
Ray Con	22½
Republic I.&S.,com.	74½
Republic I. & S., pf.	92
Sloss-Sheffield	36
Tennessee C. & C.	12½
U. S. Steel, com	96½
U. S. Steel, pf	108¾
Utah Copper	78
Va. Iron C. & C	52

N. Y. CURB†	Nov. 20
Big Ledge	½
Butte & N. Y.	50
Butte C. & Z	6½
Butte Detroit	½
Caledonia	45
Calumet & Jerome	1¼
Can Cop. Corpn	2
Carlisle	3½
Cashboy	04
Con. Ariz. Sm	1 1/16
Con. Coppermines	7¼
Con. Nev.-Utah	1/16
Emma Con	50
First Nat. Cop	2½
Goldfield Con.	40
Goldfield Merger	04
Greenmonster	1 1/16
Hecla Min	4 11/16
Howe Sound	3½
Jerome Verde	11/16
Kerr Lake	4½
Louisiana	½
Magma	37½
Majestic	28
McKinley-Dar-Sa	60
Milford	1¼
Mohican	1/16
Mother Lode	37
N. Y. & Hond	12
Nipissing Mines	8
Nixon Nevada	1 1/16
Ohio Cop	1
Ray Hercules	3½
Richmond	‡56
Rochester Mines	.36
St. Joseph Lead	16
Standard S. L.	1/16
Stewart	25
Success	13
Tonopah	4¼
Tonopah Ex	1 1/16
Tribullion	½
Troy Arizona	19
United Cop	50
United Verde Ext	31
United Zinc	1¼
Utica Mines	12
Yukon Gold	1½

SAN FRAN.*	Nov. 20
Alta	03
Andes	10
Best & Belcher	03
Bullion	01
Caledonia	10
Challenge Con	04
Confidence	03
Con. Virginia	13
Gould & Curry	01
Hale & Norcross	03
Jacket-Cr. Pt	09
Mexican	18
Occidental	60
Ophir	13
Overman	04
Savage	04
Sierra Nevada	08
Union Con	1 27½
Utah Con	01
Belmont	3 50
Jim Butler	75
MacNamara	19
Midway	09
Mont.-Tonopah	10
North Star	06
Rescue Eula	09
West End Con	84
Atlanta	08
Booth	04
Comb. Frac.	‡03
D'field Daisy	‡02
Florence	10
Jumbo Extension	15
Kewanas	05
Nevada Hills	07
Nevada Packard	22
Round Mountain	20
Silver Pick	08
White Caps	74
Big Jim	‡75
United Eastern	3 50

BOSTON EXCH.*	Nov. 20
Adventure	1¼
Ahmeek	84
Algomah	25
Allouez	53
Ariz. Com., ctfs	9¾
Arnold	‡25
Bonanza	21
Butte-Balaklava	32
Calumet & Ariz	65
Calumet & Hecla	440
Centennial	13
Copper Range	47½
Daly West	2
Davis-Daly	3½
East Butte	10
Franklin	4¼
Granby	65
Hancock	8½
Hedley	‡16½
Helvetia	25
Indiana	1
Isle Royale	24
Keweenaw	1½
Lake	6¾
La Salle	2¾
Mason Valley	4
Mass	6¼
Mayflower	1½
Michigan	1½
Mohawk	61
New Arcadian	2
New Idria	10
North Butte	13
North Lake	35
Ojibway	1½
Old Dominion	36½
Osceola	60
Quincy	66½
St. Mary's M. L.	52
Santa Fe	80
Seneca	‡6
Shannon	5½
Shattuck-Ariz.	20
So. Lake	1½
So. Utah	17
Superior	4¼
Superior & Bost.	3
Trinity	4
Tuolumne	1½
U. S. Smelting	44
U. S. Smelt'g, pf	44½
Utah Apex	2
Utah Con	12
Utah Metal	3½
Victoria	2
Winona	1
Wolverine	33
Wyandot	.50

BOSTON CURB*	Nov. 20
Alaska Mines Corp.	12
Bingham Mines	9½
Boston Ely	45
Boston & Mont	50
Butte & Lon'n Dev	13
Calaveras	1½
Calumet-Corbin	‡01
Chief Con	1¾
Cortez	10
Crown Reserve	21
Crystal Cop	60
Eagle & Blue Bell	2
Gila Copper	17
Houghton Copper	50
Intermountain	1
Iron Cap, Com	13½
Iron Cap Cop., pf.	14½
Mexican Metals	.26
Mines of America	1¼
Mojave Tungsten	32
Nat. Zinc & Lead	30
Nevada-Douglas	1 11/16
New Baltic	75
New Cornelia	14½
Oneco	25
Pacific Mines	‡35
Rex Cons	.06

SALT LAKE*	Nov. 20
Bannack	26
Big Four	01
Cardiff	3 10
Colorado Mining	11
Daly	1 40
Daly-Judge	6 75
Empire Copper	1 17
Gold Chain	14
Grand Central	47
Iron Blossom	48
Lower Mammoth	03
May Day	03
Moscow	11
Prince Con	61
Rico Wellington	19
Silver-King Coal'n	2 35
Silver King Con.	3 15
Sioux Con	03
So. Hecla	1 00
Tintic Standard	1 45
Uncle Sam	02
Wilbert	14
Yankee	03

TORONTO*	Nov. 20
Adanac	11
Bailey	04
Beaver Con	28
Chambers Ferland	10
Coniagas	2 90
Hargraves	08
La Rose	31
Peterson Lake	08
Temiskaming	25
Wettlaufer-Lor	05
Davidson	32
Dome Exten	09
Dome Lake	12
Hollinger	4 55
McIntyre	1 25
Newray	45
Porcu. Crown	20
Teck-Hughes	33
Vipond	17
West Dome	14

STOCK QUOTATIONS—Continued

COLO. SPRINGS	Nov. 20
Cresson Con.	4 43¾
Doctor Jack Pot.	.03¾
Elkton Con.	03½
El Paso	15
Gold Sovereign	02½
Golden Cycle	1 67
Granite	35
Isabella	07½
Mary McKinney	06¾
Portland	1 00
United Gold M	15½
Vindicator	34½

LONDON	Nov. 5		
Alaska Tre'dwell	‡£1	0s	0d
Burma Corp.	4	1	3
Cam & Motor	0	12	0
Camp Bird	0	8	0
El Oro	0	10	0
Esperanza	0	8	6
Mexican Mines	5	17	6
Min. Corp. Can.	0	17	3
Nechi, pfd.	0	10	0
Oroville	0	18	6
Santa Gert'dis	0	14	6
Tomboy	1	1	0

* Bid prices. † Closing prices. ‡ Last Quotations.

MONTHLY AVERAGE PRICES OF METALS

Silver	New York			London		
	1915	1916	1917	1915	1916	1917
Jan.	48.855	56.775	75.630	22.731	26.960	36.682
Feb	48.477	56.755	77.585	22.753	26.975	37.742
Mar.	50.241	57.935	73.861	23.708	27.597	36.410
April	50.250	64.415	73.875	23.709	30.662	36.963
May	49.915	74.269	74.745	23.570	35.477	37.940
June	49.034	65.024	76.971	23.267	31.060	39.065
July	47.519	62.940	79.010	22.597	30.000	40.110
Aug	47.163	66.083	85.407	22.780	31.498	43.418
Sept.	48.680	68.515	100.740	23.591	32.584	50.920
Oct.	49.385	67.855	87.332	23.925	32.361	44.324
Nov	51.714	71.604		25.094	34.192	
Dec	54.971	75.765		26.373	36.410	
Year	49.684	65.661		23.675	31.315	

New York quotations cents per ounce troy, fine silver London, pence per ounce, sterling silver, 0.925 fine.

Copper	New York		London			
	Electrolytic		Standard		Electrolytic	
	1916	1917	1916	1917	1916	1917
Jan.	24.008	28.673	88.083	131.921	116.167	142.895
Feb	26.440	31.750	102.667	137.895	133.167	148.100
Mar.	26.310	31.481	107.714	136.750	136.000	151.000
April	27.895	27.935	124.319	133.842	137.389	147.158
May	28.625	28.788	135.457	130.000	152.522	142.000
June	26.601	29.962	112.432	130.000	137.455	142.000
July	23.865	26.620	95.119	128.409	125.500	140.409
Aug.	26.120	25.380	110.283	122.391	126.304	137.000
Sept.	26.855	25.073	113.905	117.500	134.071	135.250
Oct.	27.193	23.500	122.750	110.000	142.523	125.000
Nov.	30.625		134.659		155.432	
Dec.	31.890		145.316		162.842	
Year	27.202		116.059		138.281	

Tin	New York		London	
	1916	1917	1916	1917
January	41.825	44.175	175.548	185.813
February	42.717	51.420	181.107	198.974
March	50.741	54.388	193.609	207.443
April	51.230	55.910	199.736	220.171
May	49.125	63.173	196.511	245.114
June	42.231	62.053	179.466	242.083
July	38.510	62.570	168.357	242.181
August	38.565	62.681	169.870	243.978
September	38.830	61.542	171.345	244.038
October	41.241	61.851	179.307	247.467
November	44.109	.	186.932	
December	42.635	. .	183.368	
Av. year	43.480	. . .	182.096	

Lead	New York		St. Louis		London	
	1916	1917	1916	1917	1916	1917
January	5.921	7.626	5.826	7.530	31.167	30.500
February	6.246	8.636	6.164	8.595	31.988	30.500
March	7.136	9.199	7.375	9.120	34.440	30.500
April	7.630	9.288	7.655	9.158	34.368	30.500
May	7.463	10.207	7.332	10.202	32.967	30.500
June	6.936	11.171	6.749	11.123	31.011	30.500
July	6.352	10.710	6.185	10.644	28.137	30.500
August	6.244	10.594	6.088	10.518	29.734	30.500
September	6.810	8.680	6.699	8.811	30.788	30.500
October	7.000	6.710	6.898	6.650	30.716	30.500
November	7.042		6.945		30.500	. .
December	7.513	.	7.405		30.500	.
Year	6.853	. . .	6.777		31.359	.

Spelter	New York		St. Louis		London	
	1916	1917	1916	1917	1916	1917
Jan.	16.915	9.619	16.745	9.449	89.810	48.329
Feb	18.420	10.045	18.260	9.875	97.762	47.000
Mar	16.846	10.300	16.676	10.130	95.048	47.000
April	16.695	9.459	16.525	9.289	99.058	54.632
May	14.276	9.362	14.106	9.192	94.217	54.000
June	11.752	9.371	11.582	9.201	68.591	54.000
July	8.925	8.843	8.755	8.473	50.750	54.000
Aug	8.730	8.360	8.560	8.190	51.587	54.000
Sept	8.990	8.136	8.820	7.966	52.095	54.000
Oct	9.829	7.983	9.659	7.813	54.159	54.000
Nov	11.592		11.422		56.023	
Dec	10.665		10.495		55.842	
Year	12.804		12.634		72.071	

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton.

Pig Iron, Pgh	Bessemer‡		Basic‡		No. 2 Foundry	
	1916	1917	1916	1917	1916	1917
January	$21.60	$35.95	$18.78	$30.95	$19.70	$30.95
February	21.16	36.37	18.93	30.95	19.51	30.95
March	21.81	37.37	19.20	33.40	19.45	35.91
April	21.65	42.23	18.95	38.90	19.45	40.06
May	21.78	46.01	19.11	42.81	19.58	43.60
June	21.95	54.22	18.95	50.05	19.34	50.14
July	21.95	57.45	18.95	63.80	19.20	63.95
August	21.95	54.17	18.95	50.37	19.22	63.96
September	22.88	48.40	19.58	42.24	19.53	48.58
October	24.61	37.25	21.26	33.95	21.51	33.95
November	30.07		28.18		26.55	
December	35.16		30.95		30.79	
Year	$23.88		$20.98		$21.15	

‡ As reported by W. P. Snyder & Co.

Engineering and Mining Journal

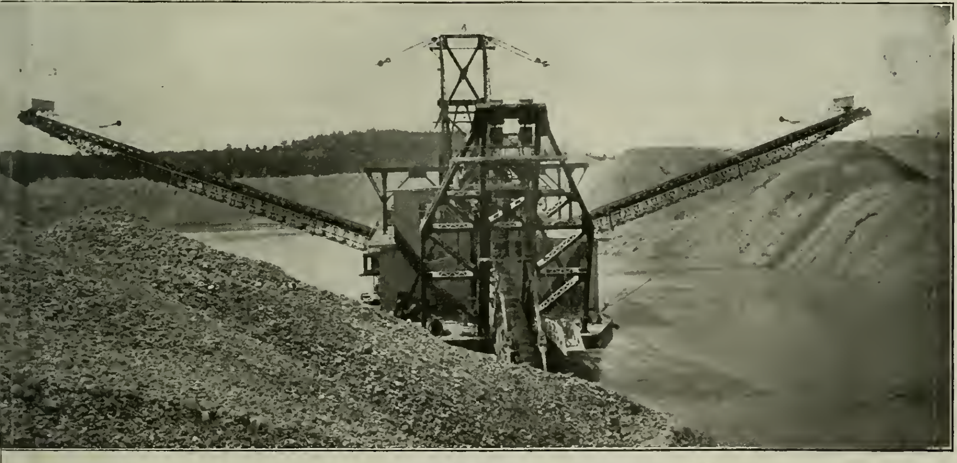
ME 104 DECEMBER 1, 1917 NUMBER 22

Yuba No. 16 Double-Stacker Dredge

BY LEWIS H. EDDY*

his dredge, one of the largest gold-placer redges in the world and the first double-stacker f its type, was designed for reconstructing the hannel of the Yuba River at Hammonton, Calif., oincident with the recovery of gold. It follows redges Nos. 14 and 15, widening the channel nd strengthening the retaining walls by deposit-ng tailings on the inside tailings piles of the pre-eding dredges.

HE making of a new channel to divert the present course of Yuba River, in Yuba County, California, with the coincident recovery of the gold in the els, is being effected by means of the late additions e dredging fleet of the Yuba Consolidated Gold s. Before the installation of the Yuba No. 16 e-stacker dredge,[1] two single-stacker dredges, s Nos. 14[2] and 15[3], were used to recover gold and epare the ground for the double-stacker. In the progress of the work the two single-stacker dredges have thrown up two double rows of tailings, leaving a channel between, which is about 500 ft. wide and 80 ft. deep. Yuba No. 16 is digging out this channel, recovering the gold and placing the tailings on the crown of the inside tailings piles which were left by Yuba No. 14 and Yuba No. 15. These double rows of tailings piles form banks or retaining walls about 400 ft. thick at the base and 30 to 40 ft. high. The tailings distributed by Yuba No. 16 add from 10 to 12 ft. to the heighth of the inside rows.



YUBA NO. 16 DOUBLE-STACKER GOLD DREDGE IN YUBA RIVER AT HAMMONTON, CALIF.

he photograph shows a bow-end view, with digging ladder in working position and tailings being deposited from the port-side er, crowning the inside row of tailings formerly deposited by one of the single-stack dredges. The view of the retaining wall n in the background, forming one bank of the new channel, shows clearly the difference between the old tailings pile and the pile being deposited. Note the dark and the light lines extending from a point where the tailings are dropping, down to dge of the water

Fig. 1 shows the respective positions, *A* and *B*, of Yuba No. 16, while depositing tailings on the crown of Yuba No. 14 at *C* and Yuba No. 15 at *D*. The channel is being excavated to bedrock, a depth of about 80 ft. The redeposited sand and silt are covered with 10 or 12 ft. of heavy gravel to prevent scouring and to provide a solid stream bed. Only one stacker is used at a time, the starboard or port according to the course the dredge is following and the side of the channel that is being excavated. The direction is approximately south, which is the general course of the river, although the dredge may of course be operated in any direction and place the tailings on either side.

The approximate situation and course of the present (or old) river channel, its relation to the ground being

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sociate editor, "Engineering and Mining Journal," San sco, Calif.

[1] ng. and Min. Journ.," June 9, 1917, pp. 1032 and 1033.

[2] g. and Min. Journ.," Mar. 28, Apr. 4 and 11, 1914, pp. 645, 9.

[3] ng. and Min. Journ.," Aug. 19, 1916, p. 329.

dredged, and the relative positions of the dredges are shown in Fig. 2. In the sketch, *E* marks the old channel; *F*, the ground worked by the single-stackers; *G*, ground (or channel) worked by the double-stacker; *H*, approximate positions of single-stackers; *J*, approximate positions of double-stacker, and *K*, the points at which the present stream will be turned into the new channels. The shaded spaces indicate the tailings piles deposited by the single-stacker dredges. Tailings from Yuba No. 16 are deposited along the crown of the piles made by the single-stackers. The sketch also shows the two new channels, which are necessary in some parts of the field, while in others only a single channel is required. When the work is completed and the stream diverted the old channel will be dredged for gold. It will require about six years to dredge the total area of the ground with Yuba No. 16. One-half of this time will be devoted to working out one side of the new channel between the old tailings piles, and the dredge will then be taken back to the starting point and the other side of the channel will be worked, which operation will consume approximately the same length of time.

CONSTRUCTION DETAILS OF YUBA NO. 16 DREDGE

Yuba No. 16 is the first dredge installed in Yuba Basin field equipped with two stackers and designed to strengthen the banks of the stream. Two of the Natomas type of dredges are equipped with extra stackers, one with two stackers and one with four, and another is in course of construction. But these multiple-stacker dredges are designed for reclaiming the soil coincident with the recovery of gold, and have nothing to do with the reconstruction of river channels. Like the single-stacker dredges, they deposit the tailings behind the dredge, though the stackers are so designed as to provide for spreading the gravel across the width of the excavation, and the single-stackers pile the tailings in a single ridge behind. The method of operating Yuba No. 16, with the exception of depositing the tailings, is exactly the same as the operation of the single-stacker dredges, involving the use of the same type of buckets and digging ladder and the same type of stacker belt. With the exception of the two stackers, their design and fabrication, the materials used and the method of construction are identical. Yuba No. 16 is approximately a complement of Yuba No. 15, except as to stackers and some of the dimensions. The all-steel hull is the same as that in Yuba No. 15, being 165 ft. long, 68 ft. wide, and 11½ ft. deep. The digging ladder is 154 ft. long and weighs 145 tons without the bucket line. It is equipped with 100 California-type buckets having a capacity of 18 cu.ft. each and a total weight for the bucket line of 454,000 lb. The dredge is designed to dig a maximum of 82 ft. below the waterline. The main drive, or digging motor, is 500 hp. The total motor equipment is 1085 hp., which is 78 hp. greater than Yuba No. 15. The upper tumbler and shaft have a co bined weight of approximately 21 tons, and the lov tumbler and shaft combined weigh approximately 1 tons. The revolving screen is practically the same on Yuba No. 15 in size, design and nozzle applian The area of the gold-saving surface is 8000 square fe

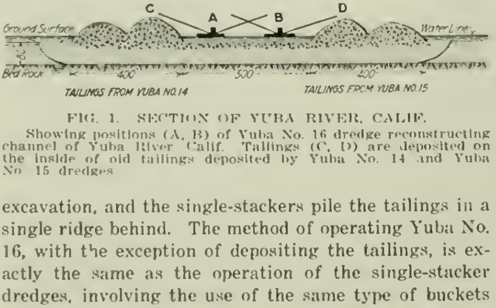

FIG. 1. SECTION OF YUBA RIVER, CALIF.

Showing positions (A, B) of Yuba No. 16 dredge reconstructing channel of Yuba River Calif. Tailings (C, D) are deposited on the inside of old tailings deposited by Yuba No. 14 and Yuba No 15 dredges

DOUBLE STACKERS 50 FT. LONGER THAN SINGLE TY

Each tailings stacker on Yuba No. 16 weighs abo 80 tons and is 225 ft. long, which is 50 ft. longer th the tailings stacker of Yuba No. 15. They are situat one at the starboard and the other at the port corr of the stern, the base points being fixed, according the practice in the construction of dredges that are designed for resoiling. The distance between the ou and upper ends of the stackers is 416 ft. 5 in. and approximate heighth of the stacker gantry above waterline is 103 feet.

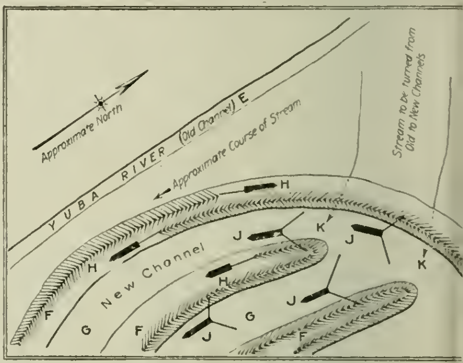
Approximate North
YUBA RIVER (Old Channel) E
Approximate Course of Stream
Stream to be turned from Old to New Channels
H
K
J
J
K
New Channel
H
H
J
G
F
G
F
J
F

FIG. 2. PLAN OF PORTION OF YUBA RIVER BASIN

Showing old channel of the Yuba River (E); ground wor by single-stackers (F), Yubas Nos. 14 and 15; ground worked double-stacker (G), Yuba No. 16; positions of single-stac dredges (H); positions of double-stacker dredge (J), and (K) course of the stream in its new channel

The hull was built on the same ways and launc into the same pond provided for Yuba No. 15. The f steel for the construction of Yuba No. 16 was laid Friday, Oct. 13, 1916, and the hull was launched Nov. 26, 1916. The dredge was completed and be moving by its own power out of the construction p and through the channel of Yuba River toward the ging ground, one mile distant, on Sunday, Apr. 1, 1 This is not record time, because there were nume and extended delays in receiving steel and other es tial materials from the East, due to winter block of the railways, and these delays aggregated abou days. Yuba No. 16 was designed and built by the e neering and shop departments of the Yuba Manufac ing Co., at Marysville, Calif., and assembled by its construction department.

Natural Gas Used in 1916 in the United States for mercial purposes amounted to 753,170,253,000 cu.ft., ex ing by nearly 125 billion cubic feet the former r established in 1915. The average price at points of sumption was 15.96c. per 1000 cu.ft. Credit for the incr production belongs to West Virginia, with an outp 299,318,907 cu.ft.; Oklahoma, with 123,517,358; Pennsyl 129,925,150; California, 31,643,266; Louisiana, 32,08 Kansas, 31,710,438; Texas, 15,809,579; and Arkansas, 2,387,935 cu.ft. These states produced 132 billion cubi more gas than in 1915.

Pyrite in Northern New York

By D. H. Newland*

Attention is directed to the possibility of increasing pyrite production from the low-grade deposits of St. Lawrence and Jefferson counties, on the west side of the Adirondacks. Extensive belts of pyritized schist and quartzite have locally enriched portions carrying 20% or more of sulphur. Considered capable of supplying 250,000 tons annually of 40-45% concentrates, but the cost would be about 10c. per unit of sulphur. This would show a handsome profit on the present market, though only a small margin on the pre-war price.

THE current discussion as to the need for increasing the supplies of pyrite for acid making has brought out a number of suggestions that merit attention. It appears, however, that most of the plans for relieving the situation look to the development of new fields of occurrence or to the utilization of products that are now wasted in the course of mining and metallurgical operations. The discussion has passed lightly over the possibility of enlarging the output of mines and mining districts now actively engaged in production, wherein may lie a partial solution of the problem at least and an opportunity that seems more attractive than some of the plans put forth, which are essentially experimental in nature.

Low-Grade Deposits in Two Northern Counties

In St. Lawrence and Jefferson counties, New York, on the west side of the Adirondacks, occur extensive belts of pyritized schist and quartzite that locally and in restricted portions carry material that assays 20% or more in sulphur. The belts are in the nature of fahlbands, composed of the normal country rocks impregnated by iron sulphides. Pyrite is the common mineral, but occasionally it may be accompanied by pyrrhotite, or more rarely the pyrrhotite may form independent bodies of itself. The fahlbands in their ordinary phases are too lean to be worth mining; it is only by a relative enrichment, which seems to have taken place through the agency of mineralizing solutions at a period subsequent to the deposition of the disseminated pyrite in the usual phase, that the grade is raised sufficiently to be considered workable. This secondary pyrite appears in stringers, bunches and scattered crystals, and has usually a coarser habit than the pyrite of the earlier formation.

The belts are remarkable for their persistence and regularity of areal development. The larger ones have recently been mapped by A. F. Buddington for the State Geological Survey, which some time ago published an investigation of the origin of the ores by C. H. Smyth.[1] There are at least nine or ten individual belts so far known. The more promising areas from a mining standpoint are grouped along a zone that runs northeast and southwest from near Canton, St. Lawrence County, to Antwerp, in Jefferson County, about 40 miles in length. The schist and quartzite which constitute the strata of the belts have a northeast-southwest strike parallel with the general structural trend and usually dip steeply to the northwest.

Careful study of the field features has demonstrated that the different areas are parts of a single series of beds that have been repeated in outcrop by folding. the strata having been tightly compressed and overturned so as to give a common inclination to the whole. The structure is more complicated, however, than would appear from this simple statement, since the beds, which belong to the oldest of the pre-Cambrian rocks—the Grenville series—have been subjected to repeated invasion by igneous magmas of various later periods. As a result the belts are more or less broken up and interrupted, and the rocks themselves show infusion of igneous materials.

Actual Mining Restricted to Two Belts

The enriched portions partake of the general form of the larger belts; that is, they are tabular bodies or attenuated lenses with a much greater length and breadth than thickness. Some of the bodies have been explored for half a mile or more along the strike, and to a depth of several hundred feet, without reaching the limits. Their width is seldom over 20 to 30 ft., and 50 ft. represents about the outside limit. Altogether they contain an enormous tonnage of lean ore.

Actual mining hitherto has been restricted to parts of two belts—the Stella-Pyrites area on the northeast end of the district and the Richville belt that lies a few miles southwest of the first. The Stella mines, at Stellaville, near DeKalb Junction, have been the most consistent producers and have had an uninterrupted record extending back to 1905, under the ownership of the St. Lawrence Pyrite Co., previous to which time they had been worked intermittently for many years. The mines are based on several parallel lenses or sheets of ore that average a little over 20% sulphur. The ore is brought up to about 45% by concentration with jigs and tables at the mine. The Cole mine south of Richville was operated up to a year or two ago for lump pyrite, which was shipped to a local pulp mill for making sulphite. The sorted ore returned somewhat less than 30% sulphur. At Pyrite, or High Falls, mining was carried on several years ago and the ore shipped in the form of concentrates. The property was taken over about 1907 by the Oliver Iron Co., which still retains control but has not attempted operations. There are known to be large reserves of ore in this property, and the same is true for the Cole mine. Prospecting has been carried on elsewhere in the belts, and some of the showings are promising.

A remarkably persistent outcrop of pyrite schist extends northeast from Antwerp, for several miles paralleling the tracks of the Rome, Watertown & Ogdensburg R.R. In the stretch of five or six miles from just north of Antwerp to near Somerville it is accompanied by hematite bodies which are found adjacent to the pyrite, either in the hanging or footwall of the latter, and which in years past have been exploited on a rather extensive scale so as to afford excellent exposures of the sulphide ores. The deposits show a width of 15 to 30 ft. and their continuity on the strike and dip is well assured. Samples of the outcropping material from a number of places on the Keene, Morgan, Wight and Dickson properties indicate a content of from 22 to 30% sulphur. The ore on the southwest end is coarser in grain and more amenable to concentration. In the vicinity of Oxbow, north of Antwerp, is another belt with bodies of pyrite and pyrrhotite that run above 25% sulphur. A composite sample of ore from one place returned 29.06% sulphur and 0.22% arsenic. The orebodies as exposed measure up to 30 ft. in width.

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[1] Education Department Bulletin 158, pp. 143-183, Albany, 1912.

There are many other localities where ore of the general grade mentioned may be found. It is not to be inferred, of course, that all offer conditions equally favorable for mining; but one may venture the opinion that at least five properties could be selected which combine the essentials of favorable situation for mining, milling and shipping operations.

The greatest drawback to immediate expansion of the output of the district, for which the present ore prices supply an incentive, is the necessity of concentrating all the product. Some ore has been shipped in crude form, as stated, but the outlet for such low-grade material is strictly limited at best. The ratio of concentration to be expected is from two to three into one, and to operate economically a mill unit should be capable of handling at least 500 tons a day. The cost of 45% concentrates may be placed at $4@4.50 a ton, or around 10c. a unit. Under such market conditions as have obtained in years past, when foreign ores were being imported free of duty and bearing nominal freight charges, there is but a minimum of profit in the business. On the other hand, anything like present conditions means a good return above all costs, and if there were any assurances of their permanancy would be sufficient inducement to new enterprise. An output of 250,000 tons of concentrates a year would seem to be within range of the natural resources of the district.

Infection as Accidental Injury

By A. L. H. Street*

The Minnesota supreme court has affirmed an award in favor of an employee at an iron mine, under the Minnesota Workmen's Compensation Act, for injury sustained under the following circumstances:

While breaking a piece of ore with a hammer a particle flew into the workman's eye, lacerating the cornea. A fellow employee used a soiled handkerchief in removing the particle, and the eye was washed with water taken from a trough used by miners in washing their hands and faces. Shortly afterward gonorrheal infection set in, resulting in loss of the sight of the eye. Finding sufficient evidence to warrant a conclusion that the infection resulted from the facts above stated, the court holds that the loss of eyesight must be attributed to an accidental injury arising, in the course of the man's employment, within the terms of the Compensation Act. (163 Northwestern Reporter, 755.)

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Application of Portable Column Hoists

By H. L. Hicks*

An item in mine operating costs that has commanded considerable attention recently is the man-power cost of hoisting, handling and hauling light loads. That machines be substituted for men on odd jobs and temporary work as well as on the more important mining operations is highly desirable in view of increasing wage demands. Many needs for portable power have been met by the mine column hoist, which is compact, easily installed and air operated. Mining men in general have become well acquainted with these little machines in hoisting the light loads incident to the sinkin of a winze or driving a raise. Hauling cars in an out of small drifts is also a common application, bu there have developed recently a number of unusual an interesting ways of applying portable hoists.

HOISTING IN A RAISE WITH COLUMN HOIST

In sinking prospect shafts column hoists have bee used to handle nearly everything, as the little two-dri compressor commonly used supplies plenty of power f hoisting when the drills are not working. In the larg sinking operations these hoists have been used to hand sinking pumps, for hoisting the drilling machines before shooting, and to put piping, conduits, etc., in the shaft. In winzes and raises they handle drills, steels, powder, timbers and muck—and men, too, when the bosses aren't around. As auxiliaries to the regular mine hoists needed in the larger winzes, column hoists have proved labor savers in bringing the rope back to the bottom which when done by hand requires several men. One little hoist, bolted to a truck, is transported through a Butte mine for all sorts of odd jobs.

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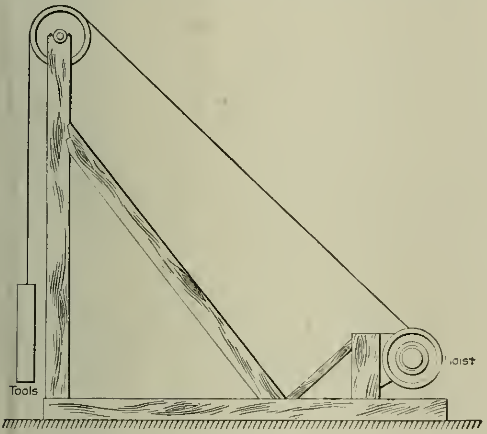
The Alabama red-ore mines employ column hoists in drifts where the grade is too steep to push an empty car by hand or haul it with a mule and the down grade is not sufficient to keep the cars moving by gravity. In some of the Michigan mines where it is necessary to move the tram cars on 30° slopes between levels, hauling up empties and lowering loaded cars, the work is efficiently done by these small machines which handle some remarkable loads. At an Illinois mine they haul loaded cars, weighing 2500 lb. each, up a 30° incline and in New York two 8½-ton cars up a 6% grade.



DRILLING RIG FOR USE WITH COLUMN HOIST

Pulling timbers from old workings is another field in which one man with a column hoist can do as much as from two to six workmen. Most of the machines use wire hoisting rope, but at Butte there is a strong preference for manila. The uses of column hoists above ground are, if anything, more varied than under ground, ranging from removing dirt from a foundation excavation to driving a tumbling barrel by belt from the rope drum. In the latter case, drill steel is tumbled to clean it for electric welding. At an Alaskan mine a Little Tugger hoist is used at the sawmill for hauling logs from the water up the beach to the lumber pile, and then to pull the logs along in front of the saw. There are reports of similar hoists handling heavy mine timbers at lumber piles in other districts. One of these machines has been utilized at another mine in Alaska to pull 50-lb. steel rails through a rail bender, as already described in the *Journal*.[1] At still another mine, all the fuel oil and supplies are hauled up an incline tram with a column hoist, as labor was too expensive.

At a mine in Cuba two of the hoists have been placed on locomotives and are used to haul cars in and out of sidings to save switching the locomotive itself. This, however, might not be considered practicable in many cases. To prevent the flow of water into a mine in Arizona dozens of holes were drilled to bedrock and slime was pumped in under pressure. The slime "sets" like cement, and it was believed that a portion of the faults could be filled up and the pumping costs reduced. The drilling rig was similar to a churn drill, the actuating power being a portable column hoist. The string of 3-in. tools was raised by the hoist and allowed to drop of its own weight and by this method 30-ft. holes were satisfactorily sunk.

Losses in Zinc Metallurgy

From the mine right up to the finished spelter there are various sources of loss, but because mining of the ore is usually the business of one party and metallurgy the affair of another party, it is seldom that the total loss per ton of ore is stated. Further than this, various byproducts result from the use of spelter in galvanizing and other works, and these byproducts naturally find their way back to the metallurgical plants to be worked up again into metal.

The fact, also, that zinc often occurs in association with other metal values does not simplify data as to ultimate total recoveries, and therefore losses. In any particular instance there exist some or all of the undetermined losses: (1) Hand-sorting loss; (2) concentration or dressing loss; (3) purchase loss; (4) roasting (calcining) loss; (5) smelting loss.

The first two need no comment; knowing them, it is possible to state what percentage of the metal mined is actually sold, or ready for the metallurgical side. All subsequent losses usually fall to the lot of the reduction or smelting works. For want of a better name, one of these has been called purchase loss; it is not usually discussed in print; many people will deny its existence; but since it does exist, the writer does not see any reason for pretending otherwise, though one may not quote chapter and verse.

The fact is that in Europe, before the war, and perhaps also elsewhere, on exchange of assays the sellers' figures were not always the true assay results, but were "cooked" by being slightly raised; similarly, the figures the purchaser returned might be also "cooked" by being slightly lowered.

The ethics of the procedure do not concern these notes, but as a result the purchaser may on settlement pay for values not present or he may get values without payment—in either case an error is introduced.

CALCINING AND SMELTING LOSSES

The calcining loss is well understood and can with modern furnaces be kept down to a low figure, but a low calcining loss by itself is no criterion of good work and must be taken in conjunction not only with the sulphur contents, but also with the actual spelter recovery.

The smelting losses are more numerous and complicated and may be roughly divided into the following classes: (a) Fume escaping into atmosphere from condensers, value absorbed by retorts, etc.; (b) zinc contents of residues discharged from the retorts.

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[1] "Eng. and Min. Journ.," Jan. 20, 1917, p. 157.

As regards the fume from the condensers, not much of this is finally lost in modern practice. There is sometimes a loss of zinc as chloride due to some zinc chloride, probably mixed with byproducts, having been charged into the retorts.

There is still an absorption of metal values by the retorts and pipes, but this is not so great as in the past on account of the introduction of presses for making the retorts. Other numerous minor sources of loss occur, including breaking of retorts and leakage into the furnace, etc.

The zinc contents of the residues exist in various forms, of which the following are the chief: Zinc as blende, zinc sulphide formed in retort, zinc silicate, zinc oxide metal.

Zinc as blende is due to imperfect calcination or to the fact that the material before calcination was too coarsely crushed.

Zinc sulphide may be formed in the retort on account of the presence of calcite in the ore, which, after the calcination, probably remains as calcium sulphate; this during distillation reacts with zinc oxide, giving zinc sulphate, which by means of the coal present is reduced to zinc sulphide, but not to metal. Or, as is equally probable, the calcium sulphate is reduced by the coal present to calcium sulphide, which with zinc oxide gives zinc sulphide. In either case the final result in the retort is zinc sulphide and not metal. Barium minerals are as objectionable as calcite in this respect. Calcination at too low a temperature will leave zinc sulphate in the charge, and this also will, by reduction by the coal, cause formation of zinc sulphide in the retort. Sulphur in the coal used as a reducing agent has a similar final effect; that is to say, every pound of such sulphur will hold firmly two pounds of zinc.

Calcination at too high a temperature also yields high zinc in retort residues; this is also accentuated by the presence of lead in the ore.

LOSS IN ZINC OXIDE PREPARATION

Artificially prepared zinc oxides which in their production have been roasted at high temperatures yield on distillation residues high in zinc; in fact, there is a distinct relationship between the temperature of the roasting and the zinc contents of the retort residues. This roasting or calcination at unnecessarily high temperatures causes slight sintering, or in some ores almost initial slagging, and therefore a lack of porosity; hence the reduction in the retort is hindered by lack of exposed surface.

It is known that during calcination at high temperatures zinc oxide reacts with oxides of iron, and probably these compounds are not as easily reducible by the coal in the retorts as the free zinc oxide.

The zinc, which exists as oxide in the retort residues, may have been formed when the retort was opened, previous to discharge. On the other hand, it is most probable that there is always a small current of air getting back through the condenser into the retort and oxidizing some of the zinc vapor, and there are other possible means by which small quantities of air may enter the retort.

Any zinc that exists as metal in the residues must have condensed from vapor on account of "cold spots" in the retort. The temperature of the reduction of zinc oxide, the boiling point of zinc and the latent heat of zinc vapor are well known, but the ease with which zinc vapor condenses is not always realized. It is well seen by putting some zinc into a small transparent silica flask, adopting the necessary precautions to permit air to leave but not to enter the flask, and then applying the necessary heat externally. It will be seen that the boiling zinc will condense on any cool spots and even on those which are obviously only a few degrees lower in temperature than the boiling point of zinc. It is seen from this that by having a cool top to a retort the vaporized metal would condense at the top, fall back again into the hotter zones, be vaporized again, and again condense in the cool top of the retort, and so on. By this procedure the metal contents of the final residues would be increased, and also the time and therefore cost of the distillation operation.

In modern works the retort residues are handled again for their lead and silver, if any, and also sometimes for their zinc contents; so the retort residues are not necessarily a final loss. In any case it is advisable that they shall, when finally dumped, be dumped "clean"; that is to say, not mixed with bricks, boiler clinker or any of the varied useless rubbish which is often available, for these residues, if valueless today, may be an asset at some near date if properly dumped.

Many of the practical difficulties in the metallurgy of zinc are due to the fact that the temperature of the reduction of zinc oxide is above the boiling point of zinc metal. The fact that the various losses are all covered by the various purchase formulas does not affect the case that the losses are varied and large.

Lead Mining in Spain

According to U. S. Consul Louis G. Dreyfus, Jr., of Malaga, Spain, lead was formerly an important product of the province of Malaga, but it has declined steadily during the last 25 years, so that Malaga is now only a shipping port for the output of the mines in the adjacent provinces of Jaen and Granada. On Jan. 1, 1917, there were 72 active lead mines in Jaen, which produced 105,884 metric tons of lead in 1916. At the same date, in Granada, there were eight lead mines, with a production of 1915 tons. Jaen produced more of the metal than any other province in Spain—about 40% of the total for the kingdom.

During 1916 there were 15 plants for the reduction of lead ores in Spain, employing 3580 laborers and turning out 147,407 tons of the metal. In the province of Jaen were three plants, employing 1329 laborers and producing 59,230 tons of pig.

Customs statistics indicate that the exports of argentiferous lead from Spain in 1916 were 21,497 tons, of which 176 were exported from Malaga. In the same year 151,848 tons of low-grade lead in pigs were exported from Spain. Malaga's share of this was 65,458 tons, of which 39,131 went to Great Britain; 18,301 to France; 3193 to Italy; 3162 to Argentina; 751 to Holland; 417 to Portugal, and 503 to Russia.

Status of Flotation-Patent Litigation

By R. C. CANBY*

Review of flotation-patent litigation with special reference to the decisions in the Miami, Hyde and Butte & Superior cases in the higher courts. "Agitation" used by Hyde; "aëration" now used by Miami. Author points out that Miami infringement was during experimental period and that bubble-column porous-bottom machines, such as the Callow cell, do not embody the "agitation of the patents," owned by Minerals Separation.

IT IS unfortunate for the clearness of the situation that the majority opinion of the United States circuit court of appeals, in Philadelphia, in the case Minerals Separation vs. Miami Copper Co., was chnically for the plaintiff, whereas, in actual point fact, it was in favor of the Miami company in that indicates that its present milling operations are not fringing the flotation patents of Minerals Separation. he opinion referred to was based upon a review of e record in the hearing before Judge Bradford in the nited States district court in Wilmington, Delaware.

Miami Experimental Work Violated Patents

The alleged infringing acts complained of by Minerals eparation, in its bill of complaint, occurred in experiental flotation tests carried on before the time that e Miami company had introduced flotation into its tual commercial operation. The opinion of the court appeals in Philadelphia was, therefore, confined in its ope to certain experimental investigations and one form practical operation as set forth in the lower-court cord. In the experimental plant there were three uxiliary features; namely, a centrifugal pump, a cerin "break in the circuit" (allowing a supposedly gitating fall of the pulp) and a Pachuca tank, used r mixing the oil into the pulp. In the practical eration, the centrifugal pump and break in the circuit ere eliminated. A bucket elevator was substituted r the centrifugal pump to raise the pulp to the necesry elevation. Judge Woolley in writing the majority pinion of the court found that these three auxiliary eps in the experimental plant, in combination, perrmed an agitation of the pulp which was in violence nd duration a fair equivalent of the agitation described the patent.

Three Patents Involved in Miami Case

There were three patents involved in the Miami suit: S. Pat. 835,120, covering the quantity of oil, the egree of agitation, and the character of froth proced; U. S. Pat. 962,678, covering the use of a mineral othing agent in solution; and U. S. Pat. 1,099,699, a odification of the second patent in suit, covering the e of aromatic hydroxy compounds (phenol and cresol, r example) without acid and without heat. These tents are referred to respectively as "the first," "the cond," and "the third patent in suit."

Judge Bradford, in his opinion, decided the "first" and "second" patents, with the exception of certain claims, valid and infringed; the "third" patent he found invalid. He considered the invention disclosed in the first patent to reside simply in the reduction in the quantity of oil, as compared with the amount disclosed in the prior art. Of the three patents in the Miami case only the first one, U. S. Pat. 835,120, was involved in the Hyde case. The United States court of appeals in San Francisco, in the Hyde case, had found this patent invalid in that it disclosed simply a difference in degree, in the less quantity of oil, and described no different agitation or character of product than already disclosed in the prior art.

Agitation Used by Hyde; Aëration by Miami

An important difference between the Hyde case and the Miami case should be particularly noted. In the Hyde case the flotation operations under consideration had been carried on in a machine having mechanical agitators or beaters, whereas in the Miami case the concentrating operations were performed in the Callow cell, an apparatus in which the necessary aëration is obtained absolutely independent of any agitation.

The employment of the three auxiliary features of the experimental plant of the Miami, above referred to, in which Judge Woolley found infringement to reside, was merely an unfortunate incident. Between the time of the handing down of Judge Bradford's opinion and the review of the Miami case in the court of appeals in Philadelphia, the United States Supreme Court rendered its decision in the Hyde case.

Supreme Court Findings in the Hyde Case

The Supreme Court, in its opinion, found that the record in the Hyde case did disclose not only a "critical" amount of oil, but also "an agitation greater than and different from that which has been resorted to before," and "resulting froth concentrate so different from the products of other processes," and, therefore, upon a combination of these three elements it found patentability.

It was of the greatest help to the court of appeals in Philadelphia to have before it the Supreme Court decision in its consideration of the Miami case. This Supreme Court decision had been considered by Minerals Separation as a tremendous victory. But when applied to the bubble-column mode of flotation, such as takes place in the Callow porous-bottom cell, the decision is most embarrassing to the contention which Minerals Separation tried, unsuccessfully, to sustain.

The opinion of the United States court of appeals in the majority opinion of Judge Woolley, and particularly in its minority opinion, by Judge Buffington, is as stated in the opening paragraph of this article, really in favor of the Miami, since the infringing features specified in Judge Woolley's opinion, although having been in the experimental plant, do not constitute a part of the operating plant of the Miami company, except as stated. When the court of appeals opinion is applied to the actual concentrating plant of the Miami company, none of the infringing features is found.

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*Consulting metallurgist, Wallingford, Conn.; associated with iami Copper Co.

This article ought to make it clear that the broad claims that Minerals Separation is making to practically the whole flotation field have not yet been sustained by the courts.

Flotation Process Has Advanced Remarkably in Recent Years

The flotation process has developed in so phenomenal a manner since the time I first became familiar with the subject, that the prior art certainly, on the face of it, appears as insignificant. The prior art, however, is by no means unimportant. It is necessary to refer to this question of the prior art not only in its relation to my entrance into the work, but more particularly as to just what were the circumstances which lead up to the Miami Copper Co.'s consideration of flotation.

The impression which Minerals Separation gives in its bill of complaint is that the Miami company took up the subject of flotation subsequent to the installation of Minerals Separation experimental operations at the Inspiration. That this is not the fact was brought out in the testimony at the trial in Wilmington, which shows that I had been engaged in carrying out experiments for the Teziutlan Copper Co. for the purpose of determining which would be the more advantageous, the removal of a Wetherell magnetic plant from the state of Chihuahua to Teziutlan, or the introduction of an Elmore vacuum flotation process plant. At that time the Teziutlan management did not know of Minerals Separation or its process, and it was at my suggestion that a part of the ore sent to London was diverted to Minerals Separation for testing.

A casual allusion made by me to one of the officers of the Miami Copper Co. as to the remarkably interesting flotation results being obtained by an aëration method upon Teziutlan ore, led to an agreement that I go to Miami at the first opportunity. It was some months before this could be arranged. It may be of interest to note that in the meantime, and before the actual signing of the Minerals Separation-Inspiration contract, I had several interviews with the managing director of the Inspiration as to whether it might be possible to combine work for that company with the investigation which I had agreed to make for the Miami. But the Inspiration signed up with Minerals Separation.

Miami Company's Early Experiments

The first flotation experiments at Miami were made with an air-compression method, but this method was in too experimental a stage to warrant the delay necessary for its development, since it was important to determine promptly the advantages of flotation as compared with an economical slime-treatment scheme which had been already developed by the Miami engineers. To save time a Minerals Separation type of machine was built. At that time Minerals Separation patent No. 835,120 was in the courts, and its validity gravely questioned, besides which it seemed a reasonable procedure to ascertain just what advantage flotation would have before entering into any contract; but with the distinct understanding of the officers of the Miami Copper Co. that they had no intention whatever of evading, in their actual operations, any rights which Minerals Separation might establish.

In argument before the United States circuit court of appeals, counsel for Minerals Separation made the statement that the Miami had also copied the Callow cell from Inspiration. This is contrary to fact. The full-length half-width Callow type of cell, referred to in the Wilmington testimony, was built by me, under Mr. Callow's instruction, and installed in the Miami experimental plant some time previous to the introduction of Callow cells at Inspiration.

The foregoing statements are pertinent in that they show that the Miami installation resulted directly not from Minerals Separation, but, primarily, from the Teziutlan experiments based upon entirely distinct methods. The history of the Miami flotation is the more important because of the tendency of Minerals Separation to minimize the prior art in its efforts to make all flotation appear to have resulted from its patent No. 835,120.

Prior Art a Factor in Considering the Patents

This view as to the unimportance of the prior art is exactly contrary, however, to the attitude with respect to the importance of the prior art which licensees of Minerals Separation had assumed in its Australian litigation, in which litigation it was itself a defendant in an infringement suit brought by Elmore. In the Australian litigation it was demonstrated, for example, that the Everson was a most efficient process. Mr. Blount, testifying for the licensees of Minerals Separation, in describing the gangue resulting from his court demonstration of the Criley and Everson process, said: "The gangue remains at the bottom almost clean. In this particular ore the gangue happens to be a very white one, and it is very striking to the eye to see the original black ore converted into an almost perfectly white residuum, and the thick scum of the sulphurets at the top of the water."

What description of the process claimed by Minerals Separation could be more exact? Then there is also a more complete description of agitation froth in the *California Journal of Technology*, November, 1903, than anything given in patent No. 835,120. Practically no prior-art installation is to be observed in the United States. One must go abroad for examples of metallurgical installation, there being a sufficient array in Australia.

But in examining the flotation development in the United States, one is struck by the impress of the independent American metallurgist upon this art. Notwithstanding this, and in spite of the decree of the United States Supreme Court and that of one of our ablest courts of appeal, Minerals Separation is apparently still claiming the flotation field.

It should be particularly noted that the Supreme Court allowed the validity of the first patent in suit, No. 835,120, for a distinct process, having an agitation of definite violence and duration, in the presence of less than 1% of oil, and that the Supreme Court has not, therefore, at all admitted the theory of Judge Bradford, that patentability resided in the mere reduction of oil.

Practical Developments of American Engineers

It would encroach too much on available space in the *Journal* to describe fully how absolutely Minerals Separation adhered to its definite type of machine, even to the minutest detail, and to its manner of operating until the competition of independent American engineers, in the development of their much more practical methods, was encountered.

Look, for example, at the equipment of the Inspiration mill, which was the first installation of importance undertaken by Minerals Separation in the United States. The original experimental plant contained a small agitation-type machine of about 50-ton capacity. Following this was the 600-ton experimental plant, which had originally an eight-compartment full-size Minerals Separation (Hoover) type agitation froth machine, followed by another of twelve compartments and subsequently a so-called, subaëration-type agitation froth machine.

Contemporarily, at several different plants, as well as at the Inspiration test plant, experiments were being made with the Callow and other aëration machines. In fact, while Minerals Separation was experimenting with its process, flotation was developing more successfully along other lines than those employed by that company, as may be judged from the ultimate flotation equipment of the Inspiration mill, which consisted of "four units with Callow machines; 13 units with Inspiration type machines; and one unit with Minerals Separation machines."

This proportion, only one unit of Minerals Separation machines in a total of 18 units in the finally completed mill, well illustrates how proportionately greater has been the contribution of the independent American engineer in the development of flotation. Therefore one may well dispute the right to proprietorship which the British company claims, since its method was actually superseded by something superior before it could completely demonstrate its economic feasibility. H. Kenyon Burch, quoted above, says that only one unit of Inspiration mill has Minerals Separation machines. Minerals Separation claims that all of the machines are operating under its process, whether they are mechanical-agitation or air-bubble type, which claim is not indicated, however, by the subsequent opinion of the circuit court of appeals in the Miami case.

The Reasons for the Anaconda Contract

In the presentation of its case, in the Miami trial, Minerals Separation laid no little stress upon the "acquiescence" indicated by the fact that the Inspiration, at first under its original contract, and subsequently under the Anaconda contract and supplemental agreement, pays royalty on the tonnage of all of the mill units, regardless of the type of machine.

It might appear, if one went into it, that there was "good business" in this Anaconda contract. One of the Anaconda subsidiaries, the Inspiration, was already under an irrevocable contract to pay the regular Minerals Separation royalty, so, as was brought out in cross examination in the Miami suit, it was not only partially a form of insurance, but may well have been worth $300,000 to release this subsidiary company from its existing Minerals Separation contract, for the benefit of the lower royalty of the sliding scale of the Anaconda "supplementary agreement."

The Anaconda contract and supplementary agreement may be criticised from many angles, but one cannot but notice that its "acquiescence" is dependent solely upon the Supreme Court's "final decision" in the Hyde case, rather than upon any subsequent decision of the Supreme Court affecting the patents at issue. But, if one considers all of the conditions involved, it certainly lessens materially the force of the Anaconda contract as an instance of "acquiescence."

I mention this matter of acquiescence somewhat at length, because such acquiescence has considerable weight not only with the court to whom it is addressed, but more especially with the mining public as a whole. The mining public should pause and find just where it stands. It should consider what danger there is of doing an injustice, on the one hand, or of too readily acquiescing in an injustice to itself, on the other hand.

All metallurgists give due credit to that group of gentlemen, composing Minerals Separation, who were astute enough to perceive the necessity of developing the ore-dressing problem along what are certainly unique lines. They were, however, unfortunate in their choice of the Cattermole process. So occupied, indeed, was their vision with this unpromising process that they entirely lost sight of already existing flotation, so that when one of their investigators accidentally produced proper conditions for flotation of the sulphide, they immediately acclaimed a new and wonderful discovery, disregarding what had been disclosed previously in the field of flotation, and claimed as the cause of the supposedly novel result the one thing upon which they had happened to be at the time experimenting; that is, the reduction in quantity of oil.

Different Factors Emphasized in Prosecuting the Hyde and Miami Cases

How completely, also, in the minds of the inventors the process depends upon the violence and the duration of agitation, as well as upon the proportion of oil, is shown in both opinions of the court of appeals, but is particularly emphasized by Judge Buffington in the minority decision in the United States circuit court of appeals in the Miami case. This dependence upon violence and duration of agitation, and permanence of froth, was particularly dwelt upon by the plaintiff in the Hyde case as distinguishing the patent in suit, No. 835,120, from the prior art. It was agitation, violent agitation, of a violence never before dreamed of. But in the Miami case, before the court in Wilmington, plaintiff's attitude was different. In this case the minute quantity of oil was claimed as effecting the result, and Judge Bradford gave as his decision that the reduction in the amount of oil, as compared with that of the prior art, constituted invention, and upon this basis sustained the patent.

It was the record in the Hyde case, however, which was before the Supreme Court, and upon that record, and its insistence upon violence of agitation and permanence as a characteristic of the froth produced by the process, that the Supreme Court found invention to reside in a combination of these elements with the "critical" quantity of oil.

This interpretation of its patent was vehemently opposed by counsel for Minerals Separation before the court in Philadelphia. The patent was so construed and sustained by the decision of the circuit court of appeals in the Miami case, however. An agitation of the requisite violence and duration was found in three auxiliary devices of the Miami experimental plant; namely, a centrifugal pump, a certain "break in the circuit," and a Pachuca tank, which was used as a mixer of the oil with the pulp. In the installation in which the bucket elevator had been substituted for the centrifugal pump, and in which there was no break in the circuit, the court found "the agitation of the patent" in the Pachuca tank.

INCOMPLETE EVIDENCE BEFORE THE SUPREME COURT

The Supreme Court of the United States had found a novel degree of agitation, greater than theretofore known, which produced a permanence of froth, of a character not theretofore known, and the use of a critical amount of oil. There was no testimony in the Hyde record to show that greater quantities of oil than the "critical" amount could be used successfully in the actual mill. It would now appear that the Supreme Court was misled by this record, since numerous plants are successfully using oil far in excess of the minute quantity characteristic of the claimed process, and slightly in excess of the limit named by the patent, 1 per cent.

In the most recent litigation, the Butte & Superior case, argued before the United States district court at Butte, Mont., one finds Minerals Separation taking again an entirely new and different attitude. Confronted as it now is by so many actual metallurgical operations in which oil in excess of 1% was being successfully used, it took precisely the position which its opponents had always argued in every prior case, and which Minerals Separation has denied in every prior case; namely, that "oil" used in any excess over that "which is attached to the metalliferous content of the concentrates" is "wasted," "unutilized," "and might just as well flow down the outside of the machine." This is the exact opposite to what Minerals Separation attorneys argued before the Supreme Court, in the Hyde case, and absolutely contrary to the contention upon which the Supreme Court sustained the patent, and found the efficacy of the "critical quantity" of oil.

FLOTATION TAKES PLACE IN MODIFIED WATER

In litigation certain assumptions of theories as to the underlying causes of flotation have been advanced by one side or the other, as, for example, in the Miami case, the moving-picture film of bubble-holder experiments in the Wilmington court, by the plaintiff, with the object of showing a different degree of attachment of air bubbles for sulphide with large amounts and minimum amounts of oil. The Miami company contended that flotation takes place in "modified water"; that is, water having a contaminant which reduces its surface tension, with the idea of illustrating that all of the various prior-art processes, as well as that of the patent in suit, No. 835,120, were fundamentally identical, all being dependent upon the same underlying principle; that it is the modifying of the surface tension that is necessary, and that, having added sufficient contaminant to modify the surface tension, any excess, more or less, of the contaminant or modifying agent, is immaterial, apart from the question of economy.

I have been greatly impressed by the fact that since the Miami case was argued in Wilmington a number of papers have been written by professors and instructors in our technical schools discussing the underlying principles of flotation. These papers were prepared in the laboratories of the technical schools, the authors being unbiased by any particular interest and untrammeled by the necessity of sustaining a particular theory, and yet none of these writers has found the "critical quantity" of oil. At the hearing of the Butte & Superior case before the district court in Butte, several testified as to their methods of investigation, and reproduced their demonstrations before the court.

THE FAMOUS CLAIM 12 REJECTED BY PATENT OFFICE

Now, Minerals Separation, which inadvertently stumbled upon a flotation result in its investigation of a process in which the preferential affinity of an actual oil for sulphide surfaces is the essential feature, took this impractical process and applied the supposed discovery to it and patented it as an improvement upon or a development from the Cattermole process, whereas the process is of the previously existing art. These gentlemen consequently state that their flotation process is also, in some way, the result of the preferential affinity of oil for sulphide. It is true that Everson, among others in the prior-art patents, had the same crude idea as to preferential affinity. It must be remembered that flotation was not new at the time of the alleged discovery. It was known, and had been known for many years. Therefore it was necessary, in order to control the process, that the company should devise some new feature to distinguish what it claimed as its new method of flotation from flotation as already known. In applying for its United States patent, Minerals Separation included this claim:

> 12. The process of concentrating powdered ore which consists in separating the minerals from gangue by coating the minerals with oil in water containing a fraction of 1% of oil in the ore, and recovering the oil-coated mineral.

The file wrapper in the United States Patent Office shows that this claim was rejected upon the ground that it expressed "merely a difference of degree" over prior patents, Nos. 763,260 and 793,808. Following this action by the Patent Office, Sulman, Picard, and Ballot cancelled the claim so rejected. Claim 12 was the only claim then in the application that did not specifically and explicitly call for the formation of a froth, and following the cancellation of this claim, the patent was granted, every claim in the issued patent specifying in explicit terms agitation and the formation of a froth, as the process covered by the patent. It should be most carefully noted that this is true also of patents Nos. 962,678 and 1,099,699, the second and third patents in the Miami suit, each claim of which calls for agitation to produce a froth.

Having been denied patentability of a claim "expressing merely a difference of degree," it was incumbent upon the plaintiff, in the Hyde case, to particularly and most forcefully dwell not only upon the degree and violence of agitation, but upon the peculiar characteristic of the froth produced by its process. The United States circuit court of appeals in San Francisco did not find that patent No. 835,120 disclosed a greater degree of agitation or a different character of froth from that shown in the prior-art patents. The United States Supreme Court, however, reversed the San Francisco court, not on a question of law, but of fact. It found that the record did disclose greater agitation and a characteristically permanent froth.

In the Miami case, however, a new set of conditions exists. There is neither violent agitation to produce a froth, nor the permanence of froth, which had been declared to be characteristic of the patent, No. 835,120, as it was presented to the United States Supreme Court and as now definitely defined by that court.

It would occupy too much space to follow the complete change of attitude of Minerals Separation during the progress of the hearing before the Wilmington court. As the case proceeded, Minerals Separation changed its position until the violence of agitation of the process, as set forth in the Hyde case, was so modified as to meet the results arising from the gentle ebullition of bubbles through a porous medium, a condition no more violent than that which is produced in a glass of carbonated water.

STATEMENTS AS TO FROTHS

Then before the United States circuit court of appeals in Philadelphia the following most remarkable statement of the contention of Minerals Separation was made by counsel for plaintiff in closing his opening argument:

> Whenever our modifying agent is used, a person infringes who gets air into the pulp in any fashion and agitates the mixture by any means to a sufficient extent to cause the mineral particles to attach themselves to air bubbles and rise therewith above the top of the mixture in a collection of bubbles and metal particles, to wit—froth.

As Judge Gray so aptly remarked in his argument, he did not know how much of the "midnight oil" had been consumed in writing so carefully prepared a proposition, but it was certainly not a "minute quantity."

Compare with the above the following description of the froth of the process as given by Mr. Sulman, one of the patentees of No. 835,120, when asked to state his distinction between the froth or scum which was referred to in the patent in suit No. 835,120, and that of patent No. 793,808, which in Judge Bradford's opinion is stated as being the process used by the Miami Copper Co.:

> A—I have already described the froth produced in the patent in suit as being of a very dense, coherent and thick deposit. The floating concentrate obtained in patent 793,808, on the other hand, was very feeble and tender in character, the very reverse of coherent and persistent and was of such a nature that extreme care had to be used in its collection.

Could two attitudes be more at variance than this contention of counsel as to what is the process of patent No. 835,120, and that of one of the joint patentees, who should surely have known what the process really is? However, it was upon such testimony as that of Mr. Sulman, given above, that the United States Supreme Court was led to find novelty in the character of the froth.

These patentees then come before the Philadelphia court, and repudiate this character of froth. They, in this case, practically ask for the reinstatement of original claim 12, which was properly denied and which they themselves, thereafter, abandoned to the use of the mining public of the United States, and, as Judge Gray again so aptly says, making thereby a contract with the people of the United States, which contract they now attempt to break.

ATTITUDE OF COURTS ON THE AGITATION FROTH PROCESS

The quotations from the testimony of experts or the arguments of counsel, while enlightening, are not so important, now that we have the opinions of the United States Supreme Court and the United States circuit court of appeals as a guide. The decision of the Supreme Court, which is based upon the record in the Hyde case, absolutely limits the Minerals Separation flotation process to what is generally known as the agitation froth process, having "an agitation greater than and different from that which had been resorted to before," and a "resulting froth concentrate so different from the product of other processes." The decisions of the United States circuit court of appeals in Philadelphia, both majority and minority opinions, would unquestionably place any partly mechanical violent-agitation froth process, with less than 1% of oil, within the scope of the patents.

It is possible that patent No. 835,120 may come before the Supreme Court again in a subsequent case, with a record having new matter of importance, such, for example, as the *California Journal of Technology*, with its description of the agitation froth process much more clearly stated than is done in the patent itself. But for the immediate present, and for some time to come, if not for the life of the patents, no one can use the violent-agitation froth process with the "critical amount" of agent without danger of coming within the scope of the patent, unless possibly by the use of some agent not in the present groups enumerated by the Minerals Separation patent. There are such already known, however, strange as it may seem that anything could possibly have been left out of the lists of oils and frothing agents so carefully compiled by Minerals Separation.

When, however, one comes to the bubble-column form of flotation apparatus, with which, as previously stated, 17 out of 18 units of the Inspiration mill, as well as a large number of other American flotation plants, are operated, a different proposition is presented.

BUBBLE-COLUMN MACHINES ARE CLAIMED TO BE WITHOUT THE SCOPE OF THE M. S. PATENTS

These bubble-column machines, the Callow-type machine, the Inspiration-type machine, etc., are not agitation froth machines, and therefore do not come within the scope of any of the patents, Nos. 835,120, 962,678 and 1,099,699, as these patents were defined by the United States circuit court of appeals in Philadelphia in the Miami decision or as No. 835,120 was defined by the United States Supreme Court in the Hyde case. When these decisions in their relation to the bubble-column operations, such as the Callow cell, for example, are considered, the question becomes solely whether the result produced in the porous-bottom cell is the effect of agitation. I consider that it has been established that this is not the case, and that such a porous-bottom, bubble-column cell itself, therefore, operates entirely outside of the scope of these patents.

It is unfortunate for the clearness of its majority opinion that the court's attention was so firmly fixed upon the percentage of oil used in the final demonstration by the Miami company; this demonstration was in fact made to controvert the claim of opposing counsel that the "spiral-coil" apparatus could not operate with so high a percentage of oil. With that idea principally in mind, the court did not sufficiently observe the preparatory details, in which the mixing of the oil, so as to absolutely preclude any suggestion of agitation, was a clearly demonstrated feature. But after all, that is immaterial, since the court in its decision says:

> If the only agitation to which the pulp is subjected (after such agitation as in the prior art was necessary to mix the oil and the ore) was the agitation of the Callow cell, we would not say that that agitation amounted to or was the equivalent of the violent agitation of the patent disclosure and constituted infringement; but in the process we are considering and upon which the decree which we are reviewing was based, the Callow cells were not the whole process, but were merely the last of four distinct parts of the process, the other three being the process of the patent or its fair equivalent.

CALLOW AËRATION NOT OF "CHARACTERISTIC VIOLENCE"

Could any sentence be framed to more completely state that the Callow cell, even when preceded by a considerable degree of agitation, "that of the prior art for mixing pulp and oil," is not an operation of the patent?

But furthermore the decision says:

> It is equally true that in this fourth step aëration is direct, and is not the result of or caused by agitation. On the contrary, agitation results from aëration, and such agitation, though present in some measure, is not even approximately of the violence and duration of the agitation of the patent. The operation of the Callow cell certainly possesses these distinguishing features from the operation of the process where aëration is caused by agitation.

This again is a most clear statement and the court, somewhat preceding these paragraphs, handed down a general and broad enunciation as follows:

> It is clear that if the defendant practiced the process of the patent and obtained a different result, or if it practiced a different process and obtained the same result, it did not infringe.

The application of this broad enunciation would mean that if up to the point where the pulp enters the Callow cell it had been subjected to "such agitation as in the prior art was necessary to mix oil and ore" there would be no such an infringement as Judge Woolley, in his opinion, found in the Miami experimental plant. Such prior-art agitation would not be that of the patent, which agitation the Supreme Court found to be an "agitation greater than, and different from, that which had been resorted to before," and therefore not that of the prior art. But, more than this, the broad enunciation sets forth that even were this agitation actually that of the patent, if it did not produce the result of the patent it would not be infringement. A mere opinion as to the comparative violence of different agitations is necessarily vague. But the decision names something absolutely definite and susceptible of positive demonstration. If the pulp which enters the Callow cell, when brought under the proper conditions, does not perform the "result," that is, the separation of the process of the patent, there is no infringement.

SUBSEQUENT ASSAYS SHOWED NO BENEFICIAL RESULTS FROM USE OF THE PACHUCA TANK

Unfortunately there were no assays accompanying the demonstration made in the presence of the plaintiff's experts at the Miami experimental plant. These experts took a full set of samples, of which duplicates were held by the Miami company but not assayed. Nor were the assays of plaintiff's samples brought forward. A few days subsequently, however, the same experiment of cutting out the Pachuca tank was repeated, and may suggest why Minerals Separation did not bring forward its assays of the samples; the assays of this experiment are contained in defendant's exhibit No. 46 in the Miami case and are as follows:

> Grab samples of concentrates and tailings were taken under normal conditions (that is, with the Pachuca in operation). The samples assayed as follows:
>
> Tailings = 0.54% Total Cu.
> Tailings = 0.43% Oxide Cu.
> Tailings = 0.11% Sulphide Cu.
> Concentrate = 42.52% Cu.
>
> Grab samples taken after the Pachuca had been stopped for 45 minutes. The samples assayed:
>
> Tailings = 0.57% Total Cu.
> Tailings = 0.43% Oxide Cu.
> Tailings = 0.14% Sulphide Cu.
> Concentrate = 46.60% Cu.

These assays show clearly that the stopping of the Pachuca made no difference in results.

PACHUCA TANK ULTIMATELY ABANDONED AT MIAMI

The court refers to the experiment made in the operating unit of the Miami mill in which, during an eight-hour shift, results were actually better in that half of the unit in which the Pachuca was not operating. The court was impressed, however, by the fact that the use of the Pachuca was resumed at the close of the test. What the court designates as the "fourth process" is most interesting, and it is unfortunate that that was not properly in record as evidence.

The demonstration referred to in the Philadelphia decision as the "third process" was made at my instance, as I telegraphed the management at Miami to have this test made, after hearing the testimony of plaintiff's witnesses who had visited the Miami experimental plant as to the apparently important presence of "agitation froth" in the Pachuca, the quantity of which they apparently honestly overestimated. The subsequent abandonment of the Pachuca mixers naturally followed such a demonstration as that described as the "third process," but unfortunately the fact that the Pachucas had been abandoned was not in the record, and was therefore not a matter proper for consideration. It is, however, a most convincing demonstration of the absolute absurdity of Minerals Separation contention as to the function of a Pachuca mixer.

"AGITATION OF THE PATENTS" NOT EMBODIED IN CALLOW CELL

As to this agitation, no sentences could be more clearly worded to state emphatically that the operation of the Callow cell is not the agitation of the patents in suit than those in the majority opinion of the court, as written by Judge Woolley and already quoted. In writing the minority opinion of the court, Judge Buffington says, in conclusion:

> I would hold that the step of the process, "agitating the mixture until the oil-coated mineral matter forms into a froth," meant the novel air-entraining agitation which the patentees disclose, and did not cover the novel air-releasing agitation which the defendants disclose.

Moreover, Judge Woolley says, in the majority opinion of the court:

> But in the process we are considering, and upon which the decree we are reviewing was based, the Callow cells were not the whole process, but were merely the last of four distinct parts of the process, the other three being the process of the patent or its fair equivalent.

This is an absolutely clear statement that it was "the other three" parts of the process, the centrifugal pump, the "break in the circuit" and the Pachuca tank, and not the Callow cells, the fourth step, which were "the process of the patent or its fair equivalent."

Looking back to the time of the supposed "discovery" of the process set forth in patent No. 835,120, it will be noted that the disclosures in the flotation art were already too numerous to admit of anything really basic being claimed.

THE DISCOVERY OF THE "MINUTE QUANTITY OF OIL"

The minute quantity of oil, less than 1%, as compared with Everson, seemed phenomenal, but not so when compared with the "Froment instructions," which these inventors already had in their possession. The "Froment instructions" were the instructions which Froment sent to Mr. Ballot and his associates at the time they purchased the Froment patent. The information given was not public information, in the sense that it had been published, but it was information given to the patentees of patent No. 835,120.

The Cattermole patent literally, if not actually, disclosed a less amount of oil than detailed in No. 835,120 if one considered its use upon such low-grade ores as those now usually treated by flotation, because the amount of oil is figured against metallic content rather than total weight of ore treated. The statement, therefore, that the new process was brought about by reduction of oil to less than that technically disclosed in the Cattermole patent was not a fact.

Practically, however, the possibilities of minute quantities of oil were brought to the attention of the world through the expansion of flotation to other fields than the treatment of the rich Australian middlings upon which Minerals Separation had been attempting to use the Cattermole process, and the realization of this possibility has had the greatest influence upon the progress of the art. The minute amount of oil described by Minerals Separation as "critical," however, was mistakenly assumed to be the cause of the flotation phenomenon. As shown, it was the one element in the Cattermole process the discoverers happened to be investigating when they accidentally produced flotation results. Then a wide guess was made as to the limit and the amount of oil in this supposedly new discovery. Under 1% was staked out as their claim. No one must use from 1% *down*, though Froment had already told them of 1% *up!* Considered in this light, at least so far as a mere difference in amount of oil is concerned, the discovery does not appear to be so startling.

SUPREME COURT ACCEPTED "CRITICAL AMOUNT OF OIL," CHARACTERISTIC AGITATION AND FROTH

The United States Supreme Court was prevailed upon to accept the idea of a "critical" amount of oil. It also found that in order to cause this critical amount of oil to function, it was necessary to employ a definite degree of agitation, greater than that of the prior art. Also that the resulting froth, to be characteristic of the process, must have a greater degree of permanence than had been previously produced. It has been demonstrated, however, that the permanence of the froth is due to the solid particles held within the viscous ilm of the bubbles.

It was found, through microscopic examinations by Professors Taggert and Beach, that these solid paricles, in a flotation froth, lie completely within this viscous film. The particles must consequently be exceedingly small. Might one not, therefore, much more onsistently claim proprietorship to flotation of a "minute particle," in modified water, than to admit the patentability simply of a minute quantity of the modifying agent? Furthermore, flotation practice actually shows that the minuteness of the sulphide particles is an essential in order that the particles may be held within the viscous film and floated, but the quantity of modifying agent has most certainly been shown, by practice, not to be "critical."

The gentlemen composing the Minerals Separation group, in their consideration, originally, of an accumulation of zinc-lead middlings, in Australia, were most astute in their recognition of the possibilities of certain processes, the practical development of which metallurgists, owing to their conservatism, had neglected. The mining world should not fail to give due credit to these gentlemen for their marvelous perception as to the possibility of such processes, even though the evidence of such perception has been most largely shown in the development of a monopoly in patent ownership and by the expenditure of large sums in patent litigations, rather than in metallurgical developments.

MIAMI FLOTATION FOLLOWED TEZIUTLAN EXPERIMENTS

As to the Miami flotation installation, it came about, as already related, indirectly through the Teziutlan experiments and without any intention of usurping or evading any just rights of Minerals Separation, having simply the purpose of developing something which appeared to be much more promising. A natural prejudice against anything so revolutionary as flotation had, in this case, to be overcome and questions as to its practicability satisfied. Fortunately the atmosphere of doubt and mystery as to the practicability of the process itself has now been entirely swept away by a perfect avalanche of technical literature and a most remarkable advance in successful flotation practice.

I feel that the legal situation also has been cleared by the decisions of the United States Supreme Court and the United States court of appeals in Philadelphia, so that there should now be nothing to retard further the development of flotation along the lines so successfully pursued by our American engineers in bubble-column flotation.

However, notwithstanding these activities of Minerals Separation, against which this article is an earnest protest in behalf of the mining public, it is apparently a fact that of upward of 400 mining operators who are now using flotation, fewer than 10% of that number, as shown by the record in the recent hearing in Butte, have acquiesced in the patent contentions of Minerals Separation. And, more than that, of those who have acquiesced, there is in the Inspiration mill, for example, only one unit out of a total of 18 units, employing a method of flotation which comes within the scope of the patents as construed by the United States court of appeals at Philadelphia, in the Miami case.

SUPPLEMENTARY COMMENT SUGGESTED BY THE BUTTE & SUPERIOR DECISION

Since writing the foregoing, Judge Bourquin has handed down (Aug. 25, 1917) the opinion of the United States district court at Butte, Mont., in the Butte & Superior case. Because of the fact that the method of operating, which has been considered by Judge Bourquin and upon which his decision is based, is so entirely different from the method of porous-bottom cell, Judge

Bourquin's decision has absolutely no bearing whatever upon the porous-bottom cell method of operation. However, it seems advisable to add this appendix in order to point out again the difference in operating conditions obtaining in the two methods, that is, that of the violent-agitation froth method, and that of the bubble-column method of the porous-bottom cell; such as the Callow cell. As has already been pointed out in the article, the United States Supreme Court in its decision most clearly and distinctly limits the process of patent No. 835,120 to a definite degree and duration of agitation. The Butte & Superior company was, as Judge Bourquin states, admittedly employing the agitation as well as the other elements of the process of the patent.

After Jan. 7, 1917, because of the Supreme Court decision, the Butte & Superior increased the oil to an amount greater than that of the patent, admittedly for the purpose of coming within the prior art. Now, the gist of Judge Bourquin's opinion is that this increase of oil, having been made by the employment of a useless and even harmful oil, "having no more effect than the addition of so much milk or other useless substance," does not avoid infringement. He also says, however, on the other hand, that if the oil were effective and useful, instead of inert and harmful, this excess would be of that abandoned by the patentees to the public and would involve no infringement. In the Butte & Superior case, the question is one entirely of oil used. According to Judge Bourquin, it involves not only the amount of oil, but also the efficacy of the oil employed. Whether the question as to the efficacy of the oil is actually of the patent, or has simply been injected into it by Judge Bourquin, need not at present be discussed, but I do not find it in the patent or in the Supreme Court interpretation of the patent.

USE OF BUBBLE-COLUMN METHOD AT INSPIRATION

The bubble-column method of the porous-bottom cell, however, such as the Callow cell, in its legal aspect follows absolutely different lines from the method employed by the Butte & Superior company. The bubble-column method is that referred to in the Miami decision in the circuit court of appeals. The porous-bottom cell method, moreover, is not from any point of view a mere evasion of patent No. 835,120 and its corresponding patents, but is a radical and distinct improvement over the method of the patents at issue. That it actually is a decided improvement is clearly indicated by the fact that in the Inspiration mill, as already stated, 17 out of the 18 units used this porous-bottom cell method. It is used solely because a carefully made series of tests, side by side with the agitation froth method, demonstrated unquestionably that the porous-bottom cell method is the better. That it was not used merely to evade the Minerals Separation royalties is clearly manifest by the fact that, owing to an irrevocable contract, which was made prior to the time of these comparative tests the Inspiration had bound itself to pay the royalty upon all tonnage treated. There was, therefore, no possible exception to be made as to the tonnage treated in the porous-bottom cells in these 17 units, but royalty had to be paid just the same as upon the one unit using Minerals Separation's own agitation froth method.

The United States court of appeals in Philadelphia, in the Miami case, has, in both its majority and minority opinions, clearly indicated that the porous-bottom cell method would not in any way constitute infringement; that its degree and duration of agitation does not approach that of the patent; and that the separation is not the result of such agitation as is incident to the operation of the cell.

SOME MARKED DIFFERENCE BETWEEN THE MIAMI AND BUTTE & SUPERIOR CASES

It will thus be seen that the Butte & Superior case, in its question of infringement, relates entirely to the oil used, as to quantity and, according to Judge Bourquin's opinion, also as to efficiency of the oil. In the Miami case, however—and this would apply to all porous-bottom cell operations—it is entirely a question as to the degree and duration of agitation, and as to the character of the froth produced, and is in no wise a question of the oil or modifying agent, either as to its quantity or its character.

It might be well to note just here that in the second patent in suit in the Miami case the patent makes no reference whatever to the fraction of 1% of reagent, nor does it in any way limit the quantity of soluble frothing agent to be used. It should be particularly noted, also, that this second patent, as well as the third patent, is precisely the same in its claims as the first patent, both as to its degree and time of agitation as the manner of producing its froth. Judge Bourquin's decision makes no reference to the second and third patents in the Miami suit, since these two patents were not considered by him.

It may appear superfluous to discuss more fully a decision which has absolutely no bearing whatever upon what I consider the more efficient porous-bottom cell method of flotation, except that it may be appropriate to mention certain of its features in their bearing upon things which have been said in the first part of this article. Judge Bourquin's decision reflects distinctly the manner in which counsel for Minerals Separation have completely changed their entire argument. I have already shown how absolutely different, in the Butte & Superior case, was their argument from any arguments theretofore made by them, they even claiming what had heretofore been the contention of their opponents, that any oil in excess of that actually necessary to do the work was merely waste; "and might just as well have run down the outside of the machine." When reading Judge Bourquin's opinion, with his explanation as to the minute quantity of oil and the necessity of varying all of the different conditions of the operation to meet the varying circumstances, it is difficult for one to realize that he is not reading the defendant's argument. In illustration of this, take, for example, the following sentence:

> The tendency *was* [italics are mine—R. C. C.] to attach prime importance to the reduction in amount of oil used, when in fact this is but a necessary incident (for which there are substitutes if not equivalents) to the creation of the infinitude of bubbles that do the work.

In all of its hearings the different defendants have argued just that very thing—that the reduction of oil was an "incident." There is another paragraph which is of particular interest. It is as follows:

> How the air particles are introduced into the pulp is immaterial. For, introduced, they are still particles and

not bubbles. Agitation subsequent to introduction is vital and alone can convert air particles into water-oil-air bubbles. It is this subsequent agitation that, within the claims of the patent, agitates "the mixture until the oil-coated mineral matter forms into a froth" or "to form a froth." And it is all one whether this be applied agitation or self-agitation, the agitation set up by the air particles themselves in merely rising through the mass and thereby coming in contact with both water and oil all co-acting to form bubbles which capture the metal.

Judge Bourquin may have been completely confused by the plaintiff's new line of argument so to have read into the patent any such description of the process as given in the above paragraph. What he says as to "self-agitation," agitation by the air particles "in merely rising through the mass," is in absolute conflict with the distinction made by the court of appeals in Philadelphia, and is actually nothing less than the reinstatement of the original claim 12, which was properly denied patentability by the United States Patent Office, and subsequently abandoned by the patentees themselves. The porous-bottom cell method of operation was not before Judge Bourquin, so he may not, therefore, have so fully realized the distinction between the two methods of aëration as would otherwise have been the case. He certainly could not have been conscious of how much the specious arguments of the plantiff's counsel induced him actually to read into the patent, nor to what extent he was thereby placing his opinion in absolute conflict with the court of appeals in the Miami case.

There are unfortunately also many among the mining public who do not fully understand the legal distinction which exists between the violent-agitation froth method and the porous-bottom cell method of flotation, and who may not realize that Judge Bourquin's decision has no reference whatever to the latter, and thereby may be led to further misunderstanding of the real situation through the unwarrantedly wide scope claimed for Judge Bourquin's opinion by certain correspondents in financial and other journals.

Research in the United Kingdom

OTTAWA CORRESPONDENCE

In the 1916-1917 report, which is the second that has been issued by the Committee of the Privy Council for Scientific and Industrial Research, of London, England, there is mention of a number of matters which are of interest to metal mining engineers. Under the chairmanship of Sir Robert Hadfield, preparations are being made for taking a survey of what can be done in the way of conducting a research on tungsten and its commercial applications. This work may lead to a much extended use of this metal and so in turn to a greater search and demand for deposits. Investigation has also begun of the existing knowledge and practice of the zinc industry, and the smelting and refining of copper, he quality of copper and the copper alloys. The Instiution of Mechanical Engineers has received a grant for research into the properties of the lighter alloys, among them being aluminum-iron, aluminum-silicon, aluminum-magnesium, and orther combinations.

Eight researches on the better recovery of tin and ungsten are now being conducted, and the results, hough not published, are said to show a 5% improvement in the recovery at the Cornish tin mines.

Ore Smelting in the Swansea District of Wales

An important industry of Swansea is the smelting of ores, especially copper and zinc. The industrial district from Port Talbot on the east to Llanelly on the west has been described as one of the largest metallurgical centers in the world. In normal times nearly every kind of ore is smelted in this area. Copper smelting was the first great manufacturing industry of Swansea, opening up the coal industry of the district for the smelting of ore and establishing a large shipping trade, wooden vessels being built first for bringing ore from Cornwall and later from Chile.

The amount of copper ore imported since the outbreak of the war has declined by almost 40%, says a recent U. S. Consular Report, while imports of copper regulus and precipitates have remained practically normal and arrivals of zinc ore have increased. Separate figures for the imports of these ores during 1916 are not available. According to the annual returns of the Swansea Harbor Trust, the imports into Swansea of copper, zinc, lead, tin, nickel, and lead ores, together with their alloys, amounted to 93,310 long tons in 1916, as compared with 95,878 tons in 1915, 155,055 tons in 1914, and 113,293 tons in 1913. Of the total for 1916 the greater part consisted of copper and zinc. Copper ore was supplied principally by Mexico, South Africa, and the United States; zinc ore came chiefly from Italy and Algeria.

SWANSEA'S SPELTER TRADE

The spelter industry of the United Kingdom is largely centered in Swansea. During the pre-war year 1913 the production of spelter in the United Kingdom was about 60,000 metric tons and the home consumption 195,000 tons. The British producers were thus able to supply only one-third of domestic requirements.

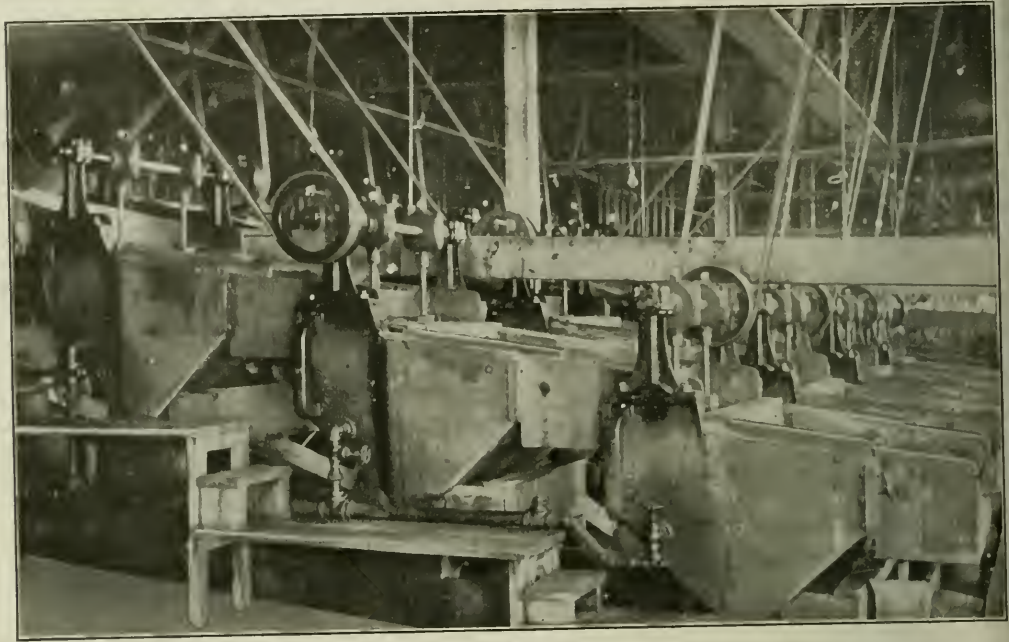
It is reported that a government extension provides for an increase in the Swansea spelter works to deal with a further 100,000 tons of concentrates, which is equivalent to about 38,500 tons of spelter. This would give an approximate capacity of about 100,000 tons of spelter, or one-half of the annual consumption in the United Kingdom. In November, 1916, the Agents General of Australia visited Swansea to inspect the smelting works with the object of finding a market within the British Empire for Australian zinc concentrates.

Previous to the war Germany, Belgium, the Netherlands, and the United States were the largest producers and exporters of spelter. During the war the United States has become the chief source of supply, resulting in a greatly increased production and export trade.

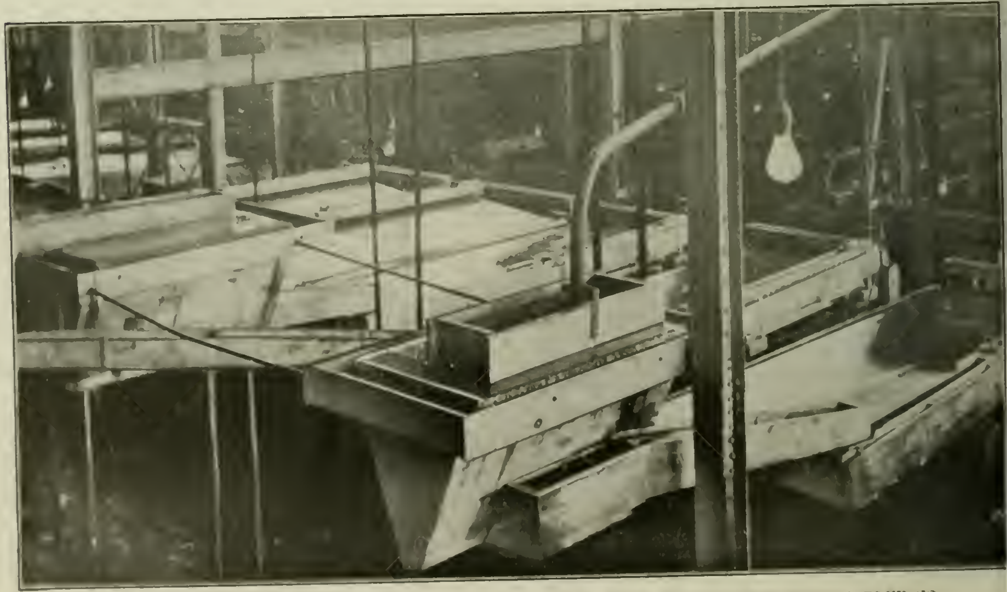
More zinc ore has been imported into the United Kingdom since the outbreak of war—64,670 tons in 1913 and 114,360 tons in 1915. Italy sent 13,801 tons in 1913 and 37,055 tons in 1915; Australia, 16,772 tons in 1913 and 38,883 tons in 1915.

Imports of crude zinc in cakes decreased in 1915, as compared with 1913, by almost one-half. In 1913, out of a total of 145,004 tons of crude zinc cakes imported into the United Kingdom, 117,679 tons (80%) came from Belgium and Germany, as compared with only 4670 tons (3%) from the United States. In 1915, out of a total of 74,522 tons, the United States supplied 46,276 tons (62 per cent.).

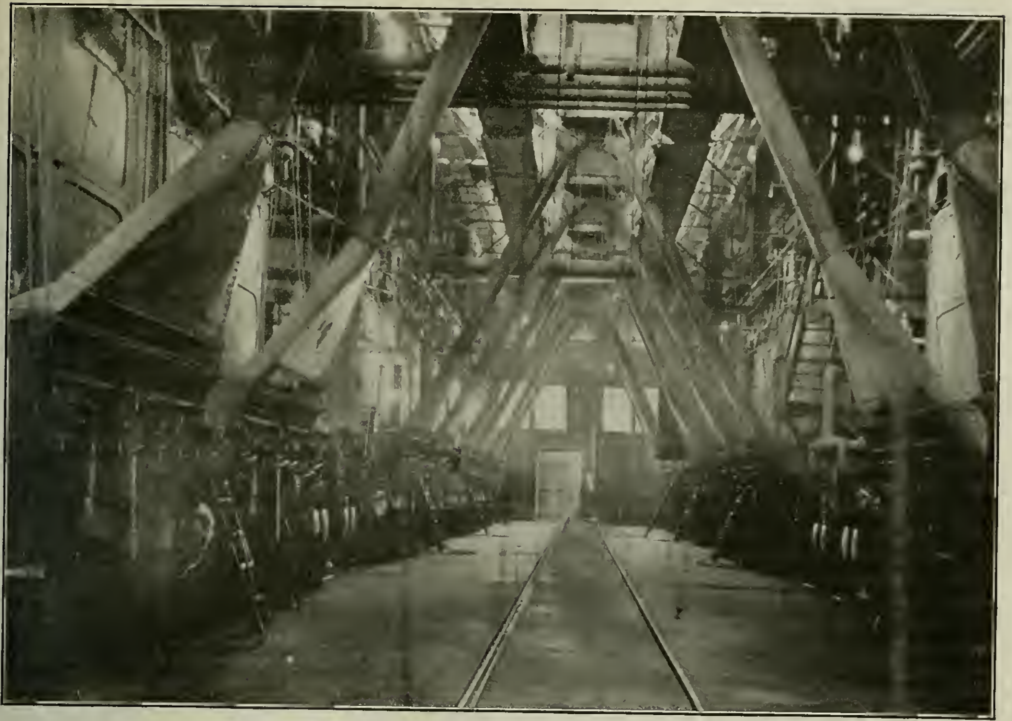
Views from Michigan Copper Country



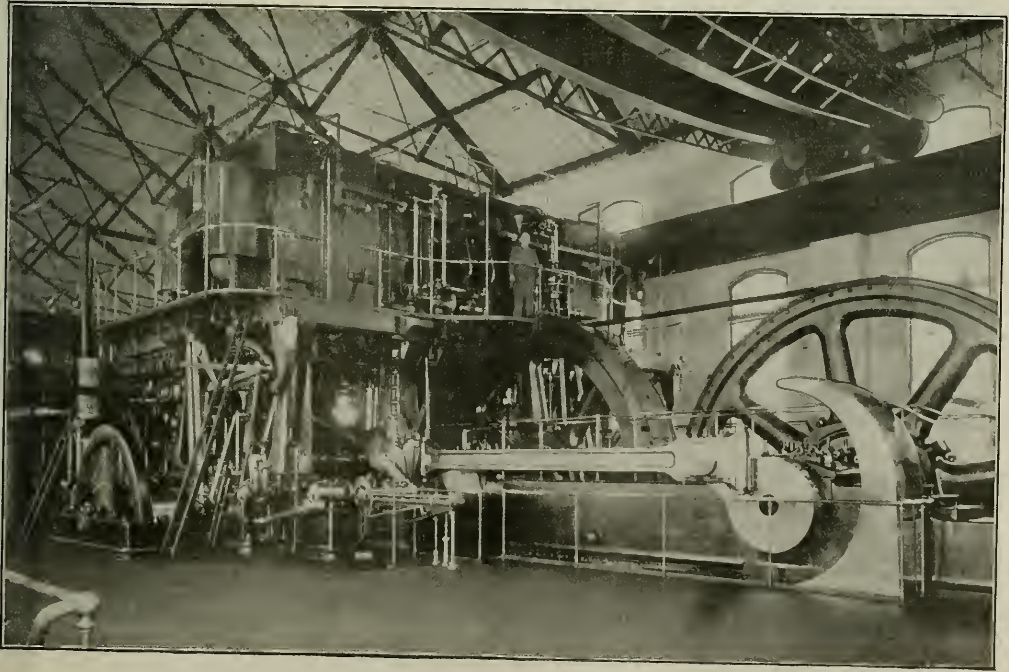
JIG FLOOR AT STAMP MILL OF CHAMPION COPPER CO. AT FREDA, MICH.



FEED DISTRIBUTOR FOR CONCENTRATING TABLE IN THE STAMP MILL OF CHAMPION COPPER CO.



MECHANICAL STOKERS IN POWER HOUSE OF THE CALUMET & HECLA STAMP MILL



TRIPLE-EXPANSION HOISTING ENGINE AT RED JACKET SHAFT, CALUMET, MICH.

Correspondence and Discussion

Chemicals Used in Flotation

The *Journal* of Oct. 27 contained a paper credited to Messrs. Ralston and Yundt regarding "Chemicals Used in Flotation." The paper is highly educational and interesting and indicates practical knowledge. I would call attention to the subdivision "Manganates and Chromates Are Used for Differential Flotation." Here the authors, after stating the facts regarding the practice, discuss the costs and suggest a means of preparing the manganates, which suggested method I consider in error and misleading. A similar error is found in German literature with a considerable number of incorrect statements regarding the manufacture of manganate salts.

Let us assume that the permanganates are under discussion as the oxidizing agent desired, as they carry the double oxidizing power and are stable where the simple manganate salts are unstable except in strong alkaline solutions. The potassium salts alone give the convenient crystal form, and no sodium salt or evaporated powder can be prepared without, say, 30% or more of alkali or NaOH present. Manufacture of permanganate salts was formerly exclusive with Germany, with a price per pound of potash crystals under 25c. Since the war prices have jumped to $4 or a little less for sodium-permanganate solutions of equal oxidizing power, but carrying a large proportion of soda salts as chloride or sulphate of soda. This sodium permanganate is made in New York and used in mill and Government work as a temporary expedient until a better product can be obtained. The method of manufacture used is what is called the chlorate method. This condition, and statements of manufacturing chemists who have seen German practice, warrant the conclusion that the manganate roast is a rather difficult operation and that German means and apparatus are impracticable and too expensive for American adoption.

The authors state that the fusion of manganese dioxide and carbonate of the alkali will produce manganate, presumably the simple manganate which could be oxidized to the per salt. Practically this statement is untrue, as the reaction, $MnO_2 + 2K\ (\text{or } 2Na)OH + O = K_2\ (\text{or } Na_2)MnO_4 + H_2O$, shows that oxygen is essential, which the fusion act denies. It is academic that if a large excess of alkaline carbonate be used, adequate to form a fluid mixture with MnO_2 and the mass be heated to about 1000° C. and air be blown through the fluid mixture, one will get manganate. The operation is utterly impracticable in a technical or economic sense because of the temperature and the immense volume of alkaline carbonate or resulting hydrate entering the leached solutions (several times the normal amount) and defeating the permanganate act to follow.

The only practical result of a fusion of MnO_2 and Na_2CO_3, using the large excess of the caustic adequate to enable fusion, would be that on adding such fused product to a flotation bath MnO_2 would precipitate and the alkali go into solution. Even if the fused mixture were blown with air to form the manganate Na_2MnO_4 the flotation solution, not carrying a strong alkalinity, such as 5 to 7%, would decompose the manganate into MnO_2 and the alkali.

The statement of Messrs. Ralston and Yundt I consider incorrect, and impractical if it were true. With the German apparatus the oxidizing roast to manganate is exceedingly delicate and other apparatus has not been perfected to compete with the German in any practical sense. Because of the mis-statements made concerning manganate manufacture, I deem it best to correct the misunderstanding. I speak after having spent some months in the research of the subject.

Essex, Mass., Nov. 2, 1917. PARKER C. CHOATE.

Passports for Mining Engineers

Passports always have been a theoretical essential for traveling Americans, but mining engineers usually must start to far-off places on such short notice that, if it is feasible to depart without the official "ticket-of-leave," the privilege of carrying such a document is often waived. A country like Cuba, practically under the protection of the United States, an ally in the great war, and ordinarily as accessible as New Jersey or Brooklyn, would seem to be out of the passport class.

A call in person at the New York branch office of the Department of State yielded the information, from one clerk, that a passport is necessary to go anywhere outside of the United States. The first clerk being either too busy or not willing to respond to further inquiry, a second clerk was asked: "Has some special order been issued, on account of the war, making passport conditions for travelers to Cuba any different from last year?" The reply was: "Conditions are just the same. Passports have always been required. The only difference is that you can't buy a ticket now unless you have a passport."

The matter being urgent, an application was made at the Pennsylvania Station. A through ticket to Havana Cuba, was sold without question, similar in every way to a ticket sold a year ago. Baggage was checked without inconvenience. The jolt came here at Key West where an intelligent official of the Treasury Departmen gave the precise information that on June 22, 1917, a definite order was issued prohibiting the embarcation on any vessel bound for a foreign port, of any passenge not provided with a passport issued by the governmen of his nationality. The order became effective at Ke West on or about June 28, 1917. The moral is that it i unwise to accept the verbal statement of a subordinat Government clerk regarding any important matter. On should insist upon being shown the official text of an Government regulation interfering with one's life, liberty or pursuit of happiness. Beware the Governmen clerk! WILLIAM B. MCKINLAY.

Key West, Fla., Nov. 18, 1917.

Mining in Russia

The editorial, "Mining in Russia," in the *Journal* of Nov. 10, was a brief but correct summary of factors acting against such meritorious enterprises in Russia as the Irtysh, Kyshtim, Ridder and Spassky; also on the general labor situation.

In mentioning a few engineers who had brought some of the world's greatest mines to their present stages you quote Hoover—T. J., I presume—as solving the Broken Hill treatment problem. This is unfair to Australians, who will protest when they read the belittling of their efforts in the past. For 20 years the clean separation of the lead and blende from the rhodonite gangue of the Barrier lode was a problem, and recovery of the lead, then mostly desired, was rarely above 70% from a 15 to 20% ore; this by gravity methods.

Early in the present century C. V. Potter commenced his experiments on flotation of Broken Hill ore, and in 1902 obtained a patent. In 1906 I saw his or the Delprat process working at the Proprietary mill treating 1000 tons of tailings daily. There was also the work by Delprat, De Bavay, Hebbard and others (during which time the Zinc Corporation—where Hoover was experimenting—tried the Elmore and many other processes) and later Horwood and Lyster, with their selective systems. At the Central mine of the Sulphide Corporation recoveries of metals by gravity and flotation concentration—processes devised by that company's staff—are now 94% lead, 91% zinc and 92% silver. Intermingled with all of this development was the vexatious litigation with Minerals Separation.

Honor to whom honor is due. Give Australians their due regarding flotation and other metallurgical innovations, adopted and used extensively throughout the world. M. W. von Bernewitz.

New York, Nov. 15, 1917.

A Florida Rare-Mineral Deposit

An interesting article entitled "A Florida Rare-Mineral Deposit" appeared in the July 28 issue of the *Journal*. On p. 155 Mr. Liddell says: ". . . toward the last of the grinding operation the zircon suddenly swells greatly, disengaging large quantities of helium as it does so." In view of the fact that helium is rarer than the other substances mentioned in the article, greater prominence should have been given to a phenomenon that may presage a new and important source of radium. Helium is listed as an inert monatomic gaseous element occurring in the atmosphere of the sun and stars and in small quantities in the earth's atmosphere, in several minerals (especially cleveite, uraninite and bröggerite) and in certain mineral waters. It has a density of 1.98 as compared with hydrogen and is known as a decomposition product of the radium emanations. As a source of radium emanation zircon becomes more important than formerly. Curiosity will be aroused as to the means of detecting the Florida helium. That it may have emanated as a sort of smoky haze, like the products of combustion of a Tampa perfecto, is to be surmised from Moses and Parsons' "Mineralogy," fourth edition, 1909, p. 403, which says: "Colorless or smoke varieties are called jargon, and are comparatively worthless." According to Dana's "Descriptive Mineralogy," 1901, p. 486, some varieties of zircon are not only playful but exhibit a peevish lack of loyalty. A type found in Norway is called "tachyaphaltite," named from two Greek words signifying that it flies from the gangue when struck. Is the Tampa stuff jargon, or must the mineralogy textbooks be revised? T. Montmorency Dillon.

Habana, Cuba, Sept. 15, 1917.

Geologists and the Oil Industry

It is only five years since the first geologist had the temerity to open a consulting office at Tulsa, Okla., the headquarters for oil operators in the great mid-continent oil field. Clients were few, in spite of the modest fees demanded and excellent work performed. The operators had migrated mainly from the old eastern fields, where geologists are still looked upon as little better than fakers and "oil-smellers."

After demonstrating the tremendous wealth in oil of the Cushing pool and its north extension, which were located by geologists, and the later success of the Doherty interests in Butler County, Kansas, which have always maintained a geological staff, most of the skeptical oil men reversed their opinions and became so pro-geologist that there are now over 3000 bona-fide and self-styled geologists in the mid-continent field.

The sudden demand for geologists created a following of pseudo-geologists, who formerly relied on magic wands, divining rods, Spanish needles and other devices of the quack for impressing the tenderfoot with their occult powers for locating oil pools. As yet the advent of the legitimate oil geologist is too recent for many of the operators to be able to differentiate between "the wheat and the chaff." In fact, the section is undergoing the earlier experience of Colorado, where the enchanted tenderfoot was prone to employ the so-called mining engineers who suddenly developed from carpenters, janitors, and black-legs at a time when an active but largely non-discriminating demand for "mining experts" arose in that mine-mad country.

There are today many able geologists in the mid-continent field, and many more younger men who, after they have had the requisite experience added to their recent college education, will develop into competent geologists. But today they are severely handicapped by the failure of the public to discriminate between properly trained, experienced geologists and the quacks who masquerade as such. This condition threatens the profession with a setback and while the situation in time will resolve itself, the profession for its own protection should leave no stone unturned to educate and warn the public against the folly of indiscriminately engaging any one who merely calls himself a geologist, and all should combine in eliminating the quack. It should be made evident that a smattering of highly scientific words or anticlinal lingo and the wearing of scientific instruments do not identify a geologist. Some of the members of the geological profession are not entirely blameless in adding to the growing distrust; they ride their hobbies to an extreme, sometimes fail to give a clear, broad-gage exposition of their conclusions and too often attempt to decide probabilities that are better left to the promoter or capitalist.

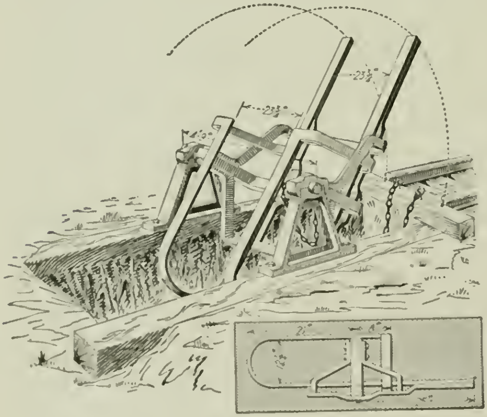
St. Louis, Mo., Nov. 1, 1917. H. A. Wheeler.

Details of Practical Mining

Automatic-Dumping Cradle

The automatic-dumping cradle for mine cars shown in the accompanying drawing is in use at the mines in the Southeast Missouri lead district. Cars used with a cradle of the dimensions given hold one ton and have a capacity of 22 cu.ft. They are of the rigid solid-box type, having an 11-sq.ft. bottom and sides 2 ft. deep; are equipped with Whitney Wonder roller bearings for a 24-in. gage and hauled in trains drawn by mule or motor, with simple chain-link couplings.

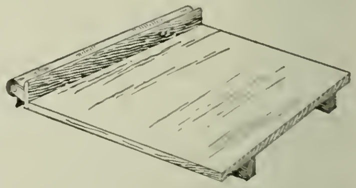
The cars are hand trammed directly into the cradle, or tipple, which at once overbalances, holding the car wheels to the tipple track and dumping the contents of the car into the chute or pocket below. Two chains bolted to the solid ground between track rails are fastened to the 3-in. square iron bar below the cradle. The angle of dump is checked by the length of these chains, which, upon tension, jerk the cradle and car back to a semi-normal position, at which point the carman takes hold and rights the car and cradle by drawing the car back to the main track. The center of gravity of the tipple when empty being low and back of its axis of rotation, causes the cradle to retain a level position. When a loaded car is run into the tipple the center of gravity becomes higher and moves to a point ahead of the axis of rotation making it overbalance so as to discharge the contents of the car. The discharge causes the center of gravity to approach the axis of rotation, and little effort is required to right the tipple and empty car. The system is rapid in dumping, has the advantage of utilizing cars without gates, levers or locks and eliminates the nuisance and delay incident to cleaning the track around the chute after each car is discharged. At shaft pockets where tipples are subjected to greater usage than at the various dumping chutes, the shock received by the bolts and chains as each car is dumped is lessened by the use of coil springs placed around the bolts in such a manner as to act as shock absorbers, allowing the bolts to be raised from their seats against the compression of the springs.



AUTOMATIC MINE-CAR TIPPLE

Drafting-Table Cover

I know of no more convenient cover for the drafting table than a roller shade, writes Oliver Martin in the *American Machinist*. It has the great drawback, however, that loose tracings are drawn into the roller occasionally and thus mysteriously disappear. In order to avoid this, I mount the roller shade on a strip of wood about the same length as the table; and this strip of wood I screw on the rear edge of the table. The upper edge of the strip should be from 2 to 3 in. above the top of the table. It does the trick—try it.



DRAFTING-TABLE COVER

A "Miner's" Under-Reamer

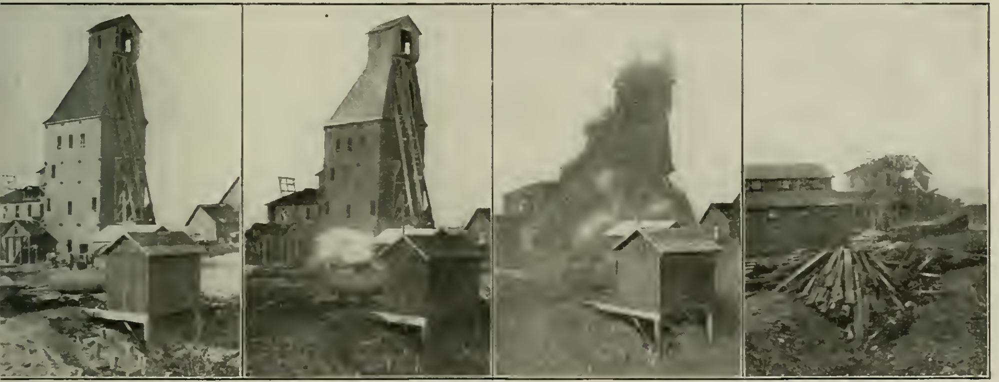
Churn-drill operations in outlying districts with one rig are likely to cost more per foot of hole drilled than where several rigs are at work. This is due to the fact that it requires about as many spare tools and parts and special emergency tools or appliances for small operations as for large ones, and if sufficient provision is not made at the outset, the expense incident to delays in waiting for delivery when an emergency arises is a heavy tax on operations. Churn drillers and tool dressers are paid skilled-labor wages, and good ones are none too many. Men working in outlying prospects expect straight time whether they work or lie idle, and when three shifts of drillers are waiting for a new cable or special fishing tools, etc., for two or more weeks the chance taken by not being prepared in the first place is doubtful economy. "Necessity is the mother of invention," however, and invariably "there is always more than one way of skinning a cat."

A few years ago in the underground development o a prospect in the Santa Catalina Mountains, Arizona, a No. 23 Star churn-drill rig was used. It was before th passage of the eight-hour law and the drillers worked i two 12-hour shifts. They were paid $6.50 and the helper $4.50 per day and were getting straight time. Hole No 2 had been drilled with a 10-in. Mother Hubbard bit t depth of 320 ft. when caving from above necessitated asing. The drillers could not make the 8¼-in. casing ass the 150-ft. point, owing to a deflection in the hole. very method known to drillers was tried until one, ho had been an oil-well driller in California, proposed ending to Los Angeles for an under-reamer. It was 0 mi. from Benson, a two days' wagon haul when the an Pedro River was not up, and this meant at best a wo weeks' lay-off, with a cost of $22 per day against he footage drilled. Miners' experience, however, came the rescue. A joint of 2-in. pipe was loaded with 0% gelatin powder and lowered by the bailing rope to he point of deflection and set off. The effect was chamber the hole at the center of the curve and, after he operation had been repeated once or twice, the cas- ng was lowered to the bottom.

Shooting a Shaft House

By W. R. Hodge*

The wooden shaft house at the Burra Burra shaft of he Tennessee Copper Co. was erected about 1900 and as replaced last summer by a steel building. While he erection of the new building and incidental retimering of 800 ft. of shaft was in progress, ore was oisted through the McPherson shaft, at the north end f the mine. Hoisting ore from this shaft entails in-



SUCCESSIVE STAGES IN SHOOTING BURRA BURRA SHAFT AT DUCKTOWN, TENN.

onvenience and difficulties, and speed in reëquipping e Burra Burra shaft was consequently desirable.

Owing to the construction of the wooden shaft house was impossible to place foundations for the new tructure while the old one was still standing. The ld building consisted of a main portion, which stood 10 ft. above the collar of the shaft, and railroad bins f 2000 ton capacity connected to the main building ut structurally independent of it. It also contained e sheaves, crusher bin, crusher, picking belt and team engine for driving the belts.

When the first steel for the new building arrived, bout half of the railroad bins were abandoned and recked by hand, with some assistance from a small errick. When all the steel for construction had been eceived, hoisting was begun at McPherson shaft and iscontinued at the Burra Burra. The building was stripped of all machinery except the bare 15-ton frame of the crusher which, being immune to injury, was left in place. The crusher was 48 ft. above the collar of the shaft, and after the structure had been wrecked was found uninjured and almost directly below the position it had formerly occupied. Stripping the shaft house of machinery took about six shifts.

The main building was supported on four rows of 12 x 12-in. posts arranged symmetrically on the center line of the building so with two rows of these posts shot away simultaneously on one side, the building would lean and fall to that side—like a tree chopped two-thirds through. When the stripping of the building was complete the timbers connecting the main building with the bins were cut loose and the four stringers of the skipway were sawed square across. Then the two rows of posts on the south side of the shaft house were bored, 2½ sticks of 60% dynamite placed in each one and the holes well tamped with clay to insure a complete fracture of each post. Electric detonators in the dynamite were connected with a switch in the 220-volt lighting circuit of the mines and fired. The left center photograph was taken at the moment of this explosion. The building settled an inch or so to the south, but apparently was uninjured although inspection showed the dynamite had done the work expected, all the posts in the two rows being cut in two. Careful examination showed that the 12 x 12-in. stringers in the skipway were holding the building in place, and they, too, were shot out. The right center photograph shows the shaft house at the time of firing the second set of blasts. The house did not fall square to the south, as was expected, but partly to the southeast, squatting down on its foundations. A railroad crane was then put to work on the wreck, and in 14 shifts cleared the ground so that foundations could be started for the new shaft house. The crane also wrecked the remainder of the railroad bins, by wrapping a chain around sections and pulling, thus rolling the timbers from their foundation.

Cost of the Cornish Pumping Engine at the Chapin mine, Iron Mountain, Mich., excluding installation cost, was $120,600. The cost of the pumping engine itself was $85,600; the cost of the pumps in the shaft, $30,000; and the cost of a power winch was $5000. This was used only for installing the pumps in the shaft.

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*Mining engineer, Tennessee Copper Co., Ducktown, Tenn.

Events and Economics of the War

A sudden thrust of the British on Nov. 21, without artillery preparation, penetrated the German lines before Cambrai to a depth of 6½ miles; barriers were leveled through the use of tanks; most of ground was held and open fighting for the possession of Cambrai is in progress. Small gains elsewhere were claimed by the British near Ypres and by the French in the Aisne sector and at Verdun. The Italians continue to hold the Piave line and have so far defeated all efforts to flank their left on the Asiago Plateau. In Petrograd the Bolsheviki still control; Lenine has sought to disband the Russian armies at the front; Trotzky, posing as foreign minister, has published alleged secret agreements of Russia with the Allied governments. Germany has extended her "war zone" at sea to include the Azores. The British House of Commons voted to disenfranchise the "conscientious objectors" to war.

In this country, the railroad brotherhoods have placed their demands for higher wages in the hands of the President. The railroads have likewise asked permission of the Interstate Commerce Commission to increase their rates and, pending a decision, are conducting a vigorous campaign for higher railroad efficiency. All enemy and ally-of-enemy insurance companies, except those dealing in life insurance, have been forbidden by Secretary McAdoo to continue their business in the United States. By order of the President, soldiers will guard the waterfront of New York to bar access of enemy aliens to the various piers. Similar action will probably be taken at other vital points.

To Pool Eastern Roads

Beginning at once the Eastern railroads of the country, comprising 25% of the total mileage and doing 60% of the business, are to be operated as one single railroad system by a committee made up of the operating vice presidents of the roads involved, under the direction of the Railroads' War Board. The outstanding features of the plan of operation and its ramifications are, according to the *Sun*, as follows:

The Government tacitly consents to a virtual abrogation by reason of war necessities of the section of the Interstate Commerce Act making it unlawful for any common carrier to enter into any contract or agreement for the pooling of freights.

That through this action there will be combined in one railroad system 65,000 miles of railway with 1,194,000 cars and 677,000 employees.

That the present system under which shippers can route their own freight is about to be discontinued, all this being placed in the hands of some central authority acting for all the railroads, this agency to designate over what routes, private as well as Government, shipments shall move.

That an immediate development will be a classification of non-essential freight to be moved when possible or to be placed under an absolute embargo if conditions make this necessary.

That passenger schedules will be greatly changed and curtailed, particularly the through schedules, with the possibility that on some roads through passenger traffic will be eliminated, that they may be used more extensively as freight lines.

After Three Years in Great Britain

Reviewing the three past years of war on the third anniversary of its outbreak, and after pointing out the long series of unfulfilled prophecies and shattered expectations in the political and military field, the London *Stock Exchange Gazette* says:

"Events in the domain of finance, high and low, have not followed the course expected. When the war broke out, there was a good deal of unconcealed apprehension regarding the ability of this country and its allies to stand the financial strain of a world-wide and prolonged war. After three years, we may justly boast that, stupendous as has been the burden, it has been borne with consummate ease.

"The cost of war, not only to this country, but to every other belligerent, has, like the duration of the conflict, far surpassed all reasonable anticipations. In the early days of the struggle we were spending barely £1,000,000 a day, whereas at the present time our average daily outlay, inclusive admittedly of large advances to allies, is about £8,000,000. Yet this huge obligation is being provided for without paralyzing either the finances or the industries of the country. An almost unthinkable load of war debt has involved a corresponding addition to the burden imposed on the taxpayers of the country, and today the national revenue is more than 200% greater than it was in the last year of peace. We have done more than pursue the safe and sound policy of providing out of fresh taxation the means wherewith to pay interest and sinking fund charges on war debt, for we have furnished year by year, out of current revenue, a substantial contribution toward the cost of naval and military operations

"Despite the enormous additions to the taxpayers' burdens, the country still flourishes, both in a financial and an industrial sense. When, on the eve of the outbreak of the war, the Bank of England's reserve of gold was well-nigh exhausted and the official rate of discount was put up to 10%, there was a very widespread impression that a financial collapse was inevitable. But the crisis was adroitly handled. The Bank of England's stock of gold, which had sunk to £27,622,069 on Aug. 1, was quickly reinforced, and rose to an unprecedently high figure within a few months. This summer it stood at £53,128,645, or a level well in excess of its pre-war average.

"Three years ago it was thought that any war, but especially one of such duration and magnitude, would seriously weaken all our great financial institutions. Today, on the contrary, our banks, our insurance companies, and our various types of financial corporations, are stronger than ever, thus testifying not only to the solid and secure foundations on which they are built, but to the foresight and prudence of those responsible for their direction.

"In the world of industry and commerce, too, the calculations of August, 1914, have for the most part been rudely upset. At first the prevailing note was one of marked, and, as it subsequently proved, unjustifiable timidity. Many joint stock companies which ought to have known better either nervously postponed the declaration of dividends, or when declaring them deferred their payment to a subsequent occasion. The result was the infliction of quite unnecessary hardship on thousands of investors throughout the country. But the crisis once passed, wiser counsels prevailed, and companies began to distribute freely the profits at their disposal.

"In the commercial and industrial world uncertainty and some anxiety prevailed at the outset, but they soon gave place to confidence, and the popular cry for a time at least was 'Business as usual.' Everything in all trades was to go on as before, and incidentally the commercial energies of the country were to be concentrated on the capture in neutral and Allied markets of Germany's lost commerce.

"But it was very soon discovered that business as usual was, in many directions, an impracticable ideal. Trade took a natural, though generally unforeseen, course. Some industries suffered acutely; others flourished exceedingly. Those engaged in the production of luxuries were hard hit, and will probably not recover from the blow until long after peace has been signed. On the other hand, industries concerned in the production of articles used in the prosecution of the war and those that minister to the wants of the masses have for the last three years been having the time of their lives.

"Engineering enterprises, manufacturers of textiles and clothing, makers of explosives, coal, iron, and steel undertakings and shipping companies, have been making profits undreamt of in peace times. The state has laid them all under a heavy toll in the shape of an excess-profits duty, but even after meeting that onerous impost they are still able to pay dividends which should satisfy the aspirations of the most exacting investor.

"After three years of war, then, the general position may justly be described as surprisingly satisfactory, and the whole nation can await with composure the events of the coming 12 months."

Germany Rules on American Property Held in the Empire

The official *Reichsanzeiger* (Berlin) announces that the ordinances dated Oct. 7, 1915, governing compulsory notification to the authorities of foreign property in Germany have been extended, together with the penalties in cases of noncompliance, to property owned by citizens of the United States, as from Nov. 20, 1917. The term "property" includes shares in German enterprises within the empire and legal claims upon persons domiciled within the empire. Transfers of such property or claims are permissible only by the Chancellor's express sanction.

The ordinance has a retroactive force if it can be shown that the transfer was made earlier with the purpose of evading the new regulation. It does not apply to property owned by citizens of the United States residing in the empire.

The immediate purpose of the compulsory registration is to prevent the illegal transfer or liquidation of American property held within the limits of the German Empire for the purpose of removing the same from official control and conveying its proceeds abroad. Such transfer or liquidation is allowed only when specific permission is granted.

These restrictions do not apply to such disposition as Americans may desire to make of their property within Germany. They, however, are not permitted to sell their holdings to a resident member of a firm in this country without specific permission. American manufacturing plants are not molested, and Americans resident in Germany may also continue freely to dispose of their private means within the confines of the country.

The official announcement states that the compulsory liquidation, or the administration of the property of American firms, is not contemplated, as it is presumed the provisions of the "Trading-with-the-Enemy Act" do not purpose the sequestration or confiscation by the American Government of German property held in the United States.

Important Features of Army and Navy Insurance Law

A division of military and naval insurance of the Bureau of War Risk Insurance has been organized as a part of the Treasury Department and is in operation. A large number of policies on the lives of soldiers has already been issued. The benefits of the law are available to all members of the United States Army, Navy, and Nurses' Corps. Applications for such insurance must be made by Feb. 12, 1918, or else they will be barred, according to a recent announcement by Secretary McAdoo. A summary of some of the main features of the law follows:

Premiums for a $10.000 policy begin with $6.30 per month at ages 15, 16 and 17; increase to $6.40 per month for the ages 18, 19 and 20; to $6.50 per month for the ages 21, 22 and 23; to $6.60 per month for the ages of 24 and 25; to $6.70 per month for the ages of 26 and 27; to $6.80 per month for the age of 28; to $6.90 per month for the ages of 29 and 30; to $7 per month for the age of 31, with progressive increases for ages above those given. The minimum amount of insurance that may be taken out is $1000.

The compulsory allotment to a wife or children, which is separate from the insurance, shall not be less than $15 a month, and shall not exceed one-half of a man's pay. A voluntary allotment, subject to regulations, may be as large as the insured desires, within the limits of his pay. In addition, the Government will pay monthly allowances as follows:

Class A. In the case of a man to his wife (including a former wife divorced) and to his child or children: If there be a wife but no child, $15; if there be a wife and one child, $25; if there be a wife and two children, $32.50, with $5 per month additional for each additional child; if there be no wife but one child, $5; if there be no wife but two children, $12.50; if there be no wife but three children, $20; if there be no wife but four children, $30, with $5 per month additional for each additional child.

Class B. In the case of a man or woman, to a grandchild, a parent, brother or sister: If there be one parent, $10; if there be two parents, $20; for each grandchild, brother, sister and additional parent, $5. In the case of a woman, to a child or children: If there be one child, $5; if there be two children, $12.50; if there be three children, $20; if there be four children, $30, with $5 per month addditional for each additional child.

If the man makes an allotment to certain other dependent relatives the Government will also pay them an allowance which may equal the allotment, but this shall not be more than the difference between $50 and the allowance paid to the wife and children. The increased compensation in case of death runs from a minimum of $20 monthly to a motherless child, or $25 monthly to a childless widow, to a maximum of $75 monthly to a widow and several children. The widowed mother may participate in the compensation.

In case of total disability the monthly compensation runs from a minimum of $30, if the injured man has neither wife nor child living, to a maximum of $75 if he has a wife and three or more children living, with $10 a month extra if he has a widowed mother dependent upon him. The maximum is enlarged still further when the disabled man constantly requires a nurse or attendant, in which case $20 monthly may be added. If the disability is due to the loss of both feet, both hands or total blindness of both eyes, or if he is helpless or permanently bedridden, $100 monthly is granted.

The law contemplates future legislation for reëducation and vocational training for the disabled. It gives them full pay and their families the same allowance as for the last month of actual service during the term of reëducation.

I. W. W. Round-Up in Kansas

State and Federal officials began a round-up of members of the I. W. W. throughout Kansas on Nov. 21. More than 100 persons were arrested in the Butler County oil fields as a result. Of these over 50 remain in custody, including O. E. Gordon, Alfred Barr and Samuel Forbes, who are known to be national officers of the I. W. W. organization. Lodging houses and buildings used as meeting places were invaded. Attention was then turned to the Towanda field. Citizens aided the officials, who were armed with John Doe warrants. In cases where there is not sufficient evidence against the men to support prosecution by the Government, charges of vagrancy will be preferred.

The round-up was in charge of Oscar Schmitz, working as a special agent under the Bureau of Investigations. Reports from the oil fields that the I. W. W. intended to resort to violence were responsible for the Government's action.

Ten Tons of Aluminum in a Zeppelin

According to notes furnished to a London journal by a French officer, in the construction of the framework of a Zeppelin from 10 to 12 tons of aluminum is employed. The covering of the 18 balloons enclosed inside the big outer envelope is made of a cotton substance, lined with "goldbeater's skin," instead of with rubber, and the quantity used is so large that the intestines of 30,000 cattle go into the material for one Zeppelin.

Each of the 18 balloons is fitted with a valve, and separated from those on each side of it by a funnel to carry off the explosive mixture of the hydrogen of the balloons, the oxygen of the air, and the gases given off by the engines. When all five motors are working together—one contained in the forward car, one in each of the two side cars, and two in the rear car—the speed attained is 68 miles per hour, but, as a rule, all the engines are not used at one time, and the normal rate of flight is from 50 to 56 miles per hour. The ordinary crew consists of 22 men, but during raids a crew of only 18 men is carried.

Coal Producers Pool Output

The Fuel Administration has approved a producers' pool just formed at Cleveland which will handle shipments of coal mines in Ohio, West Virginia, a part of Pennsylvania and perhaps Tennessee and Kentucky. Creation of other pools will be encouraged. If Government pooling is put into effect it will be made operative next spring and will supersede the shippers' pools, the Government requisitioning at the mines the entire output of coal and selling it without profit.

Oklahoma coal operators have been threatened by Fuel Administrator Garfield with Government seizure and operation of their mines if they permit production to halt pending action on their demand for higher prices. The producers had notified Dr. Garfield they could not pay wage increases asked by the miners unless they get more than the 45c. a ton increase granted by Dr. Garfield, and that they would not make the wage increases retroactive to Nov. 1, as directed.

Dr. Garfield requested the Priority Board on Nov. 22 to revoke, effective after Nov. 30, the order requiring all coal shipments from Middle West fields to go through to the Lakes for trans-shipment to the Northwest. The purpose is to divert the coal to relieve acute shortages in the Middle West and New England.

Need Only Ten Billions More This Fiscal Year

Government expenditures are running far below estimates given to Congress, according to Secretary McAdoo, who predicted that the amount of money still to be raised for the fiscal year would not exceed $10,000,000,000. He said:

> Vague and unfounded apprehensions seem to exist in the public mind as to the extent of the financial requirements of the United States during the current fiscal year. It may be helpful to the country to know that these requirements have been greatly exaggerated, and that in the judgment of the Secretary of the Treasury there is no reason whatever for apprehension on this score. This opinion is based upon the latest estimates of our financial needs.
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> During the last few days the various departments of the Government have submitted to me their estimates of expenditures during the current fiscal year. On the basis of these estimates I am confident that, allowing for a liberal balance in the general fund at the close of the fiscal year, not more than $10,000,000,000 remains to be raised by the issue of bonds, war-savings certificates and Treasury certificates of indebtedness. This is not regarded by the Treasury Department as a task which will in any way strain the capacity or resources of the United States.

France To Demonetize Some of Its Silver Coins

The French government has decided to demonetize certain types of silver coins, says the *Matin*, to put a stop to the hoarding which is paralyzing trade. When 15,000,000 nickel coins were struck by the mint all vanished virtually as soon as issued. The hoarding craze is especially prevalent in the provinces. To force out the hidden money, Finance Minister Klotz plans to demonetize all silver coins bearing the effigy of Napoleon. On Nov. 22 he issued a circular announcing the Government's intention and pointing out that the intrinsic value of the silver in the coin is only 67% of its nominal value.

Industrial News from Washington

By Paul Wooton, Special Correspondent

Use of Domestic Manganese Hinges on Smelting Problem

The expansion in the mining of manganese ores since the war began is characterized as nothing less than remarkable by W. C. Phalen, of the staff of Dr. Charles L. Parsons, the head of the mining-technology division of the U. S. Bureau of Mines. Mr. Phalen has visited every important manganese-producing region of the United States in the last year. During the last five months he has made a survey of the manganese resources of the West.

While hundreds of holes have been opened and domestic production has been forced to a higher point than believed possible a few years ago, certain metallurgical problems must be solved to make available the large reserves of highly siliceous ores if the country is to become independent of foreign supplies. The large reserves of rhodocrosite in the Butte district, in Montana, and to a less extent in San Joaquin County, California, particularly impressed Mr. Phalen with the necessity of attempting in metallurgical practice to use these as well as large deposits of high silica manganese ore in certain of the Western states.

Characteristics of Carbonate Orebodies at Ophir, Utah

In connection with his study of the zinc-carbonate and related copper-carbonate ores at Ophir, Utah, G. F. Loughlin has expressed the following opinion upon economic features:

> It is to be expected that bodies of lamellar zinc carbonate like those at Ophir will prove to be of high grade, owing to the complete removal of limestone, but of small dimensions and confined to the immediate vicinity of fractures and open bedding planes. Such small bodies are not likely to lead to larger bodies of massive ore, unless they lie near to ground-water level, or to some impervious stratum or fault that impounded the waters containing the oxidized compounds of zinc.
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> In districts where mixed sulphide deposits in limestone contain both copper and zinc in considerable quantity the resulting carbonate ores of both metals are to be expected in the oxidized zone, the copper carbonate immediately below the position of the original sulphide body or its siliceous casing, and the zinc carbonate below the copper carbonate. The details of these relations, as well as the richness and size of the carbonate bodies, depend on such local factors as the purity and permeability of the limestone replaced and the relative openness of bedding planes and fractures, which must be determined for each deposit or group of deposits.

Survey Fails To Discover Platinum

After the most careful survey that ever has been made of existing and possible sources of platinum, the geologists of the U. S. Geological Survey are convinced that there is no domestic occurrence of the metal justifying a large mining operation. With the situation in Russia doubtful, with obstacles in the way of obtaining the Colombian output and with domestic production certain not to exceed 1000 oz., it is not improbable that American women will be called upon to surrender their platinum jewelry to supply the needs of the rapidly expanding sulphuric-acid industry.

The Russian production in 1916 was one-third that of 1915. No estimate can be made of the quantity produced in 1917, but it is reported to be small. The spread of revolution throughout Russia, it is thought, will cause banks and speculators there, who have been holding platinum for higher prices, to disgorge. Some are of the opinion that unexpectedly large supplies of platinum soon will come on the market as a result.

To Safeguard Labor During War

In orders just issued by the chief of ordnance and by the quartermaster-general to arsenal commanders and to manufacturers engaged in Government work, the following comment is made.

> In view of the urgent necessity for a prompt increase in the volume of production of practically every article required for the conduct of the war, vigilance is demanded of all those in any way associated with industry, lest the safeguards with which the people of this country have sought to protect labor should be unwisely and unnecessarily broken down. It is a fair assumption that for the most part these safeguards are the mechanisms of efficiency. Industrial history proves that reasonable hours, fair working conditions and a proper wage scale are essential to high production. During the war every attempt should be made to conserve in every possible way all of our achievements in the way of social betterment.

Explosives Law Hampers Employment of Austrian Miners

Every effort is being made by the explosives section of the U. S. Bureau of Mines to prevent loss of production as a result of the enforcement of the explosives law. There is no way, however, of permitting Austrian miners to be licensed. Miners of that nationality may be employed where shot-firing systems are used or where the explosive is issued by a licensed foreman. In cases where this arrangement is not possible, it is believed that Austrian employees can be transfered to work in which they are not required to use explosives, without any important interference with mine production.

Car Shortage Increases

If the cars now delayed in the congested region east of Chicago and north of the Potomac River could be released, a large part of the unfilled car orders could be taken care of, the Railroads' War Board reports. Car requisitions that could not be filled amounted to 140,012 on Nov. 1. This is an increase of 25,104 cars as compared with the situation on the corresponding day of 1916. More than half of the unfilled orders are from parts of the country outside of the congested district.

Editorials

Railway Freight Rates

AT AN early stage in the present war, J. R. Finlay indicated, in a paper read before the Mining and Metallurgical Society of America, that the country or army with the greatest developed mineral resources at its command would probably win the war. In that paper he pointed out the predominating place that fuel, iron and steel were already occupying in military decisions, and how the control of these and other mineral products would ultimately spell ruin to the side whose raw materials were inadequate for present methods of war. Germany realized this fact, and this was undoubtedly one of her main reasons for quickly taking and holding the coal and iron fields of Eastern France and the coal fields of Belgium. This discovery has been made in the United States several times since Mr. Finlay wrote of it. Each time it has been elaborated upon by its new discoverer and some prominence given the matter in the daily press, until finally, and since the war has come home to us, we are all more or less imbued with the idea that a most important part of our present undertaking is that of getting out of the ground every pound of metal and coal that we can and *the transportation of these as quickly as possible to the point where they may be used* for some purpose more or less directly connected with the war.

With developed mines in plenty, with men to work them, with plants for treating the output and mills for converting product into merchantable form, what do all these avail if our means of transportation between mine and factory are inadequate? The chain is no stronger than its weakest link.

As we look about us today, few have the means of seeing or the ability to comprehend the intricacies and magnitude of the great war machines that our Government is trying to put into operation, but most of us are daily reminded of the fact that our railways are not equal to the task that they are asked to perform. Who or what is to blame for this condition and how is it to be rectified, for it must be rectified or we have already reached the limit of our capacity?

A long, long time ago—most of us were then little children—when railways made their tariffs what the traffic would bear and wage scales were determined by the law of supply and demand, main lines spread their tentacles into prairie and mountain; new lines were conceived and were paying dividends before they were completed. Many were poorly located, of course, and failed, but, generally speaking, railway building and operating were immensely profitable and there was always money for the track and equipment of any reasonable project, and mines had cars in which to move their product. Congested terminals, roads blocked with traffic, embargoes on freight, shortage of cars and fuel were not causes of complaint. To be sure, the railways took the most of what the consumer paid for his supplies, paying it out in dividends or putting it back into more rails and equipment. This was our complaint; the railways were robbing us, and they must be regulated. It was no idle dream, the railways *did* take all that they could get, much more than they should have taken, but regulation has proved to be not only a dream but a nightmare. If ever the term boomerang was appropriately used it was what the shippers got when they got the Interstate Commerce Commission, with the powers that it has so injudiciously used. Shall we, then, place the blame for our present inadequate facilities upon the shoulders of the Interstate Commerce Commission and the various intrastate railway commissions and let it go at that? Scarcely. We, the people who ship over the railways and the consumers of produce asked for the appointment of these commissions, asked that they be given power and asked that most drastic regulations be enforced. Then we, or our attorneys, appeared before the commissions and submitted proofs of mismanagement and gross overcharges. They were *our* commissioners and they appear to have believed most of what was told them. Railway officials appeared and presented their side and the side of the stockholders. But many of these gentlemen had been connected with more or less shady practices in the past and consequently their statements were taken with a grain of salt, no matter how penitent they might have been. The railways were regulated in a manner according very nearly to the idea of the shippers and the consumers. There was one group of men who knew what this regulation would result in; namely, railway financiers, managers and operators, numerically a small group, whose warning and advice were not heeded.

The railway management is responsible for present conditions only to this extent: During a certain period of railway building and operation it maintained the rights or the power of the railways above the rights of the people. A reaction was bound to follow and did follow, but the reaction was allowed to continue until the railways have actually suffered, until we are actually suffering ourselves, until we have put the biggest stumbling block possible in the way of winning our nation's greatest undertaking, and this is attributable only to our own selfish short-sightedness and ignorance. We have been a long time learning this, and war conditions are only accentuating what 90% of us knew several years ago and what we all, Clifford Thorne excepted, know now.

If we realize that a deplorable condition exists, if we understand what forces, what power brought this about, and we surely do, the next thing to be done is to use that power to bring back the pendulum to the zero point. It is our privilege and duty to say to the interstate and intrastate commissions: "We were wrong, and you have gone too far. Some of the statements of managers must have been nearer right than ours. Reconsider what they have told you, and henceforth act as arbitors to bring about the greatest good for the greatest number regardless of the fact that you may put some of us out of business, out of business that existed only because we were a favored few."

But what has all this got to do with mines, miners, operators, producers of fuel minerals and their products? Why should we miners and metal men give this subject special consideration? We have a great deal to do with it. This war will be won or lost through the ability or inability of the railways to keep our product moving. It is all-important to us, from our own selfish standpoint, and all-important to the nation, that we use every effort and influence to keep our coal and metals moving.

Increased railway facilities are a personal necessity to many of us; they are a national necessity. We need both tracks and equipment vastly in excess of the present supply. This is not a time to debate as to the best source of money for supplying railway needs, the return on the investment, etc. We know that the railway should be in a position to pay the same rate of interest on the money it requires as would any business of equal safety or risk, no matter from what source it borrows. The railways are not paying that interest now and can only and should only get capital when they can vouch for an adequate return. An increase of income is the *sine qua non* of the present railway situation.

Railway income is practically all acquired from traffic and freight, in proportion one year being about the same as another, and of the freight nearly half is derived from the transportation of products of the mines. The Bureau of Railway News and Statistics, summarizing the figures for the year ended June 30, 1914, gives the following figures respecting the sources of income for the railways of the United States: Passenger traffic, 22.88%; product of mines, 35.44; manufactured articles, 10.58; forests, 7.66; agricultural products, 7.43; merchandise, 2.99; miscellaneous freight, 2.63; animals, 1.90; miscellaneous sources, 3.72; express, 2.47; mail, 1.90%. This gives some idea of whom it is that the railway serves and who it is that pays the largest percentage of railway freight charges and why it is that the producers of raw minerals are so deeply interested in the prosperity of their chief ally, the railways.

Today there are probably not half a dozen of the important mines in the United States but are waiting for some machinery or delayed supplies or that have not trouble in making shipments. We have been inclined to congratulate ourselves on obtaining a 10% reduction in freight rates and then another 5% and possibly another; but today, as we are waiting for cars or supplies, we see that we were not the recipients of unalloyed benefits. We realize that there have been too many reductions.

Like lead poisoning of the human system, we have been administering a sort of cumulative dose to the railways. We made complaints and got reductions. No bad effect was noted in the railway. We appreciated our gains. We repeated with the same result, and did it again. Finally we have seen that there were some ill effects not previously noted. But we cannot give the railway a dose of physic and bring it quickly back to its earlier vigor. We have got to begin and treat it decently and make our neighbors do the same. We cannot turn over to the railway money that it should have had and used but which we have paid our stockholders, but we can see that its freight rates are brought up to a point where they will yield the fair profit that the road should have. No, we cannot do all of the repair work ourselves, even though we do pay the most of the railway bills, but working through proper legal channels we can do our bit, which should be a large bit toward the repair of the link we have helped to weaken in the chain in our national economy.

What Zinc Smelters Ought To Do

IF ANYBODY had said four years ago that the price for common spelter would be about 8c. per lb. and that producers would nevertheless be complaining that they could not get a new dollar for an old one, he would have been promptly and properly pronounced a lunatic. However, what would then have seemed so utterly fantastic is a grim and serious reality now. The explanation is that all industry is on a basis multiplied by about 1.6 (probably more than that in the case of zinc) in so far as cost of production is concerned, and a price of 8c. for spelter now is no better than 5c. in 1913, and probably not quite so good. As compared with the first quarter of this year, the production of spelter has been reduced from a monthly average of about 65,000 tons to a rate of about 50,000 tons at present. Many smelteries are being operated at only partial capacity; many have been closed; some have been abandoned.

Now, it is useless for zinc smelters to delude themselves with any hopes of a return of the fat times of 1915-16. The competition among themselves and their great surplus of smelting capacity will prevent that; in short, natural conditions. About the only chance for a return of unnatural conditions that might favor the zinc smelters is that the War Industries Board may monkey with things that ought to be let alone. But assuming that Washington displays commonsense and keeps its hands off, there is no need to waste sympathy on the zinc smelters in their present plight. They made great profits in 1915-16, they knew (at any rate they were told) what was going to happen, and if some of them have had to throw away their plants the high prices represented precisely that contingency and the market offered the amortization in advance. However, this is cold comfort to many smelters who are permanently in business and are now disappointed and perplexed. Them we advise to forget the past and turn their eyes to the future. With the enormous smelting capacity that we now possess, with the competition of the electrolytic producers, and with so many of the galvanizers making their own spelter, the idea of other smelters ought to be to increase the consumption of spelter by developing new uses for it.

The one great field for increasing the use of spelter is in sheet zinc. It has been notorious during the last 20 years that while a very large part of the spelter of Europe has been rolled the United States has so treated only a small part of its product. Perhaps we cannot use so much sheet zinc for roofing in this country; perhaps our conditions may not be favorable to that; but certainly we can put zinc sheets and rods, light and heavy, to many more uses than at present and now is the time, preëminently the time, to do it. For, with a surplus of plant and of smeltermen, reflected in the relatively low price of spelter, we are in a position to substitute sheet zinc for other sheet metals, especially tin plate and copper, that are in deficient supply.

It is well known that the Germans, who are short of copper and tin, have done this. We ought to do likewise and even more extensively, for we shall continue to make and use many things that the Germans have been compelled to dispense with. Let anybody observe the articles in everyday use that are made of sheet metal for which zinc might be substituted—covers of containers, cans, buttons, gas and electric fixtures, hardware trimmings, buckles, to mention but a few of the hundreds of things that will be noted by one who opens his eyes. Consider also the multitude of things for which cast zinc might be used as well as cast brass.

This is the way that zinc smelters ought to be thinking. It is interesting that the New Jersey Zinc Co., which is now building a rolling mill, is probably thinking this way. There ought to be more rolling mills, more competition in the sheet-zinc business, and the rollers should unite in a propaganda to increase the use of their product. Now is the time of all times, when copper and tin are in such scant supply as to be unobtainable for many former uses.

Status of Flotation Litigation

THE illuminating article by R. C. Canby in this issue on the status of the flotation-patent litigation of Minerals Separation in America will interest every mining and metallurgical engineer who is anxious to know the essential points in the decisions thus far rendered. The article will interest especially those engineers who, through not being directly affected, have stood without the maze of patent phraseology involved in this litigation, hoping the way would be cleared before they had occasion to make use of the flotation process. Mr. Canby has performed a distinct service to the mining industry in pointing out the high spots in this well-nigh interminable litigation, and in so clarifying the main points at issue that the ordinary operator may grasp the real scope of the Minerals Separation patents. The industry has long needed such a clarifying presentation of this subject.

The article, while of considerable length, will well repay careful reading and will be readily understood by those who have not heretofore attempted to follow the intricate phases of this litigation. In his lucid presentation of the subject the author has eliminated patent verbiage so far as is possible in treating of the patent claims of Minerals Separation. Mr. Canby, who was the developer of the Miami Copper Co.'s practice in flotation, naturally speaks from his side of the case. Minerals Separation will not be expected to accept his views so far as they may represent the expression of personal opinion, but the especial value of the article is in the general review of the American litigation and the directing of attention to certain pertinent paragraphs of the courts' decisions indicating the limitations of the Minerals Separation patents. It is made clear that the flotation process is by no means a monopoly.

BY THE WAY

Throw a couple of rocks in that chute, "pard," I think the boss is down on the sill listenin'.—*The Anode.*

The first experience in price-fixing of which there is any record, says a contemporary, was in the year 301, when Emperor Diocletian fixed maximum prices on over one thousand articles. It was so arbitrary a measure that it finally ended in much bloodshed. Out of fear, nothing was offered for sale, and the scarcity grew much worse; until, after the death of many persons, the law was repealed.

An Associated Press correspondent who has just returned from Russia sketches the composition of the Bolsheviki party as first composed of innumerable German paid agitators and propagandists, whose sole purpose is to reduce the country to complete anarchy. The second class is composed of fanatics, escaped criminals, released political prisoners, and expatriated Russians whom political amnesty brought back to the country. These the sense of accumulated wrongs, real and imaginary, of half a century has driven into a frenzy of anarchistic revolt, and without sharing the motives of their German leaders, they find their doctrines quite congenial. The third and largest class is a tremendous body of ignorant workmen and soldiers with nebulous notions of democracy, who have been taught by their leaders that freedom is a debauch of idleness. This briefly is the Bolsheviki, maximalist or extreme socialist faction in Russia.

We have already told about how Gelasio Caetani, now Captain Caetani, used the Brunton transit in surveying the mine with which he blew up the Col di Lana. Mr. Brunton recently received a letter from Captain Caetani that he has sent to us with permission to publish it, as follows:

War Zone, Italy, Oct. 19, 1917.

My Dear Brunton:

From the Italian Front I am writing to tell you that your Brunton compass has followed me through 14 years of American mining life, and now for over two years from trench to trench; from the Alps to Macedonia, and from there to the arid Carso. The great mine I made at Col di Lana was all surveyed with your compass, and the work turned out so true that it made the first success of its kind at the Italian Front.

At last, after 16 years' service, mark No. 1999 got knocked out by a shell, and I have replaced it with No. 7871, which contains remarkable improvements for trench work. It requires less risk in using it.

All this is to tell you how grateful I am to you and your little instrument—my ever-faithful companion—and the great help America is giving to our cause, for a little part is also given by your compass.

My kindest regards to my many friends in America and to yourself.

Sincerely yours,
CAPT. G. CAETANI,
Royal Engineers.

David W. Brunton, Esq.,
Denver, Colo.

Mr. Brunton adds properly that Captain Caetani must have had a pretty narrow squeak when his instrument was smashed, but with characteristic modesty he says nothing about it.

November Mining Dividends

Dividends disbursed in November, 1917, by 27 United States mining and metallurgical companies making public reports amounted to $9,697,493, as compared with $12,245,275 paid by 29 companies in November, 1916. Canadian and Mexican companies paid $1,509,226, as compared with $1,941,798 in November, 1916.

The Coniagas Mines, Ltd., and Mass Consolidated Mining Co. passed their dividends and the Hecla Mining Co. reduced its rate from 15c. to 5c. per share. Miami, Shannon and United Verde omitted the "extras," which they have been recently adding to their regular payments.

United States Mining and Metallurgical Companies	Situation	Per Share	Total
Am. Zinc, Lead and Sm., pfd	U. S.	$1 50	$144,840
Anaconda, c	Mont.	2.00	4,662,500
Barnes King Dev., c	Mont.	.10	40,000
Big Creek Leasing	Ida.	.50	2,500
Caledonia, l. s	Ida.	.03	78,150
Chief Cons., s. l	Utah	.10	88,406
Cons. Arizona Smelting, c	Ariz.	.05	83,150
Creason, g. s.	Colo.	.10	122,000
Golden Cycle, g	Colo.	.03	45,000
Grand Central	Utah	.04	20,000
Granite, g	Colo.	.01	16,500
Hecla, l. s	Ida.	.05	50,000
Homestake, g	S. D.	65	163,254
Internatl. Nickel, pfd	U. S.-Can.	1 50	133,689
Iron Cap Copper, c	Ariz.	.50	72,055
Mammoth, g. s. l. c	Utah	10	40,000
Miami, c	Ariz.	1 50	1,120,671
Nevada Wonder, g s	Nev.	10	140,840
New Jersey Zinc	U. S.	4 00	1,400,000
Prince Cons., l. s	Nev.	.02½	25,000
Shannon, c	Ariz.	.25	75,000
Tamarack & Custer, l. s	Ida.	.03	53,288
United Eaatern, g	Ariz.	.05	68,150
United Verde, c	Ariz.	.75	225,000
United Verde Extension, c	Ariz.	75	787,500
Wilbert, l. s	Utah	01	10,000
Yellow Pine, z. l	Nev.	03	30,000

Canadian and Mexican Companies	Situation	Per Share	Total
Amparo, g. s	Mex.	$0 03	$60,000
Asbestos Corpn. of Can., pfd	Que.	1 00	40,000
El Oro Min. & Ry. g	Mex.	24	57,375
Granby Cons., c	B. C.	2 50	374,963
Greene-Cananea, c	Mex.	2 00	976,888

The dividend by El Oro Mining and Railway Co., which was the first since 1913, was announced as a payment from past profits.

The totals for the first eleven months of the year are as follows: Mining and metallurgical companies, $188,898,860; holding companies, $4,979,361; Canadian, Central American, South American and Mexican mines, $17,891,083.

Utah Copper on Fifth Avenue

It is doubtful if many mine operators, engineers, geologists or metallurgists regard their particular success or accomplishments from an artistic point of view, unless professional pride may be said to partake of the artistic. Appreciation, however, of the possibilities of a field not frequently explored by the artist is disclosed in the recent exhibition in a Fifth Avenue art gallery of mine paintings, by Jonas Lie, presenting examples of American mining and metallurgy as developed by the Utah Copper Co., and a canvas depicting the Garfield converters. Daniel C. Jackling, the developer and one of the principal owners of Utah Copper, commissioned Mr. Lie to paint the Utah Copper series which are on exhibition at the galleries of M. Knoedler & Co. at 556 Fifth Ave., New York.

Concerning this exhibition, the *New York Herald* of Nov. 18, says:

It is understood that the commissioner of Mr. Lie's pictures recommended the method of operation that has caused this mine to yield such wealth of ore. The method had been to tunnel in. He divined that the property was a mountain of copper and had it dug away in a series of benches or terraces, starting from the top. As a result there are 75 steam shovels working day and night, with an average daily yield of 30,000 to 40,000 tons. Persons who have viewed the mountain in proper perspective say that the benches look like great steps and that, as the mountain narrows into a peak, there is a strong resemblance to a pyramid with columns of steam and smoke rising from the shovels at work. The resemblance has been recognized by Mr. Lie, one of whose canvases is entitled "The Pyramid."

Largest among the paintings are the "General View" and "From the Upper Tramway Station." These are 50 x 74 in. Then comes "The Pyramid," at the foot of which is an excavation resembling an amphitheater. No. 4 is "The Approach." The others are "Bingham," one of the mining towns; "The Pit," "Sunrise," a view of the mine soon after daybreak; a view from above and a more sketchy version of the upper tramway station. Mr. Lie shows everything about the mine, which lies about 20 miles from Salt Lake City, except the dump, that is beginning to rise, like another mountain, out of the lake.

A tenth picture is the Garfield converters in operation. It is entitled "The Garfield Converters," and was painted for E. A. Cappelen Smith, one of the inventors of this converter.

The A. S. & R. Co. vs. B. H. & S. M. & C. Co.

F. W. Bradley, president of the Bunker Hill & Sullivan Mining and Concentrating Co., has written a letter under date of Nov. 14 to a stockholder, in which he summarizes the points at issue between his company and the American Smelting and Refining Co. as follows:

Dear Sir:

I have your letter of 9th inst. with clipping from *Wall Street Journal* of 8th inst. regarding above litigation, which I have read and herewith return.

The suit referred to in the clipping was started last August in the effort to prevent us from smelting our own ore in our own smelter, which started up operations July 5th last. A petition was made for a temporary injunction pending the outcome of the litigation, which resulted in a preliminary hearing before United States Judge Woolverton in Portland, Ore., on 7th, 8th and 9th inst. Judge Woolverton now has the matter under consideration, and will render an opinion at his convenience. In the meanwhile, our smelter is in continuous operation.

The plaintiff, in effect, charges that it was the real purchaser of our interest in the Tacoma Smelter; that the purchase was made with the idea of securing all our ore for a period of 25 years, so that we would not again go into the smelting business for that length of time; and that the only reason we have gone into it again is because our cupidity was aroused by the recent war prices for lead.

On the other hand, we contend that plaintiff was not the real purchaser; that all our product was not covered by the 25-year contract; that we incurred no obligation not to again go into the smelting business; that "cupidity" had nothing to do with the building of our smelter, as we began the work before lead had reached the recent war prices; and that one of the reasons for the building of our own smelter was because the American Smelting and Refining Co. had so suppressed competition that we could find no market whatever for such of our production as was not covered by the 25-year contract.

Our legal defenses have been very briefly summarized by Mr. M. A. Folsom, as follows:

"Our 25-year smelting contract was made in 1905 with the Tacoma Smelting Co. Until 1912 this company received part of our ore at its plant at Tacoma and diverted the balance to the smelters of the A. S. and R. Co. In 1912 the Tacoma Smelting Co. abandoned its lead plant and since that time all of our ores have been diverted to the A. S. and R. Co. We have not had a contract wtih the A. S. and R. Co.; but it seems that in June of this year, after we had completed our smelter, the A. S. and R. Co. procured an assignment of the Tacoma contract and is now seeking to enforce it in the name of the A. S. and R. Co. The Tacoma company, with whom the contract was made, has no plant now in which it could handle our ore, and of course will not be damaged if we smelt our own ores.

"We contend that the contract could not be assigned without our consent, because it imposed financial obligations upon the Tacoma company, and we had a right to say that we would not look to any other company for the performance of those obligations. The Supreme Court of the United States seems to have held that a smelting contract like ours cannot be transferred by one smelting company to another.

"But in any event, our contract was amended in 1907 so that the Tacoma company agreed to pay us during the life of the contract for lead in our ore the price for lead made by the A. S. and R. Co. in New York City on the date of any shipment. In other words, the Tacoma company and our company agreed to let a third party (the A. S. and R. Co.) fix the price for the lead each day and we would settle accordingly. Now the price fixer claims to have taken an assignment of the contract and seeks the aid of the court to compel us to deliver lead ore to him during the next 12 years at the price which he shall himself fix!"

As to the other matters mentioned in the clipping from the *Wall Street Journal* of 8th inst., our ores have never averaged as high as 8 oz. of silver and 14% of lead as stated; but they have averaged approximately 4½ oz. of silver and 11% lead. The same article states that our dividends have been but $15,500,000; whereas the total has been $20,370,000, and in addition we have $6,500,000 of actual operating profits tied up as invested capital in the shape of cash, securities, plant and property. Also in addition, we have eight years' ore developed and ready for mining, concentrating and smelting.

However, it is true, as stated in the clipping, that we would have been better off if we had some time ago installed a smelting plant at the mine to take the place of our water concentrating plants; but the statement is not correct in throwing out the inference that we could have had a smelting plant at the mine from the beginning, not only because of lack of railroad facilities, but also because the progress in the art of smelting has but recently enabled us to establish an up-to-date plant at the mine that can compete with other established lead-smelting plants in the United States.

I am taking the liberty of sending copies of this letter to some of our stockholders who may have also seen the article you have so kindly called my attention to.

Yours very truly,

F. W. Bradley.

San Francisco, Calif., Nov. 14, 1917.

Mexico To Adjust Damage Claims

According to dispatches from Mexico City a damage claim bureau to adjust claims arising during the revolution will be established, as provided in a decree issued by President Carranza on Nov. 25. The president will also designate the rules of procedure.

All claims must be presented in Spanish with as many affidavits of proof as possible. Each claim must outline the amount of damages and the name and nationality of the person making it. Foreigners must attach to their claims certificates of nationality, or otherwise it will be assumed that they are Mexicans. Companies incorporated under the Mexican law will be considered Mexican concerns. When a foreigner shall be dissatisfied with an award he may present a personal claim through his diplomatic representative, which will be arbitrated by three persons—one designated by the president, one by the foreign diplomat, and one by mutual appointment. In no case may an arbitrator belong to the diplomatic or consular service. The term for the filing of claims will expire three years from the date of the signing of today's decree.

The question of returning to private control the National Railways of Mexico, which for some time have been operated by the Constitutional government, was taken up at a meeting of the directors of the company, on Nov. 23 in Mexico City. Carlos Dasave y del Castillo Megrente, chairman of the board of directors, and Luis Cabrera, Minister of Finance and a member of the board, will go shortly to New York to discuss arrangements for resumption of control by the company.

Back Up the Twenty-Seventh Engineers

The movement that was started last week to organize a Comfort Club for the 27th Engineers, the mining industry's own regiment, with the purpose of raising a fund out of which to buy such comforts as cigarettes, pipes and tobacco, is now well under way, and the suggestion that those who must stay should help to make life pleasant for those who go has already met a generous response. The *Journal's* original subscription of $1000 has been more than doubled. Donations received to date are:

Engineering and Mining Journal	$1000.00
New York Engineering Co.	1000.00
A Friend, Nov. 23	5.00
H. H.	5.00

The generous subscription of the New York Engineering Co. was accompanied by a letter which we reproduce. Another donor suggests that the aid of the ladies' committee of the Institute and the Mining and Metallurgical Society be enlisted to help increase the fund, which is an excellent idea. The letters follow:

New York Engineering Company
U. S. Express Building
2 Rector Street
Office of the President

New York, U. S. A., Nov. 26, 1917.

Mr. W. R. Ingalls,
Engineering and Mining Journal,
New York, N. Y.

Dear Mr. Ingalls:

I am glad to note in your last issue that you have started the ball rolling for a subscription to the 27th Engineer Regiment, and I herewith enclose check for $1000.00 to help keep this ball in motion.

Mining work always has been hazardous, but with the additional casualties from shot and shell, certainly these men who volunteer deserve everything that we can give them.

Judging by the personnel of the officers of this regiment, we are sure that it will accomplish wonderful work, and we should all be proud of the opportunity to render any service to this splendid regiment.

If I can be of any further service, please command me, and wishing you all success, I beg to remain,

Yours very truly,

(Signed) A. C. Ludlum.

New York, Nov. 23, 1917.

Mr. W. R. Ingalls,
Engineering and Mining Journal,
New York, N. Y.

Dear Mr. Ingalls:

Notice of your recently organized Comfort Club for the 27th Engineer Regiment, appearing in your issue of November 24th, has been read by me and will be read by the mining profession throughout this country with much interest and sympathy. It will receive the support of the profession at large. I most heartily endorse this move on the part of the *Journal* and suggest that you invite the joint ladies' committee of the A.I.M.E. and the Mining and Metallurgical Society to use their organization to collect subscriptions for the Club. This ladies' committee, as you know, has organized subcommittees throughout the West for the purpose of collecting funds for relief and other purposes.

Very truly,

Mining Engineer.

Back up the men of this regiment who have enlisted for the most dangerous work at the front. Think of them whenever you settle down for a comfortable smoke and imagine how it would be if the rôles were reversed You can impress them in a most intimate way that mining men have their self-sacrifice in mind, simply by joining the Comfort Club. Remember the 27th Engineers and keep on remembering them until you have mailed us your check, drawn to the order of the *Engineering and Mining Journal.*

COMPANY A, 27TH U. S. ENGINEERS

THE FIRST MILITARY MINING UNIT TO BE ORGANIZED IN THE UNITED STATES ARMY

This is the nucleus of the thousands of men who probably will be incorporated in the special mining regiments which are to form a portion of the American Expeditionary Army. Company A is at Camp Meade, Md. The upper photograph is of the officers of Company A. In the front row, left to right: Lieut. Ellsworth H. Shriver, Capt. Norval J. E. Welsh (commanding), First Lieut. Ralph S. Edmondson. Middle row, left to right: Lieut. Vaughn H. Wilson, First Lieut. Buckingham Miller, First Lieut. John J. Croston. Back row, left to right: Medical Corps: Capt. Wilson G. Wood, Lieutenants Brady and Gillespie

Personals

The offices and equipment of both the constituent units in the consolidated McGraw-Hill Publishing Co are now under one roof. In the confusion incident to the removal of what was formerly the McGraw Publishing Co.'s plant from West 39th St. to the Hill Building, at 10th Ave. and 36th St., there may be some slight delay in receiving your copies of the "Engineering and Mining Journal." For this we ask your indulgence, with the assurance that after readjustments have been made the combined facilities of the two big plants will leave nothing to be desired in the way of prompt and efficient service.

Leighton Stewart, mining engineer, has established an office at 42 Broadway, New York.

R. S. Archibald has gone to South Dakota, to look over some prospects in the Black Hills.

Gordon R. Campbell, secretary of the Calumet & Arizona Mining Co., is visiting New York and other eastern points on business.

J. B. Moore has resigned as superintendent of mines for the Tigre Mining Co., at Esqueda, Sonora, Mexico, and will shortly return to San Antonio, Texas.

Benjamin B. Thayer has returned to New York from an inspection of the Anaconda properties in Montana, and of the International Smelting Co. at Tooele, Utah.

R. M. Edwards, president of the Franklin, South Lake, and other mining companies, who has been for several months at Houghton, Mich., has returned to Boston for the winter.

A. G. Mackenzie, secretary of the Utah chapter of the American Mining Congress, was in Washington recently investigating the possibility of Government action affecting lead and zinc.

Hon. Martin Burrell, Secretary of State and Minister of Mines, in the newly formed Unionist government of Canada, has been elected by acclamation for the constituency of Yale-Cariboo, B. C.

John B. Wise, superintendent of the electrolytic and acid plants of the Chile Exploration Co., Chuquicamata, Chile, returned to Chuquicamata on Oct. 18 and resumed his former duties.

Frank L. Estep, chief engineer of the Tennessee Coal, Iron and Railroad Co., has resigned to accept a similar position with the Nova Scotia Steel and Coal Co. at New Glasgow, Nova Scotia.

Dr. Allerton S. Cushman, president of the Institute of Industrial Research at Washington, is now a major in the Officers' Reserve Corps, and has been assigned special research work on the chemistry of high explosives, under the ordnance section.

E. A. Holbrook, formerly professor in the mining department of the University of Illinois, has been appointed supervising mining engineer and metallurgist with the U. S Bureau of Mines, and will act as superintendent of the station at Urbana, Illinois.

W. H. Plank, formerly assistant engineer of the Pittsburgh station of the U. S. Bureau of Mines, has been appointed mining engineer in the mine-safety section, and will have headquarters at the station. Rescue car No 3 at Evansville, Ind., will be under his charge.

J. Frater Taylor will retire from the presidency of the Algoma Steel Corporation at the end of the year, but will continue his connection with its affairs in an advisory capacity as chairman of the Lake Superior Corporation. **W. C. Franz** will succeed him as president.

George A. Millar, superintendent of the Bessemer Rolling Mills, at Bessemer, Ala., will leave to take charge of construction of the new steel mills at Fairfield, both properties belonging to the Tennessee Coal, Iron and Railroad Co. He will be succeeded by **W. J. Smith**, formerly assistant superintendent.

Obituary

James Hamilton Peabody, formerly Governor of Colorado, died in Denver, on Nov. 23, aged 65 years. He was elected Governor in 1902. Shortly after this, the strike of miners at Cripple Creek occurred. Early in November, 1903, he was required to call out the state militia to quiet disorders resulting from the Vindicator mine explosion in Cripple Creek, in which two men were killed. A few months later he caused the arrest of Charles H. Moyer, president of the Western Federation of Miners, who was later released by U. S. Judge Thayer at St. Louis. Peabody was defeated for reëlection but was declared the lawful governor of the state by the General Assembly in March, 1905. He surrendered the office to Lieut. Gov. Jesse F. McDonald by agreement, however, after serving only a few hours.

Grant B. Schley, controlling owner of the Britannia Mining and Smelting Co., of British Columbia, died at his home at Far Hills, N. J., on Nov. 22, aged 72 years, after a long period of ill health. He was born in Chapinsville, N. Y., in 1845, and came to New York in 1870. In 1885 he became a partner in the newly formed brokerage firm of Moore & Schley. He was prominent during the panic of 1907 through the purchase and subsequent absorption of the Tennessee Coal, Iron and Railroad Co. by the Steel Corporation. He was one of those summoned to Washington to appear before the Senate Committee on the Judiciary, which investigated the affairs of the Tennessee company. It was through the efforts of Mr. Schley that the Britannia Mining and Smelting Co. was made a profitable producer. This company, incorporated in British Columbia in 1908 to take over the Britannia mine and assets of the Britannia Copper Syndicate, as well as property of the Britannia Smelting Co. Ltd., was a failure at first. After most of his associates in the enterprise gave up hope, Mr. Schley advanced the money for the further development that turned the mine into a profitable producer. Mr. Schley was a director of the American Smelting and Refining Co., the Chihuahua Mining Co., the Coal Creek Mining and Manufacturing Co., the Pittsburgh Coal Co., the Republic Iron and Steel Co., and several others. He was a member of many clubs, including the Union League, Metropolitan and New York Yacht Clubs.

Sir Leander Starr Jameson, leader of the famous Jameson Raid in the Transvaal, South Africa, died on Nov. 26 in London, aged 65 years. He was born in Edinburgh, Scotland, in 1853 and received the degree of M.D. from London in 1877. He went to South Africa soon after the discovery of the Kimberley mines, where he became a friend of Cecil Rhodes. From 1891 to 1895, Jameson acted as administrator of Mashonaland and for services rendered was appointed to the same office in Rhodesia Dr. Jameson promised the Uitlanders to redress their grievances against the Boers. On Dec. 29, 1895, he invaded the Transvaal with 494 men, eight Maxims, and three light field pieces. He was surrounded at Doornkop, near Krugersdorp, and on Jan. 2, 1896, compelled to surrender. The Boers handed the raiders over to the British Government, and Jameson and the officers in command were tried in London. Jameson was found guilty of a felonious offence, and was sentenced to penal servitude, but the sentence was at once commuted to 10 months' ordinary imprisonment. He was released in December following, owing to ill-health. He later returned to South Africa and was elected Member for Kimberley in 1900. He was soon appointed a director of the De Beers company and of the British South Africa Co., of which latter company he was later president. When Rhodes' death occurred, Jameson was made Premier of Cape Colony, and Privy Councillor in 1907, resigning in 1908. From 1910 to 1912 he was Member of Parliament from the Harbor Division of Cape Town, and in 1911 was created baronet.

Societies

American Chemical Society, Philadelphia Section—Prof. Abraham Henwood, presiding officer of the section, has named the following committee to select candidates for the 1918 officers to be voted on at the December meeting of the section: Dr H. S Lukens, Clarence A. Hall and James K. Coyne.

Engineers' Society of Western Pennsylvania—A meeting of the Metallurgical and Mining Section was announced for Tuesday, Nov 27, in the auditorium of the Union Arcade Bldg., Pittsburgh, Penn. J. E. Johnson, Jr., was to make an address on "The Situation Regarding Manganese, Pyrite, Sulphur, Chromium and Potash."

Engineers' Club of Northern Minnesota held its regular monthly meeting at Hibbing, on Nov 17, at which the following officers were elected for the ensuing year: A E Anderson, Virginia, president; W R Van Slyke, Eveleth vice president; E E Anderson, Chisholm, secretary-treasurer. Directors elected were: A St Vincent, Hibbing; A Tancig, Chisholm, and Charles M Torway, Eveleth.

American Society of Mechanical Engineers will hold its thirty-eighth annual meeting in New York, on Dec 4 to 7, in the Engineering Societies Bldg. At the opening session, honorary membership will be conferred upon Maj.-Gen. George W. Goethals, followed by an address by Hon. William H. Taft. The program will include the presentation of many papers. The dominant theme of the meeting will be the "Engineer's Part in War."

Mining and Metallurgical Society of America, New York Section, held a meeting on Nov. 22, at the Columbia University Club. Addresses were delivered on the following subjects: "Mining and Trench Construction on the French Front, with a Brief Description of Methods and Tools Used," by Major Rousseau, of the French Army Engineers, who is stationed in Washington as one of the French advisors of the United States Government; "27th Engineers' Regiment (Mining) and the Work That It Is Expected to Perform Abroad," by Maj. O. B. Perry.

Trade Catalogs

Sullivan Angle-Compound Power-Driven Air Compressors. Sullivan Machinery Co., 122 South Michigan Ave., Chicago, Ill. Bulletin 75C. Pp. 32; 6 x 9 in.; illustrated

Sullivan Tandem Compound-Corliss Air Compressors, Class WC. Sullivan Machinery Co., 122 South Michigan Ave, Chicago, Ill Bulletin 75F. Pp. 32; 6 x 9 in., illustrated

"Better Ventilation—Lower Production Costs" is the title of a new pamphlet issued by Bemis Bros. Bag Co., St Louis, Mo., which treats of the ventilating problem in metal mines and the advantages of the Flexoid system.

New Patents

United States patent specifications listed below may be obtained from "The Engineering and Mining Journal" at 25c. each British patents are supplied at 40c. each.

Air Compressor. Henry Bolthoff, Denver, Colo. (U. S. No. 1,246,801; Nov. 13, 1917.)

Alloys—Process of Making Metallic Alloys. Hilliary Eldridge, New York, N. Y. (U. S. No. 1,246,571; Nov. 13, 1917.)

Briquettes—Process of Making Briquettes or Other Molded Articles. Carleton Ellis, Montclair, N. J., assignor to Ellis-Foster Co. (U. S. No. 1,246,805; Nov. 13, 1917.)

Cadmium in Zinc Ores—Apparatus for Removing Cadmium from Zinc Ores. Charles Pomeroy Fiske, Palmerton, Penn., assignor to the New Jersey Zinc Co., New York, N. Y. (U. S. No. 1,246,576; Nov 13, 1917.)

Caisson. James C. Meem, Brooklyn, N. Y., assignor of one-half to Frederick L. Cranford, Brooklyn, N Y. (U. S. No. 1,246,136; Nov 13, 1917.)

Carbide Lamp. George Bowie, Herrin, Ill. (U S. No. 1,246,534; Nov. 13, 1917.)

Centrifugal Pumping Apparatus. Gustav Pagel, Charlottenburg, Germany, assignor to General Electric Co. (U. S. No 1,246,149; Nov. 13, 1917.)

Dumping Cages, Shoe for. George Heeren, Gillespie, Ill. (U. S. No. 1,246,596; Nov. 13, 1917.)

Excavation—Apparatus for Sheathing the Walls of an Excavation. James C. Meem, Brooklyn, N. Y., assignor of one-half to Frederick L. Cranford, Brooklyn, N. Y. (U. S No. 1,246,133; Nov. 13, 1917.)

Ingot Mold. Emil Gathmann, Baltimore, Md. (U. S. No. 1,246,738; Nov. 13, 1917.)

Metal-Tempering Compound. Axel S Carlson, Denver, Colo. (U S No 1,246,802; Nov. 13, 1917.)

Ore-Concentration Process. Walter A. Scott, Chicago, Ill. (U S. No. 1,246,665; Nov 13, 1917.)

Ore-Treating Apparatus. Herbert B Walling, Salt Lake City, Utah, assignor to Western Mining and Exploration Co. (U. S. No. 1,246,195; Nov. 13, 1917.)

Trench Machine, Multiple Wheel. Frederic E. Bager, Kenosha Wis., assignor to Frederick C Austin, Chicago, Ill. (U. S. No. 1,246,524; Nov 13, 1917.)

Trenching Machine. Hans J Bentson, La Jolla Calif., assignor to Frederick C Austin, Chicago, Ill (U S No 1,246,527; Nov 13, 1917.)

Tube and Ball Mill—Combined Tube Mill and Ball Mill. Leo I. Mushett, Manhattan, Nev (U. S No. 1,246,775; Nov. 13, 1917.)

Tunnel Shield. James C Meem, Brooklyn, N. Y., assignor of one-half to Frederick L. Cranford, Brooklyn, N. Y. (U. S. No. 1,246,134; Nov. 13, 1917.)

Editorial Correspondence

SAN FRANCISCO—Nov. 24

California Oil Fields Statistics for month of October show a production of 8,417,597 bbl. and shipments of 9,455,295 bbl. This represents a reduction of 1,037,698 bbl. in the total of stocks during the month leaving the amount of stocks on hand at Nov. 1, 33,762,500 bbl. This represents also a decrease from Jan. 1, 1917, of 9,877,794 bbl. from the stocks on hand at that date. During October the daily average production was 271,535 bbl. and daily average shipments were 305,010 bbl. compared to 278,156 bbl. daily average production in September and 297,074 bbl. daily average shipments in September. These figures are from the report of the Independent Oil Producers' Agency and are practically comparable to the figures issued by the Standard Oil Company.

Miners' Frontier Carnival at Randsburg is suggested by the "Golden State Miner." That paper calls attention to the fact that Bakersfield has its County Fair, Pasadena, a Rose Festival, San Bernardino, an Annual Orange Day, and Los Angeles, its Rodeo. So Randsburg wants to make a showing of frontier mining life. It is well situated for such a carnival, as it combines the mountains and the desert within a radius of a few miles. It has also the attraction of being the center of a territory which produces gold, silver, lead, zinc, copper, tungsten, potash and salt. Randsburg, Johannesburg and Atolia are the three important towns of what is commonly termed the Randsburg district. Randsburg is noted as the home of the Yellow Aster mine. Johannesburg is the terminus of the Santa Fe branch railroad, which runs out from Kramer. Atolia is one of the oldest tungsten camps in this country and still is a large producer. The three camps could make a fine showing in the way of a carnival of frontier mining incidents. It is to be hoped that, if this carnival should be held, the morale of the carnival will be cleaner than has been exhibited in other places as representative of the days of '49. If Randsburg should follow the lead of Atolia and declare itself dry, the three camps, Randsburg, Johannesburg and Atolia, could make a fine showing. A few years ago a dry mining camp was thought to be an impossibility, but the sentiments of the people and the demand for sobriety, honesty and moral conduct has made wonderful changes in the mining camps of the West, and it is probable that within a few years the use of intoxicating liquors will be barred out of all mining camps.

Kern River Oil Fields have not been irreparably damaged by the infiltration of water. The petroleum department of the State Mining Bureau has demonstrated that repairs to wells when intelligently directed are both profitable to the owners and increase the amount of marketable oil. A rumor which has gained some headway is that oil wells in the Kern and other fields have been so badly damaged by water as to greatly shorten the life of the fields, and the State Mineralogist Hamilton and R. P. McLaughlin, oil and gas supervisor, have recently made examinations and kept a record which proves the beneficial results of proper repairs to infiltrated wells. A recent tabulated statement showing conditions before and after repairs of 11 wells in Kern County shows that two of these wells produced no oil and that one flowed 12,000 bbl. of water and the other 1440 bbl. Two wells showed only a trace of oil. One well produced 3 bbl. oil and 32 bbl. of water; two wells produced each 5 bbl. of oil and a total of 650 bbl. of water; one well produced 5 bbl. of oil and 5 bbl. of water, and one, 7 bbl. of oil and 1000 bbl. of water. This is a total of 25 bbl. of oil and 15,927 bbl. of water from 11 wells. After repairs it is shown that nine of these wells produced a total of 59 bbl. of oil and 240 bbl. of water; one well had a trace of oil and 100 bbl. of water. Another produced 10 bbl. of oil and only a trace of water. Mr. McLaughlin states that it would not have been necessary to install a single compressor plant in the entire Kern River field, had operators availed themselves of the services of competent geologists to direct early developments. He states also that compressors can now be dispensed with by the adoption of proper technical methods. The direction and inspection of new development work throughout the state as required by law, prevents the engineering staff of the bureau from solving all the old problems that may be presented; but geologists and engineers have a right and are welcome to the use of general plans developed by the bureau. It is shown by the record of the Alma, Jr., Oil Co., well No. 2, repaired under the immediate supervision of the mining bureau staff, that the repair work cost approximately $10,000, required about five months' time, resulted in the elimination of two compressor plants which were employed formerly in lifting 15,000 bbl. of water daily. This means a saving of nearly 100 bbl. of fuel oil daily and reducing operating expenses $500 per month. The saving amounts to about $115 a day, and the production of oil has been slightly increased, making a total daily saving of about $150 daily or a profit of 500% on the expenditure for repairs.

BUTTE—Nov. 23

Coal Situation in Montana is becoming more serious as the consumer faces either an actual shortage or prohibitive prices in spite of all the efforts of the Federal and state authorities to check the continuous rise in retail prices. On Nov. 16 the general public was startled by an alarm sent out by State Fuel Administrator Swindlehurst and published in the daily papers over his signature, that Montana is facing a coal shortage this winter, and that it therefore behooved every consumer to save coal. It was also explained that the threatened shortage was not due to operations at the mines but to the inability of the railroads to furnish sufficient cars to haul the coal, and that the administration was therefore more or less helpless to afford relief. Railroad officials explain the car shortage by the fact that all available cars are pressed into service for handling ammunitions and food for the Allies and that every 24 hours, some 500 cars are sent east by the Western railroads while only 300 are returned, meaning a loss of 200 cars a day to these roads. Under such conditions, if true, the supply of cars will ultimately cease altogether with results that may mean considerable suffering to the inhabitants of this part of the country. In the meantime the general public is being fed on promises of investigations and price regulations; meetings of local committees are being held all over the state; several Government agents have arrived to study the situation, but nothing tangible has as yet resulted from all these efforts in the way of relief to the general public which has practically given up hope that such relief will ever come. While the present abnormal conditions are taken into account by all intelligent citizens, yet the suspicion is growing in Montana as elsewhere that the control of production and sale of coal and other articles of daily use is either not in the hands of those most competent to handle such important business or that Government control is impossible of achievement on account of inherent difficulties and in spite of the best intentions of those entrusted with the task.

SALT LAKE CITY—Nov. 24

Clearing House for Coal Producers in this section is being established to work in harmony with the fuel administration to help in the solution of the problem of distribution. The Utah Producers' organization—embracing all the producing companies of the state—asked to appoint representatives in the clearing house, has named John S. Critchlow, of the United States Fuel Co., and William Gordon, of the Independent Coal and Coke Co. A third man will be chosen from outside the state. Reports of coal shipments made the week ended Nov. 17, show: For the Denver & Rio Grande, 1298 cars shipped, as compared to 1481 the week preceding; the Oregon Short Line shipped 719, as compared with 675 the week preceding, and the Union Pacific 545, as compared with 544. Beginning Dec. 1, the Utah Coal Route will relieve the congestion of the mines at Hiawatha, Black Hawk, Mohrland, Panther, etc., which at present have their only outlet over the Denver & Rio Grande; and this new factor in the transportation question will soon make itself felt. Up to the present, shipment has been made in carload lots by the various railroads, and it is now proposed to ship directly to the retailers. The coal mines of the state are in a position to meet the demand, but the danger of shortage still exists, owing to the difficulties confronting the railroads in regard to equipment, motive power, labor shortage, etc. However, the coming into operation at this time of a new coal-carrying line should do much to better the situation.

WALLACE, IDAHO—Nov. 24

Bunker Hill Affected by Suit of Star Mining Co. vs. Federal Mining and Smelting Co. was a fact frankly made known by the testimony of Stanly A. Easton, who appeared in the case on behalf of the Star company. Mr. Easton's testimony was in line with that of other experts engaged by the plaintiff company to the effect that the apex of the lode in controversy is within the boundaries of the Evening Star claim. In response to a question on cross examination as to whether or not the Bunker Hill & Sullivan company was interested in the outcome of the trial, Mr. Easton unhesitatingly stated that it was. In explanation he stated that the Federal Mining and Smelting Co., the defendant, was a subsidiary of the American Smelting and Refining Co., which was endeavoring to control the lead output of the Cœur d'Alene district; that if the Federal company gained possession of the ore in dispute, it would, of course, be diverted to the smelteries of the A. S. & R. Co., which would be a long step in furtherance of its designs; and in confirmation of this he referred to the case now pending in the Federal court in which the A. S. & R. Co. is endeavoring to enforce a construction of its contract with the Bunker Hill & Sullivan company through which the Bunker Hill would be barred from treating its ore in its own smeltery and be forced to ship it to the A. S. & R. The impression is that the interest of the Bunker Hill & Sullivan goes beyond the desire to have the ore in controversy open for competitive bidding, as indicated in Mr. Easton's statement. The Star company, while strong financially, has practically retired from mining operations. A few months ago the Federal company had an option on the property and did much work toward developing it through the Morning workings, but allowed the option to lapse. The contention of the Federal in the recent trial suggests that the company abandoned the Star option when it became convinced that the main ore shoot apexed on its own ground and not on the Star. It is now believed that in the event that the court decides the Star-Federal case in favor of the Star, the Bunker Hill & Sullivan company will take over the Star mine and place it on a productive basis, thus turning a large tonnage to its own smeltery which might otherwise go to competitors.

ELY, NEV.—Nov. 24

Production of Lead Ore in the eastern section of White Pine County will soon show a decrease. The first snow has appeared, which causes the outside mines to try to get their ore to the railroad, resulting in a general shortage of cars for transportation. Also considerable dissatisfaction has occurred on account of the present price of lead, producers claiming they cannot make operations pay, and a curtailment in production will result. The smelter embargoes have had a bad effect. The Ward mine, at the request of the smelters, has cut its shipments to not exceeding 50 tons daily. The Hunter mine, which a few months ago had half a dozen different leasers working producing silver-lead ore, is closed down, probably for the winter. The Muncy and Aurum Coper properties, which have been shipping considerable ore, will be obliged to close soon on account of transportation conditions, the snow preventing haulage over the range.

HOUGHTON, MICH.—Nov. 24

Copper Range Co.'s Suit against Adams township for $56,000 paid in taxes on the Baltic mine, under protest in 1915 was decided in favor of the defendant by Judge Patrick H. O'Brien, of the Houghton County Circuit Court. The decision sustains the method used by the county equalization committee and state tax commission in the use of stock quotations as a valuation basis. This is a method that has been in general use in Michigan for many years. A decision in favor of the company bringing the suit would have undoubtedly had a far-reaching effect as it would bear upon every copper-producing property and prospect in the state. The other question involved in the suit, regarding the undervaluation of properties in Calumet and Osceola townships, was answered in the decision by finding that the 1915 assessment cannot be attacked on ground of frauds. In connection with the stock quotation valuation method, Judge O'Brien said that the Baltic and other Copper Range mines are comparatively young properties and the stock-market investor, with an uncanny foresight of the market, places a higher market value in proportion to the earning power for that reason. He believes, therefore, and holds that this method of valuing a property for taxation is not fundamentally wrong. An interesting fact brought out in the suit was that the copper mines of Michigan pay a larger percentage of their net earnings for taxes than the mines of any other district in the world.

JOPLIN, MO.—Nov. 24

Extension of Field north and west of Picher to near Chetopa, Kan., is indicated by recent findings of the Hoover Mining and Royalty Co., of that place. Drilling has shown good ore formations and shaft sinking has been started and will be followed immediately by the construction of a concentrating plant.

Record Time in Development and mill building has just been made by the William Kenefick interests, of Kansas City, in starting their new mill west of Baxter, Kan., known as the Blue Diamond. Shaft sinking was started Sept. 9; two shafts have been put down to 220 ft. connected with a 240-ft. air drift, and there is room for eight machine drills. Mill building was started Sept. 14, and a 250-ton modern plant has been constructed. On Nov. 26 the property will start operations double shift.

Zinc Ore Market is Poorer than even the nominal market prices for ore indicate, is the conclusion of the officials of the Ore Producers' Association, who, during the last few days, have made an extended investigation. During the last three weeks, the condition of the market has been aggravated by a shortage of cars for shipments. At a number of the mines in the Oklahoma fields there have been no bids on ore for three weeks and they will have to shut down or enlarge their bins.

Revival at Spring City, Mo., of mining operations are expected to follow the ending of litigation between the St. Paul Mining Co. and the Delta Lead and Zinc Co. By the terms of the adjustment, the St. Paul Co., which owns the land in fee, takes over the lease and the 150-ton Aladdin mill, also equipment at shafts Nos. 5, 7 and 8, the pumping plant at the Alpha shaft, and also the Delta lease on the McGowan land. In preparation for the renewal of active operations, the St. Paul Co. has started a 2500-gal. Layne centrifugal pump to drain the land.

ST. LOUIS, MO.—Nov. 24

Wage Cut of 75c. per Day has been made by the lead mining companies throughout the Southeast Missouri lead district, this cut to take effect on Dec. 1. The Catherine mine, near Fredericktown, Mo., which is under lease by the Federal Lead Co., has been closed.

TORONTO—Nov. 24

Opening of Rice Lake gold mining district of Manitoba is to be aided by the Provincial government, which will construct a winter road from Fort Alexander at a cost of $10,000. This will enable the mine owners to bring in the machinery for several small mills and greatly hasten development work.

Flotation in Use in Gold Mill in Ontario for the first time when the Miller Independence mine, of Boston Creek, adopted the process for its 35-ton mill. The system of treatment is by Blake rock crusher delivering into 4 x 5-ft. ball mill, and a Groch flotation machine. The company is treating ore averaging $8 per ton, and the recovery has averaged close to 94% of the gold content. About 30% of the gold is recovered on the amalgamating plates, 30% in the mercury traps and the rest in the flotation concentrates, which assay $200 to the ton.

LITTLE BAY, N. F.—Nov. 20

Copper Mining in New Foundland has been generally dull during the last four decades, the only mining activity being shown in the iron industry of the Nova Scotia Steel and Dominion Steel companies, at Wabana. The population and wealth of the country are interested mostly in industries connected with the sea. There are many well-known commercial deposits of minerals favorably located on the seacoast, but until outside parties become interested they must remain dormant. The copper deposits of the island are mainly in the Bay of Notre Dame, where there are 5000 sq.mi. of serpentine formation and many outcrops of high-grade chalcopyrite. The only operations of any size now being worked are Tilt Cove and Little Bay, the former shipping from 15 to 20 thousand tons annually of hand-picked ore. These operations have been producing almost continually since 1864, about 250 persons being employed and all mining is done above tide, there being no boiler or pump in operation. Drilling is done with hand steel. Little Bay mine, 20 miles west of Tilt Cove, was discovered in 1878, when 10,000 tons of 8% copper were stoped from the outcrop and it continued working until 1894, when the price of metal dropped so low the operators quit. During the years of shipping, there were produced 215,000 tons of 10% copper ore, about 4000 tons of matte of 32% copper and 6000 tons of "best selected" metal smelted on the property. In all, about one million tons were mined, the existing dumps containing upward of 500,000 tons, not including slags. The drainage from these dumps runs into a pond 1200 x 800 ft., where there are ideal conditions for cementation. The mine is situated about 1500 ft. from tidewater, where a shipping pier is under construction and a tunnel from it is completed 600 ft. This tunnel will tap the old workings at the 250-ft. level. The mine is 1452 ft. deep and the total length of the workings is but 1000 ft. Pumping is underway with the object of working the tunnel from both ends and ascertaining the extent of the orebody exposed by crosscuts in the foot wall, many of which were driven in searching for a parallel rich occurrence, which was never found, although as far as prospecting went, low-grade ore (3-4%) was found. Thirty-two miles west of this property—14 miles from tidewater—there is a chalcopyrite outcrop, owned by local capital, which was recently incorporated as the Great Gull Lake Copper Co. Three shafts are being sunk to a depth of 60 ft., the outcrop being traced for several miles and shows pay ore with boulders on the surface from one to 150 tons, assaying 7% copper. All these ores carry small amounts of gold and silver One other enterprise is an attempt to open a deposit of molybdenum in White Bay. While almost every known ore occurs in the country, there is not a concentrator in operation on the island.

The Mining News

ALABAMA

Jefferson County

SUPERIOR IRON AND LAND CO. (Birmingham)—Incorporated with capital of $50,000. Officers are L. K. Steiner, president, R. F. Huffman, vice president, and Carl Steiner, secretary and treasurer.

NATIONAL STEEL PRODUCTS CO. (Bessemer)—Recently organized with capital of $50,000 to manufacture railroad appliances, patented and steel castings. Expect to be in operation in 90 days. R. S. Bohannan, president; Geo. A. Millar, vice president; J. V. Calvin, secretary.

Lauderdale County

FLORENCE ROLLING MILL (Florence)—Idle for several years, will be opened under management of John Armistead, of Birmingham, to manufacture iron and steel hoops and steel spikes. Gas from Sheffield furnace will be used for fuel. Martin J. Lide, of Birmingham, consulting engineer.

ARIZONA

Cochise County

GRAND CENTRAL (Fairbank) — Tailings dump of Grand Central mine east of here purchased by J. H. Hunt & Co., and machinery being erected to treat it.

COPPER QUEEN (Bisbee) — Water to operate new concentration plant to be obtained from Cochise shaft. New plant will handle large tonnage of low-grade ore developed in granite porphyry of Sacramento Hill.

Gila County

LOUIS D'OR (Globe)—Second drill hole to be started soon. Small leaching plant on Cedar Tree claim operating under lease.

OLD DOMINION (Globe)—Offers bonus of a $50 Liberty Bond to employees who remain with company continuously for one year. After paying for bond in installments, employee receives at end of year his bond and money paid and interest.

Mohave County

CUPEL (Kingman)—High-grade silver-lead ore opened in Springer shaft. Was formerly a large producer.

WHITE HILLS (Chloride)—Lessees taking out high-grade silver ores. Property situated 30 miles from here.

GOLD ORE (Goldroad)—Control secured by E. H. Teter & Co., owners of Big Jim. Shaft will be sunk additional 200 ft. with considerable drifting. Over 30,000 tons of ore already developed.

Pinal County

BROKEN HILL (Ray)—Wagon road to mine nearly completed.

SWASTIKA (Tucson)—Property in San Xavier district sold recently for $125,000.

YELLOW GROUP (Twin Buttes)—Ross and Tovote, of Tucson, operating under lease.

RIGGINS (Kelvin) — Molybdenum property sold to Robert Boykin, of Tucson, shipping to refinery at Tucson.

QUEEN CREEK (Superior) — Sinking continues below 450-ft. level. Messrs. Mackay and Stevens of Dundee, Scotland, accompanied by W. E. Defty, consulting engineer, recently visited property.

Santa Cruz County

DUQUESNE (Patagonia) — Shipping about 200 tons daily. Steam plant replaced by electricity.

Yavapai County

JEROME DISTRICT will continue operation of mines under labor agreement prepared by Judge E. W. Lewis, of the President's commission. The agreement embodies the same general points contained in the agreements effected in other Arizona mining districts.

DUNDEE ARIZONA (Jerome) — New electrical equipment received; sinking resumed.

CALUMET & JEROME (Jerome) — Air hoist installed at collar of winze on 600-ft. level about 100 ft. south of shaft. Crosscut No. 1 advanced 480 ft. from 600-ft. station. In two months work on 600-ft. level amounted to more than 1500 feet.

Yuma County

COBRITA VERDE (Salome)—Work to be resumed under direction of C. H. Reedall. Shaft will be sunk to 500 feet.

MOHICAN (Yuma)—Groundstone group of gold claims near Alamo have been taken over by controlling interests in the Mohican.

ARKANSAS

Baxter County

ANSEL-CRAWFORD (Mountain Home)—Installing new engine in small mill.

BIG JOHN (Mountain Home)—Leased to R. S. Ansel, who has started development. Will drive tunnel on zinc outcrop.

Marion County

ZINC BASIN (Rush)—Leased by Oklahoma-Arkansas Mining Co. Will start operations at once. Luther Evans, formerly with J. C. Shepherd, in charge.

TEMPLE MINING CO. (Buffalo)—Shipping first car hand-cobbed zinc carbonate ore this week. Last six months development opened up good working face. Will start erection of small concentrating plant at once.

PHILADELPHIA (Rush)—One of J. C. Shepherd group. Will install electric motor to handle cars. Main tunnel 1800 ft. in mountain with ore showing; recovery is

15%. Cross vein of blende cut at 1500 ft. still continues; three well defined leads of carbonate. Mill running steadily two shifts.

CALIFORNIA

Calaveras County

OLD CALAVERAS (Sheepranch)—Optioned by E. J. Bumsted and associates, of Los Angeles; installed 20-hp. electric hoist to develop property, if sampling results warrant. Opened in 1866 and produced $500,000 in 20-stamp mill.

FEDERAL GOLD MINING CO. (Carson Hill)—Permitted to issue 100,000 shares common stock and 5000 shares preferred stock to W. A. Copps, for Allison group of claims in Carson Hill district; also to sell 100,000 shares preferred stock at 25c., proceeds to be used for installation of 50-ton mill for development work.

Inyo County

CALIFORNIA ALKALI CO. (Olancha)—Production of chemicals for United States Government necessitates employment of armed guards. Situated at Cartago, at southern end of Owens Lake.

Kern County

BLACKHAWK (Randsburg)—High-grade ore disclosed in lower levels in 14-in vein. Operated by Yellow Aster Mining and Milling Co.

Mendocino County

NATURAL GAS flow reported in town of Willits. Geological conditions do not indicate existence of large field, but results stated to be encouraging.

Nevada County

ALLISON RANCH (Grass Valley)—Water lowered to 800-ft. level and will develop immediately.

GOLDEN CENTER (Grass Valley)—Mining resumed. Milling ore from 600- and 700-ft. levels. Pumps lifting about 400 gal. of water per minute.

OSTROM & CO. (Nevada City)—Tapped gravel below bedrock at Hunts Mill claim by 600-ft. tunnel. Good pay found; channel will be further developed; washing will be started when winter rains begin.

Placer County

POVERTY BAR DREDGE (Auburn)—This dredge, working in Poverty Bar district, on middle fork American River, northeast of Auburn, which was overturned last August, has been righted; pumping out and repairing damage. Owned and operated by El Dorado & Placer Gold Dredging Co. In operation about five years.

Sacramento County

NATOMAS CO. (Natoma)—W. H. Comstock sold to company, land at rear of his property adjoining town of Folsom and old Natomas ranch. No. 10 dredge, operating nearby, will continue on acquired land.

San Bernardino County

RAINSTORM (Randsburg)—This property, the Union and No. 1, are all working; new hoist installed on Ackley lease.

BLACKHAWK (Randsburg)—Work on this tungsten mine resumed; new machinery installed; drifting will begin on 300-ft. level; crosscut will be started on the 500-ft. level.

RED DOG MILL (Johannesburg)—Reported mill will be remodeled for treatment of tungsten ores, under lease to G. W. Dennis. Operated for years on custom gold ores in Randsburg district.

Shasta County

BITUMINOUS COAL reported disclosed in 8-ft. and 5-ft. veins on Beegum Creek, in Harrison Gulch district. Location notices posted and filed on 36 acres covering prospective coal beds. Situated about 54 miles southwest from Redding on Tehama County line.

Sierra County

TABLE ROCK MINING CO. (Howland Flat)—Permitted to issue additional 100,000 shares capital stock.

Siskiyou County

CARTER (Sawyers Bar)—Waike & Mathis purchased interest of G. D. Carter. Situated five miles below the bar. Mine equipped for greater capacity.

TAYLOR LAKE (Etna Mills)—Being prospected and sampled by A. McCartney and associates prior to developing. Property owned by Harris Bros.

GRAY EAGLE COPPER (Happy Camp)—William Korner, manager, reported to have said company will continue development for next six months to determine construction of railroad westward to coast or eastward to Southern Pacific. Underground mining done under contract; employing 50 men.

Storey County

UNION (Virginia City)—Milled 380 tons on Mexican mill, averaging $23.50. On 2400-ft. level extracted ore sampling $29 and $32 per ton.

MEXICAN (Virginia City)—Repairs made; west crosscut started north of winze from 2500-ft. depth on 2900-ft. level and extended seven feet to total of 103 ft.; face in porphyry and stringers of quartz. Mill treated 341 tons Ophir ore, sampling $10.12, and 380 tons Union ore, sampling $23.50.

Tuolumne County

STAR KING MINES (Tuolumne)—Permitted to issue 90,000 shares to Ronald C. Kennedy in exchange for Star King and Sherman patented claims and the American claim, together with equipment and water rights on north fork of Tuolumne River, two miles southeast of Tuolumne. Is also permitted to sell 40,000 shares at $1, proceeds to be used for further development.

Ventura County

STATE CONSOLIDATED OIL CO. (Ventura)—Ordered by state supervisor to complete repairs to save this well and others from infiltration by water. Flowed initially 100 bbl. per day, but lack of casing allowed water to wash out derrick foundation and caused collapse of rig.

Yuba County

GOLDEN ARROW (Rackerby)—Known as Old Spanish, credited with poduction of $300,000, being reopened by W. T. Baldwin and associates. In early days ore worked in arrastra. Present operators moving 5-stamp mill from Butterfly mine.

COLORADO

Clear Creek County

OCTOBER SHIPMENTS to Idaho Springs sampling plant were 1220 tons, averaging $25 per ton.

TERRIBLE - DUNDERBERG (Georgetown)—Unwatering; Terrible shaft unwatered to point between 1300- and 1400-ft. levels. Will resume operations when workings unwatered on 1400-ft. level.

MOUNTAIN MINING AND MILLING CO. (Idaho Springs)—This Seaton Mt. property leased by Denver men; workings being retimbered and repaired. Electrically driven air compressor installed. Main adit is Idaho tunnel, cutting Bride vein at 1200 ft. from portal.

Gilpin County

GOLD LODE (Central City)—Shaft and levels retimbered. Good-grade gold-copper-lead ore being stoped on 200-ft. level.

HAMPTON (Central City)—Work resumed; shaft will be sunk 100 ft. deeper. Ore carrying enargite opened on 300-ft. level.

CASHIER MINING CO. (Central City)—New mill building now enclosed and foundations for machinery being laid. Meeker shaft being retimbered; developing.

Lake County

OHIO TUNNEL (Leadville)—Contracted for driving tunnel 1000 ft. at Birdseye property.

WOLFTONE (Leadville)—Shipping about 200 tons of zinc carbonate ore daily. Property operated by Western Mining Co.

MAY QUEEN (Leadville)—Large body of zinc carbonate ore opened by this leasing company, operating through Hayden shaft on Yankee Hill.

P. O. S. (Leadville)—Lessees repairing surface plant and installing machinery. Shaft will be retimbered before mining manganese ore left when mine was worked years ago.

Ouray County

REVENUE (Ouray)—Lessees operating. Shipping good-grade lead-silver ore.

ATLAS (Ouray)—Mine and milling plant operating steadily. Good recovery made by flotation.

BARSTOW (Ouray)—Lessees shipping fluorspar from cross vein, requiring hand-sorting to bring it up to grade.

San Juan County

EMPIRE STATE (Silverton)—Incorporated recently with capitalization of $300,000; will operate property in Eureka section.

SUNNYSIDE (Eureka)—Construction of new milling plant, and tramway from lower adit level, being pushed. Mill expected to have capacity of 500 tons daily at start, and may be increased to 750 tons later. Old mill, with capacity of 500 tons daily, will be supplied by old tramway from upper workings for the present; eventually a central crushing plant will be built at portal of lower adit, just above upper new tram terminal.

San Miguel County

FAVORITE (Ophir)—Lessees mining shipping-grade ore.

LEWIS MINING AND LEASING CO. (Telluride)—Installing flotation machines to secure better recovery.

NEW DOMINION (Ophir)—Shipping smelting ore; milling-grade ore developed; may build mill if unable to make other arrangements.

ELECTRIC OVENS for baking being installed by some of large mines of Telluride district. Considered more economical than coal at high altitudes.

Summit County

UNION (Breckenridge)—Shaft house and machinery overhauled. Work will begin soon; 100-ton mill at portal of main tunnel.

FARNCOMBE HILL DREDGING CO. (Breckenridge)—Weather conditions favorable for late work by dredges this autumn.

BAKER (Breckenridge)—Milling-grade lead ore opened by lessees. Will probably arrange for treatment at old Union mill.

OURAY-PUZZLE (Breckenridge)—Lessees working through both Ouray and Puzzle adits. Ouray shaft will be repaired, and development work on deeper levels done.

Teller County

EL PASO EXTENSION (Cripple Creek)—Drifting on phonolite dike from Campbell tunnel.

ORPHA MAY (Cripple Creek)—Lessees shipping ore from this property of Stratton's Mining and Development Co.

KOMAT LEASING CO. (Cripple Creek)—Shipping milling-grade ore. Developing on 800-ft. level in ore-shoot.

IDAHO

Shoshone County

RAY-JEFFERSON (Wallace)—Long crosscut being run to open vein 1000 ft. below lowest workings and 1800 ft. from surface; 1000 ft. remains to be run, which means probably four months before mill will have Ray-Jefferson ore.

MIDNIGHT (Mullan)—Bonded to New York syndicate. Vein cut by No. 5 tunnel of the Morning. Drifts east and west opened 300 ft. of good ore. Raise being made to tunnel, 360 ft. above; now up 150 ft. in ore. Compressor driven by electric power installed at portal of upper tunnel; boarding and bunk houses built. Extending tunnel to point over raise, which will be carried to surface.

AMAZON-MANHATTAN (Wallace)—Recently in litigation between Interstate-Callahan and Patrick Burke and property awarded to latter. Burke was backed by Day interests, and now preparing for operation. Aërial tramway nearly completed to convey ore to Ray-Jefferson mill, about half mile away; necessary buildings erected at mine. While in possession of Interstate-Callahan, considerable ore developed and connection made with lower workings of Interstate-Callahan. The Days control the Ray-Jefferson, which explains treatment of Amazon-Manhattan ore at that mill.

MICHIGAN

Copper

AHMEEK (Ahmeek)—Shipping 4400 tons daily; yield above 22 lb. a ton.

OSCEOLA (Osceola)—Has sunk shaft further after cutting plat at 38th level of No. 1 North Kearsarge.

LA SALLE (Calumet)—During last five weeks advanced 110 ft. in good ground on 45th level from Old Osceola.

ISLE ROYALE (Houghton)—Will ship this month 70,000 tons. Opening 1700 ft. of new ground monthly.

QUINCY (Hancock)—Shipping 4000 tons daily; sinking at No 2 shaft just reached 78th level and the 67th at No. 8.

NEW BALTIC (Houghton)—Has so far 325 ft. of proved rich ground, counting the unopened stretch lying in center, on 2nd level.

COPPER RANGE (Painesdale)—Has just sold old Atlantic mill at Redridge to Lake Superior Iron and Metal Co. as "old iron."

HOUGHTON (Houghton)—Began Nov. 21 in west vein to drift on 350-ft. unopened stretch, and soon after it arrives at own ground will crosscut to examine West vein as well as Superior lode.

VICTORIA (Victoria)—Just about equalling expenses on 23½c. copper. Held back greatly by shortage of labor. Enlarged boarding house to accommodate 100. Mill improvements can be completed at any time.

BEAR LAKE "POOL" (Calumet)—Found in third hole another length of copper ground from 138 ft to 166 ft., the last 20 ft. of which is good; stopped 315 ft down and started fourth hole, 500 ft west of third.

FRANKLIN (Demmon)—Pumped out bottom of No. 2 shaft, and begun to sink from 17th level to 18th. Waiting for electric motor for experimental plant, consisting of Hardinge mill and Wilfley tables for obtaining better recovery.

MINNESOTA

Mesabi Range

NEW PORT MINING CO. (Grand Rapids)—Two properties being developed south of Pokegama Lake near here. Two shafts being sunk, five drills working and boiler house and camps under construction.

CHIPPEWA IRON CO. (Ely)—Situated on McDonald property adjoining Section "30" mine. Boarding house, blacksmith shop, dry and engine house completed. Shaft now 30 ft. deep. H. D. Mullen, superintendent.

OLIVER (Coleraine) — Large washing plant on Trout Lake closed down for season. Shipped about 2,500,000 tons of concentrates which means plant received and washed over 5,000,000 tons of ore. Mines still shipping merchantable ore to docks.

M. A. HANNA CO. (Chisholm)—Two drills of Carlson Exploration Co. check drilling on S½, NW¼, Sec. 27-58-20, just southeast of this village. Also sinking on southeast corner, 5 x 7-ft. test shaft. If results are satisfactory, large openpit will be stripped with outlet through the Dunwoody mine; owned in fee by Pine Land Co. and leased by M. A. Hanna Co.

MISSOURI

Joplin District

MINE OPERATORS' CLUB has completed construction of temporary quarters at Picher, Okla. First meeting will be held on Dec. 3.

OLD RELIABLE (Quapaw, Okla.)—Purchased Algonquin mill, situated at Stotts City, Mo., and will move to site just east of Quapaw, where shaft is down to ore at 70 feet.

HIGH FIVE (Waco)—Putting down 19-in. drill hole to 230 ft. for installation of 1000-gal. Pomona pump, in order that shafts may be put down dry. Two shafts already down to water.

PLAYTER BROS. (Joplin)—Have sunk two shafts to 190 ft. on lease west of Blue Mound, Kan., and drifting at this level. Ore run goes to 250 ft. but heavy water caused owners to stop at 190-ft. level for present, awaiting pumping by other companies to help drain the water later.

DESSIE LEE (Wentworth)—Has new 250-ton mill almost ready for operation, adjoining Georgette. Drilling indicates same formation on Dessie Lee tract as on Georgette, and both companies owned by same men. O. B. Henry, of Wentworth, principal owner and manager.

MONTANA

Lewis and Clark County

SCRATCH GRAVEL GOLD (Helena)—Drifting and stoping on 500-ft. level.

COFFEE-BYRNES (Helena)—Shipping 100 tons to smeltery.

ALLARD-REED (Helena)—Shipping two carloads silver-manganese iron ore.

HELENA (Helena)—Shipped 22 carloads to smeltery. Three carloads in bins.

ECONOMY (Helena)—Drifting on strong vein at 200-ft. level.

STEMWINDER (Helena)—Stoping ore for shipment to smeltery.

ROCK ROSE (Helena)—Two carloads weekly to smeltery.

PEERLESS JENNIE (Rimini) — Mine, four miles south, after being closed for 29 years, is being reopened by Chicago men. Consists of 10 claims, belonging to Beattie estate, on which new operators have secured long-time lease and bond.

Madison County

BIRDIE MINES at Red Bluff reported under lease and bond. New operators expected to install flotation process at once to treat ore from mine and old dumps on adjoining properties. Boaz mine in same district being reopened by syndicate of Butte men who have lease and bond.

Silver Bow County

ANACONDA (Butte)—Tramway mine resumed operations on morning of Nov. 19 after shutdown of nearly two months, during which time shaft has been fireproofed by half-inch coating of cement, using cement gun. Shaft and station timbers also coated. Cost is reported as $21.50 per [illegible] ft. of shaft. On Nov. 16 company hoisted a total of 13,772 tons of ore and employed [illegible] men at its Butte mines, being about 88% of normal force.

NEVADA

Nye County

TONOPAH ORE PRODUCTION for week ended Nov. 17, amounted to 10,093 tons, valued at $176,6[illegible]8, comparing with 9901 tons the previous week. Producers were Tonopah Belmont, 2110 tons; Tonopah Mining, 2600 tons; Tonopah Extension, [illegible] tons; Jim Butler, 850 tons; West End, 1083 tons; MacNamara, 500 tons; Halifax, [illegible] tons; Montana, 111 tons; Cash Boy, 100 tons.

White Pine County

NEVADA CONSOLIDATED (McGill)—Mining about 14,000 tons daily; coal supply constantly short, using own cars and employees to bring supply from Utah and Wyoming mines. Installation of new coal-crushing and storage plant, costing $100,000, will be completed this year; will likely continue using fuel oil at cost of $1 more per barrel upon expiration of contract, Jan. 1, 1918, because coal cannot be obtained.

CONSOLIDATED COPPERMINES CO. (Kimberly)—Running one section of mill constantly, one section being shut down for repairs most of time. Owing to insufficient development of Morris workings, obtaining some ore from Ora claim, being mined by Nevada Consolidated under contract. It is stated that recovery is 80% in milling. Have laid off 25% of labor engaged in construction and outside work, owing to cold weather; churn drilling stopped; development in Alpha workings promising. Cutting wood from outlying claims for fuel. Recently let several leases on 15% net royalty; former 25% gross royalty basis proved unsuccessful.

OREGON

Jackson County

MANGANESE METAL CO., of Tacoma, Wash., purchased manganese properties in Lake Creek district, north of Medford. Has been prospecting for several months, securing options and preparing for development.

Josephine County

OSGOOD (Waldo)—I. L. Thompson, of Seattle, made second payment on this placer mine, one mile south of here. Preparing for development work. Bedrock shows some platinum.

DEL NORTE CLAIMHOLDERS ASSOCIATION (Waldo)—Commenced construction of eight-mile road from Waldo to copper claims in Preston Peak district. Supplies received. J. T. Gilmore and A. C. Hoffman, in charge.

UTAH

Salt Lake County

ALTA CONSOLIDATED (Alta)—Shipping grade ore opened at 600 ft. Winze being sunk in ore.

CARDIFF (Salt Lake)—Shipping average of 75 tons of ore daily to bins at South Fork, awaiting better ore market.

UTAH COPPER (Bingham)—Expected alterations to plants will permit handling up to 50,000 tons a day during the coming year, as compared to the high record of 38,000 tons daily at present.

COLUMBUS-REXALL (Alta) — New tram line working; from Nov. 1 to Nov. 7 good tonnage carried, consisting of shipping ore, mill ore and waste. Sent to smelteries about 200 tons of ore the week ended Nov. 7, and more in transit. Character of ore assures market.

OHIO COPPER (Bingham)—Expected to have first 600-ton unit of 2000-ton flotation plant in operation shortly after Jan. 1 and mill completed by March if no delay in receipt of electrical equipment. Cost stated from $400,000 to $500,000; company free from debt. Albert Frank, general manager, resigned to act in advisory capacity.

MICHIGAN-UTAH (Alta)—Tram line to Tanner's Flat being repaired. Shipped 350 tons, week ended Nov. 10, ore coming from several parts of property; three cars from strike in Lavinia fissure, Copper Prince tunnel, shipped on company account; four cars from Solitude or Big Cottonwood side. Pioneer Leasing shipping and six cars from old City Rocks section, Triangle Leasing Co. shipping.

Summit County

PARK CITY SHIPMENTS, week ended Nov. 10, were 2574 tons, as compared with 2500 tons week preceding.

WASHINGTON

Pend Oreille County

STERLING SILVER (Metaline Falls)—Increasing capacity of mill to 50 tons per day.

BELLA MAY AND DIAMOND R (Metaline Falls)—Being worked under lease and bond by Campbell & De Camp. Expect to employ 15 men through winter.

METALINE ORIOLE MINING CO. (Metaline Falls)—Will erect 50-ton mill if funds are available. Shipped carload lead ore last week in October. F. N. Davis, president.

CANADA

Ontario

ORE SHIPMENTS from Cobalt for October over Temiskaming & Northern Ontario Ry., as reported by Arthur A. Cole, mining engineer, were: Alladin-Cobalt, 71 tons; Beaver, 43; Buffalo, 208; Coniagas, 83; Dominion Reduction, 255; Hudson Bay, 33; Kerr Lake, 60; La Rose, 149; Mining Corporation of Canada, 1137; McKinley-Darragh, 268; National, 59; Nippissing, 371; O'Brien, 65; Penn Canadian, 31; Temiskaming, 32; Trethewey, 27; total, 3191 tons from Cobalt proper; Miller Lake-O'Brien (Elk Lake), 38 tons; Alexo mine (Porquis Junction), 611 tons.

PATRICIA (Boston Creek)—Shaft down 50 ft. on good ore.

JANSEN CLAIM (Bourkes Station)—Being opened up.

UNITED KIRKLAND (Kirkland Lake)—Shaft down 65 ft. with encouraging results.

PROVINCIAL (Cobalt)—Report on this property shows ore reserves containing 110,500 ounces.

LAKE SHORE (Kirkland Lake)—New mill expected to be completed early next year, with capacity of about 100 tons a day.

NIPISSING (Cobalt) — In October produced silver to value of $306,107 from Nipissing and customs ore, a decrease of $43,000 from the preceding month.

MINING CORPORATION (Cobalt) — Producing 4,500,000 oz. silver a year. Has recently taken option on new gold discovery in Rickard township, and on old Waldman mine in Cobalt.

NEWRAY (Porcupine) — Shareholders ratified increase of capital to $3,000,000 and optioning of stock to Crown Reserve and Dominion Reduction Co., which are now operating property.

HOLLINGER (Porcupine)—Now ready to try out new milling equipment. Plant has capacity of 2800 tons a day, but probable that mine not ready to produce this amount continuously. About a mile of development work a month being done.

M. J. O'BRIEN, LIMITED, is name of new $20,000,000 company formed to take over all holdings of M. J. O'Brien. Included in these are the O'Brien mine in Cobalt and Miller Lake-O'Brien property in Gowganda.

TEMISKAMING (Cobalt) — New report for stockholders by D. A. Mutch is not encouraging and shows a little less than previous reports. With exception of small tonnage of broken ore, there are no reserves and possibilities for further development not encouraging.

TECK HUGHES (Kirkland Lake) — At meeting to be held in Toronto a new plan of financing will be submitted to enable company to carry on development. Fiscal statement for the year ended Aug. 31, showed receipts of $31,896 and expenditures of $137,352. Mill idle for one year.

PHILIPPINE ISLANDS

NATIONAL COAL CO. (Manila)—This company, which was organized six months ago, and is exploring some coal deposits on the Island of Mindanao, has been granted a special charter by the Philippine Legislature. The capital stock is to be 3,000,000 pesos and the government is authorized to subscribe and pay for 51% of the shares, and is to be represented in the board. The first directors are Vincente Madrigal, C. H. French, Dalmacia Costas, Milton E. Springer and Rafael Corpus.

COSTA RICA

COSTA RICA MANGANESE AND MINING CO. (Playareal)—Shipped week ended Oct. 27, large steamer loaded with 51% manganese and immediately started loading another. A. M. Venge, manager.

COLOMBIA

PARIS TRANSVAAL GOLD MINES, LTD. (Eastcheap, London, Eng.)—Acquired from Consolidated Colombia Platinum and Gold Mines, Limited: 50% interest in alluvial platinum and gold dredging and hydraulicking property of 10 square miles, known as Opogodó; four square miles known as Bolivar & Colonia, on River Guapi; option on mining rights of 12 additional properties, aggregating 36 square miles. The Opogodó property, according to report, has 1364 acres proved ground. The report also recommends the Bolivar & Colonia property be further prospected and also all other properties under option. A dredge of 60,000 cu.yd. monthly capacity is recommended to be installed on the Opogodó property. The cubic yardage and contents of tested areas on this property are reported as: Soledad, 3,781,000 cu.yd., averaging 23.2d. (46.4c.); Opogodó dredging area, 100,000 cu.yd., averaging 16.3d. (32.6c.); hydraulicking area, 60,000,000 cu.yd. averaging 6d. (12c.)

NEW ZEALAND

QUICKSILVER DEPOSITS believed to exist, especially in the Waihi district, have been so far undeveloped. To encourage their opening and exploitation the New Zealand government has offered a bonus of 8c. per lb. for the first 100,000 lb. of retorted quicksilver produced; the conditions being that 50,000 lb. must be produced before Mar. 31, 1920, and 50,000 lb. more before Mar. 31, 1921.

The Market Report

SILVER AND STERLING EXCHANGE

Nov.	Sterling Exchange	Silver New York, Cents	Silver London, Pence	Nov.	Sterling Exchange	Silver New York, Cents	Silver London, Pence
22	4 7515	84⅝	42 15/16	26	4 7515	84¼	42¾
23	4 7515	84⅝	42 15/16	27	4 7515	84¼	42¾
24	4.7515	84⅝	42 15/16	28	4 7515	84¼	42¼

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

DAILY PRICES OF METALS IN NEW YORK

	Copper	Tin	Lead		Zinc
Nov.	Electrolytic	Spot.	N. Y.	St L.	St. L.
22	*23½	†80	6¼ @6½	6.25 @6 35	7 70 @7.80
23	*23½	†80	6¼ @6½	6.25 @6.35	7 70 @7 80
24	*23½	†80	6¼ @6½	6 25 @6.35	7 70 @7 80
26	*23½	†80	6¼ @6½	6.25 @6 35	7.65 @7 75
27	*23½	†80	6¼ @6½	6.25 @6.35	7 65 @7 75
28	*23½	†80	6¼ @6½	6.25 @6 35	7.55 @7.65

† Nominal.

* Price fixed by agreement between American copper producers and the U. S. Government, according to official statement for publication on Friday, September 21, 1917.

The above quotations (except as to copper, the price for which has been fixed by agreement between American copper producers and the U. S. Government, wherein there is no free market) are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

The quotations for electrolytic copper are for cakes, ingots and wirebars.

We quote electrolytic cathodes at 0.05 to 0.10c. below the price of wirebars, cakes and ingots.

Quotations for spelter are for ordinary Prime Western brands. We quote New York price at 17c. per 100 lb. above St. Louis.

Some current freight rates on metals per 100 lb. are: St. Louis-New York 17c.; St. Louis-Chicago, 6.3c.· St. Louis-Pittsburgh, 13.1 cents.

LONDON

	Copper			Tin		Lead	Zinc
	Standard		Electrolytic				
Nov.	Spot	3 Mos.		Spot	3 Mos.	Spot	Spot
22	110	110	125	282½	281½	30½	54
23	110	110	125	282¾	281¾	30½	54
24							
26	110	110	125	283	281¾	30½	54
27	110	110	125	284	282¼	30½	54
28	110	110	125	286	284¾	30½	54

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2,240 lb. For convenience in comparison of London prices, in pounds sterling per 2,240 lb., with American prices in cents per pound the following approximate ratios are given, reckoning exchange at $4 7515. £30½ = 6 4696c.; £54 = 11.4545c.; £120 = 25.4544c.; £137 = 29.0605c.; £240 = 50 9089c. Variations, £1 = 0.2121205c.

Metal Markets

NEW YORK—Nov. 28

All of the markets were dull this week, and but few features of interest are to be reported.

Copper—November is closing with an increased refinery production as compared with October, but a figure that is far short of the maximum in 1916. The Allies have been calling for a good deal of copper, and after the American Government takes what it needs, the supply for domestic consumption is still short, and there is prospect that it will so continue for months to come

Arrangements were made this week by the Copper Producers Committee, with the sanction of the War Industries Board, for the supply of copper to jobbers for distribution to consumers who buy small quantities. Jobbers have been licensed at the several important centers of consumption, care being taken to select reliable concerns that are to be counted upon to conform to the stipulated conditions. They must buy in not less than carload lots, paying the standard price of 23½c., cash New York, subject to the usual freight allowances. In distributing to the retail trade in less than carload lots they are permitted to charge an advance of 5% on the price of 23½c. On that margin they have to carry the copper that they buy and meet the expenses of distribution.

Copper wire drawers are not giving out any quotations. This reflects the different positions in which they find themselves. Some of them inform us that they are not getting any copper at 23½c., but are taking in copper at higher figures under old contracts and naturally are unable to offer wire at 23½c. plus 4c., say. When the old contracts have run out the wire business will naturally steady itself.

Copper Sheets are quoted at 33c. per lb., f.o.b. mill, for hot rolled, and 1c. higher for cold rolled.

Tin—This market is quoted nominally at 80c. There were no sales, but anybody who had any tin to offer could get 80c. On Monday morning everybody received notices that the Government had attached all supplies of tin in warehouses. It is making analyses of the several parcels and the understanding is that everything assaying over 99.75% tin will be commandeered, while tin below that grade will be released

Lead—This market was dull, transactions being smaller than in the previous week. However, there was a firm tone throughout and there were two noteworthy features; one being sales of a considerable tonnage for export to Europe, and the other being some buying by domestic consumers for delivery rather far ahead. January-February and January-March Today there were inquiries in the market by domestic consumers for some round lots In our reference to the size of the market this week we do not include some fairly large governmental transactions.

Zinc—This market was dull and weaker. The only interesting feature was some export business At the close spelter was offered at 7.55c., St Louis.

Sales of zinc dust were reported at 13½c. f.o.b. smelteries in the Middle West.

Zinc Sheets—Price of zinc sheets has not been changed. Market is still at $19 per 100 lb. f.o.b. Peru, less 8% discount.

Other Metals

Aluminum—This market continues dull with small transactions taking place at 37@38c. per lb. for No. 1 ingots at New York.

Antimony—The market continues small, but is a little firmer We quote spot at 14@14¼c., and futures at 13½c. c.i.f. in bond.

Bismuth—Unchanged at $3.50 per pound

Cadmium—This metal is quoted at $1 40 @1.60 per pound.

Nickel—Steady at 50c. per lb., premium of 5c. per lb. for electrolytic.

Quicksilver—This market advanced to $105 late on Wednesday last. On Monday it advanced to $110. This probably reflects reduction of stock in this market for San Francisco has not advanced in the same proportion. Our telegraphic report from there is $103, firm.

Gold, Silver and Platinum

Silver—This market has been dull and steady in London during the last week, opening at 42 15/16d. and closing at 42¾d. The New York market has been quiet with small offerings. Producers are awaiting news as to the proposed plan of the British and United States governments to buy one hundred million ounces at a fixed price around 85c. Conferences are now being held in Washington to try and arrive at some basis satisfactory to all interests.

Mexican dollars at New York: Nov. 22, 64¾c.; 23, 64¾c.; 24, 64¾c.; 26, 64½c.; 27, 64½c.; 28, 64½c.

Coined silver in the United States Nov. 1 was: Standard dollars, $568,269,513; subsidiary coins, $209,864,845; total, $678,134,358. Of the standard dollars, $476,449,771 are held in the Treasury against silver certificates outstanding. The continuous fall in silver price, which is now about 25c. below the September maximum, is attributed to smaller coinage purchases, the break in speculation, larger supplies called out by the high prices, and sales from China.

Platinum—Active at $103@105.

Palladium—We quote $125, demand continuing active.

Zinc and Lead Ore Markets

Joplin, Mo., Nov. 24—Blende, per ton, high $72.95; basis 60% Zn, premium $73.50; medium to low, $65@55; calamine, per ton 40% Zn, $35@38; average selling price, all grades of zinc, $58.26 per ton.

Lead, high $75.80; basis 80% Pb, $75; average selling price, all grades of lead, $74.86 per ton.

Shipments the week: Blende, 6827, calamine, 372, lead, 1159 tons. Value, all ores the week, $506,230.

Producers returned from a consultation in New York bring no hopes of a betterment of the zinc situation, but are buoyed with hopes for lead, and are declining to accept the current offering of $75 base price.

Report reached here today that the Bartlesville Zinc Co. had withdrawn from use 65% of their retorts at Collinsville, Okla.

Platteville, Wis., Nov. 24—Blende, basis 60% Zn, $62 base for premium grade down to $57 base for second grade. Lead ore, basis 80% Pb, $65 per ton. Shipments reported for the week are 3703 tons of zinc ore, 190 tons of lead ore, and 591 tons of sulphur ore. For the year to date the figures are: 131,729 tons of zinc ore, 6587 tons of lead ore, and 25,740 tons of sulphur ore. Shipped during the week to separating plants, 4551 tons of zinc ore.

Other Ores

Manganese Ore—Metallurgical ore is unchanged at $1.20 per unit.

Molybdenum Ore—Unchanged at $2 20 per lb. of molybdenum sulphide, basis 90%

Pyrites—Spanish lump quoted at 15c per unit, on basis of 10s ocean freight, buyer to pay excess freight and war risk, except that concession of 2% of war risk is allowed. Ocean rates remain at 35s for Northern, 40s. for Southern and 42s. 6d. for Gulf ports.

It is understood that shipment and allotments of pyrites will now be handled exclusively through the War Trade Board and that various committees which have had these matters in hand, will cease their activities in this direction.

Tungsten Ore—Considerable transactions are reported at no change in price, which ranges from $26 per unit for wolframite of the very highest grade down to $20 or less for lower grades of ore

Iron Trade Review

NEW YORK—Nov. 28

The week has seen an increasing demand for steel products both from the Government and from manufacturing consumers, says "Iron Age." Many of the latter are buying for requirements not directly growing out of the war. Steel absorbed by the Government and by war contracts is a growing factor and is made to seem still larger as output is cut down by coal and coke shortage.

While priority decisions are limiting the amount of steel going to some consumers, there is as yet no shutting down of plants, even in non-essential lines though such steps may not be far off

That the Russian debacle will release locomotive capacity for domestic orders is of no little significance to railroads and shippers. Domestic car orders also may be more of a factor. The Union Pacific has just placed 3500 all-steel cars with four builders.

Lake Superior iron ore prices for 1918 are being discussed. In the first Government price fixing in September, ore was not changed, being really low if $33 was fair for pig iron. Indications now are that the 1917 ore basis will carry over into 1918, unless there should be a slight advance to cover possible increases in labor and transportation. Some reservations of special grades of ore have been made already for the coming season. In the effort to insure full supply, water shipments will be kept up into December, until the freeze-up comes.

PITTSBURGH—Nov. 27

There has been a slight improvement in shipping orders received by the mills against regular commercial contracts, the totals for November promising to make a very favorable comparison with those for October. There is also an increase in Government orders. Allotments of shell-steel tonnage are heavy and within a short time the mills will be producing much more shell steel than in 1916, when they were working on such large orders for the Entente. Prospects are for a rapid increase in the amount of ship plates to be called for, as the shipbuilding program is being speeded up by the adoption of still more fully standardized methods of construction. Predictions are more common that steel will be scarcer during the next few months than it is now, although these predictions are based partly upon fears that production will be curtailed throughout the winter. For two or three weeks production of pig iron has been at a smaller rate than the average of the last few months, on account of greater shortage of coke, and steel production has been correspondingly affected. There is also curtailment on account of shortage of coal. The Youngstown district has averaged a curtailment of about 25% in the production and finishing of steel in the last fortnight, while in the immediate Pittsburgh district the curtailment is in the neighborhood of 10%. Nearly all the large steel companies, normally self contained as to pig iron, would buy if they could, but there is practically no pig iron offered, the merchant furnaces having their output curtailed correspondingly. The Carnegie Steel Co. is now operating only 48 of its 59 blast furnaces.

In bars, shapes and plates mills are endeavoring to meet requirements of regular customers and are succeeding fairly well, although with difficulty. There is scarcely a mill that is not absolutely opposed to offering any steel, irrespective of circumstances, at above the prices set by agreement. There are one or two slackers whose attitude is thus made very conspicuous. In sheets and wire products the offerings are fairly free, at the set prices, as the mills in these lines had been running out of orders. In tubular goods the scarcity is still pronounced.

Pig Iron—There have been no transactions of any moment in bessemer or basic iron in the last week. It is estimated that 200,000 tons of these grades could be sold in a few hours, for delivery over the next four months, as nearly all the large steel interests are short of iron. In foundry iron the scarcity is not so pronounced, not because of heavy production but because a number of foundries are consuming less iron. Occasional small lot sales are being made for early delivery. The majority of foundry-iron furnaces will sell for all or any part of next year, not merely at the Government price, but with a stipulation that upon change in the Government price the contract would automatically be revised as to any unshipped iron, and this despite the fact that a Government change, if made, now seems likely to be downward rather than upward. We quote the market at the set prices: Bessemer, $36.30; basic and No. 2 foundry, $33; malleable, $33.50; forge, $32, f.o.b. valley furnaces, or 95c. higher delivered Pittsburgh.

Steel—Transactions in billets and sheet bars in the open market are infrequent and involve only small tonnages. Consumers with no regular source of supply, are inquiring for large tonnages, with little result. Consumers with regular mill connections are being well taken care of at the set prices. Billets, $47.50; small billets, $51; sheet bars, $51; slabs, $50, f.o.b. mill, Pittsburgh or Youngstown.

Ferroalloys

Ferromanganese—The market continues quiet with $[illegible] the common quotation for prompt or forward, but with frequent shading $1 to $[illegible] in the price

STOCK QUOTATIONS

N. Y. EXCH.†	Nov. 27
Alaska Gold M	2
Alaska Juneau	2
Am.Sm.& Ref.,com	78
Am. Sm. & Ref., pf	102
Am. Sm. Sec., pf, A	93
Am. Sm. Sec., pf. B	‡96
Am. Zinc	14
Am. Zinc, pf	42
Anaconda	58
Batopilas Min	1
Bethlehem Steel	81
Bethlehem Steel, pf	87
Butte & Superior	17
Cerro de Pasco	30
Chile Cop	15
Chino	42
Colo Fuel & Iron	36
Crucible Steel	55
Dome Mines	6
Federal M. & S.	12
Federal M. & S., pf	33
Great Nor., ore ctf.	27
Greene Cananea	38
Gulf States Steel	88
Homestake	95
Inspiration Con	44
International Nickel	27
Kennecott	33
Lackawanna Steel	81
Miami Copper	28
Nat'l Lead, com.	44
National Lead, pf	99
Nev. Consol	17
Ontario Min	4
Quicksilver	50
Quicksilver, pf	50
Ray Con	22
Republic I & S., com.	78
Republic I & S., pf	95
Sloss-Sheffield	38
Tennessee C. & C.	12
U. S. Steel, com.	97
U. S. Steel, pf	109
Utah Copper	78
Va. Iron C. & C.	50

N. Y., CURB†	Nov. 27
Big Ledge	1
Butte & N. Y.	1
Butte C. & Z.	7
Butte Detroit	25
Caledonia	46
Calumet & Jerome	1
Can Cop Corpn	2
Carlisle	‡3
Cashboy	04
Con. Ariz. Sm	1
Con Coppermines	8
Con. Nev.-Utah	‡
Emma Con	.50
First Nat. Cop	2
Goldfield Con.	43
Goldfield Merger	‡04
Greenmonster	[illegible]
Hecla Min	4
Howe Sound	‡3
Jerome Verde	[illegible]
Kerr Lake	5.12
Louisiana	.50
Magma	45
Majestic	34
McKinley-Dar-Sa	58
Milford	‡1
Mohican	‡
Mother Lode	30
N. Y. & Hond	‡12
Nipissing Mines	8
Nixon Nevada	1
Ohio Cop	‡1
Ray Hercules	‡3
Richmond	‡56
Rochester Mines	.39
St. Joseph Lead	16
Standard S. L.	[illegible]
Stewart	[illegible]
Success	13
Tonopah	‡3
Tonopah Ex	1
Tribullion	[illegible]
Troy Arizona	17
United Cop	‡50
United Verde Ext	32
United Zinc	1
Utica Mines	12
Yukon Gold	1

SAN FRAN.*	Nov. 27
Alta	03
Andes	10
Best & Belcher	03
Bullion	01
Caledonia	10
Challenge Con	05
Confidence	01
Con. Virginia	01
Gould & Curry	01
Hale & Norcross	02
Jacket-Cr. Pt	08
Mexican	13
Occidental	60
Ophir	10
Overman	04
Savage	03
Sierra Nevada	04
Union Con	1 20
Utah Con	01
Belmont	3 50
Jim Butler	77
MacNamara	18
Midway	07
Mont.-Tonopah	08
North Star	05
Rescue Eula	09
West End Con.	63
Atlanta	00
Booth	04
Comb. Frac.	‡03
D'field Daisy	‡02
Florence	12
Jumbo Extension	16
Kewanas	06
Nevada Hills	05
Nevada Packard	20
Round Mountain	20
Silver Pick	08
White Caps	80
Big Jim	‡75
United Eastern	3 60

BOSTON EXCH.*	Nov. 27
Adventure	1
Ahmeek	82
Algomah	25
Allouez	51
Ariz. Com., ctfs	11
Arnold	‡25
Bonanza	21
Butte-Balaklava	52
Calumet & Ariz	66
Calumet & Hecla	430
Centennial	14
Copper Range	45
Daly West	2
Davis-Daly	4
East Butte	10
Franklin	4
Granby	67
Hancock	9
Hedley	15
Helvetia	25
Indiana	1
Isle Royale	23
Keweenaw	1
Lake	6
La Salle	2
Mason Valley	5
Mass	6
Mayflower	1
Michigan	1
Mohawk	61
New Arcadian	11
New Idria	12
North Butte	13
North Lake	50
Ojibway	1
Old Dominion	39
Osceola	60
Quincy	66
St. Mary's M. L.	55
Santa Fe	78
Seneca	‡6
Shannon	5
Shattuck-Ariz.	19
So. Lake	1
So. Utah	15
Superior	5
Superior & Bost.	3
Trinity	4
Tuolumne	1
U. S. Smelting	45
U. S. Smelt'g, pf	45
Utah Apex	2
Utah Con	12
Utah Metal	3
Victoria	2
Winona	1
Wolverine	33
Wyandot	50

BOSTON CURB*	Nov. 27
Alaska Mines Corp	12
Bingham Mines	9
Boston Ely	50
Boston & Mont	.50
Butte & Lon'n Dev	.15
Calaveras	1
Calumet-Corbin	‡01
Chief Con.	1
Cortez	10
Crown Reserve	20
Crystal Cop	.58
Eagle & Blue Bell	2
Gila Copper	17
Houghton Copper	75
Intermountain	85
Iron Cap, Com.	14
Iron Cap Cop., pf.	‡14
Mexican Metals	.26
Mines of America	1
Mojave Tungsten	29
Nat. Zinc & Lead	28
Nevada-Douglas	1
New Baltic	75
New Cornelia	14
Oneco	25
Pacific Mines	‡35
Rex Cons	13

SALT LAKE*	Nov. 26
Bannack	26
Big Four	‡01
Cardiff	2 00
Colorado Mining	10
Daly	1 40
Daly-Judge	7 00
Empire Copper	1 17
Gold Chain	11
Grand Central	50
Iron Blossom	55
Lower Mammoth	03
May Day	03
Moscow	11
Prince Con	78
Rico Wellington	18
Silver-King Coal'n	2 60
Silver King Con.	3 37
Sioux Con	03
So. Hecla	1 00
Tintic Standard	1 45
Uncle Sam	02
Wilbert	11
Yankee	02

TORONTO*	Nov. 26
Adanac	14
Bailey	05
Beaver Con	27
Chambers Ferland	10
Coniagas	2 95
Hargraves	08
La Rose	5
Peterson Lake	08
Temiskaming	26
Wettlaufer-Lor	05
Davidson	32
Dome Exten	09
Dome Lake	14
Hollinger	4 95
McIntyre	1 31
Newray	41
Porcu. Crown	20
Teck Hughes	1
Vipond	18
West Dome	13

STOCK QUOTATIONS—Continued

COLO. SPRINGS	Nov. 27
Cresson Con.	5.00
Doctor Jack Pot.	03
Elkton Con.	03
El Paso	15
Gold Sovereign	02
Golden Cycle	1.69
Granite	39
Isabella	.08
Mary McKinney	.06
Portland	1 10
United Gold M.	15
Vindicator	32

LONDON	Nov. 8
Alaska Tre'dwell	‡£1 0s 0d
Burma Corp.	4 1 3
Cam & Motor	0 11 0
Camp Bird	0 8 0
El Oro	0 10 0
Esperanza	0 8 3
Mexican Mines	5 17 6
Min. Corp. Can	0 16 6
Nechi, pfd.	0 10 0
Oroville	0 18 9
Santa Gert'dis	0 14 6
Tomboy	1 1 0

* Bid prices. † Closing prices. ‡ Last Quotations

MONTHLY AVERAGE PRICES OF METALS

Silver	New York			London		
	1915	1916	1917	1915	1916	1917
Jan.	48 855	56 775	75 630	22 731	26 960	36 682
Feb	48 477	56 755	77 585	22 753	26 975	37 742
Mar	50 241	57 935	73 861	23 708	27 597	36 410
April	50 250	64 415	73 875	23 709	30 662	36 963
May	49 915	74 269	74 745	23 570	35 477	37 940
June	49 034	65 024	76 971	23 267	31 060	39 065
July	47 519	62 940	79 010	22 597	30 000	40 110
Aug	47 163	66 083	85 407	22 780	31 498	43 418
Sept.	48 680	68 515	100 740	23 591	32 584	50 920
Oct	49 385	67 855	87 332	23 925	32 361	44 324
Nov	51 714	71 604		25 094	34 192	
Dec	54 971	75 765		26 373	36 410	
Year	49 684	65 661		23 675	31 315	

New York quotations cents per ounce troy, fine silver London, pence per ounce, sterling silver, 0.925 fine

Copper	New York		London			
	Electrolytic		Standard		Electrolytic	
	1916	1917	1916	1917	1916	1917
Jan.	24 008	28 673	88 083	131 921	116 167	142 895
Feb	26 440	31 750	102 667	137 895	133 167	148 100
Mar	26 310	31 481	107 714	136 750	136 000	151 000
April	27 895	27 935	124 319	133 842	137 389	147 158
May	28 625	28 788	135 457	130 000	152 522	142 000
June	26 601	29 962	112 432	130 000	137 455	142 000
July	23 865	26 620	95 119	128 409	125 500	140 409
Aug	26 120	25 380	110 283	122 391	126 304	137 000
Sept.	26 855	25 073	113 905	117 500	134 071	135 250
Oct.	27 193	23 500	122 750	110.000	142 523	125.000
Nov	30 625	..	134 659		155 432	.
Dec	31 890		145 316		162 842	
Year	27 202		116 059		138 281	

Tin	New York		London	
	1916	1917	1916	1917
January	41 825	44 175	175.548	185 813
February	42 717	51 420	181 107	198 974
March	50 741	54 388	193 609	207 443
April	51 230	55 910	199 736	220 171
May	49 125	63 173	196 511	245 114
June	42 231	62 053	179.466	242 083
July	38 510	62 570	168 357	242 181
August	38 565	62 681	169 870	243 978
September	38 830	61 542	171 345	244 038
October	41 241	61.851	179 307	247 467
November	44 109		186 932	
December	42 635		183 368	
Av. year	43 480		182 096	

Lead	New York		St. Louis		London	
	1916	1917	1916	1917	1916	1917
January	5 921	7 626	5 826	7 530	31 167	30 500
February	6 246	8 636	6 164	8 595	31 988	30 500
March	7 136	9 199	7 375	9 120	34 440	30 500
April	7 630	9 288	7 655	9 158	34 368	30 500
May	7 463	10 207	7 332	10 202	32 967	30 500
June	6 936	11 171	6 740	11 123	31.011	30 500
July	6 352	10 710	6 185	10 644	28 137	30 500
August	6 244	10 594	6 088	10 518	29 734	30 500
September	6 810	8 680	6 699	8 611	30 786	30 500
October	7 000	6 710	6 898	6 650	30 716	30 500
November	7 042		6 945		30 500	.
December	7 513		7 405		30 500	
Year	6 853		6 777		31 359	

Spelter	New York		St. Louis		London	
	1916	1917	1916	1917	1916	1917
Jan	16 915	9 619	16 745	9 449	89 810	48 329
Feb	18 420	10 045	18 260	9 875	97 762	47 000
Mar	16 846	10 300	16 676	10 130	95 048	47 000
April	16 695	9 459	16 525	9 289	99 036	54 632
May	14 276	9 362	14 106	9 192	94 217	54 000
June	11 752	9 371	11 582	9 201	68 591	54 000
July	8 925	8 643	8 755	8 473	50 750	54 000
Aug	8 730	8 360	8 560	8 190	51 587	54 000
Sept	8 990	8 136	8 820	7 966	52 095	54 100
Oct	9 829	7 983	9 659	7 813	54 159	54 000
Nov	11 792		11 422		56 023	
Dec	10 665		10 495		55 842	
Year	12 804		12 634		72 071	

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton.

Pig Iron, Pgh.	Bessemer†		Basic†		No. 2 Foundry	
	1916	1917	1916	1917	1916	1917
January	$21 60	$35 05	$18 78	$30 95	$19 70	$30 95
February	21 16	36 37	18 93	30 95	19 51	30 95
March	21 81	37 37	19 20	33 49	19 45	35 91
April	21 65	42 23	18 95	38 90	19 45	40 06
May	21 78	46 94	19 11	42 84	19 58	43 60
June	21 95	54 22	18 95	50 05	19 34	50 11
July	21 95	57 45	18 95	53 90	19 20	53 95
August	21 95	54 17	18 95	50 37	19 22	53 95
September	22 98	46 40	19 68	42 24	19 53	48 58
October	24 61	37 25	21 20	33 95	21 51	33 95
November	30 07		28 18		26 55	
December	35 10		30 95		30 79	
Year	$23 88		$20 98		$21 15	

† As reported by W. P. Snyder & Co.

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8316—GEOLOGY—Physiographic Conditions and Copper Enrichment; Discussion. (Econ. Geol., Sept., 1917; 7 pp., illus.)

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8324—SMELTERY SMOKE—The Wet Thiogen Process for Recovering Sulphur from Sulphur Dioxide in Smelter Gases. A. E. Wells. (Bull. 133, U. S. Bureau of Mines, 1917; 66 pp., illus.)

GOLD DREDGING AND PLACER MINING

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8326—HYDRAULIC SLUICING for Gold and Tin—I-II. Arthur H. P. Moline. (Chem. Eng. and Min. Rev., Sept. 5, Oct. 5, 1917; 16 pp., illus.)

GOLD AND SILVER—CYANIDING

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8336—ACID OPEN-HEARTH PROCESS. F. Rogers. (Advance copy, Iron and Steel Inst., Sept., 1917; 12 pp., illus.)

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Economic Importance of Wood Preservation

By KURT C. BARTH*

Experimentation and practice have proved that proper seasoning and preservative treatment of timber increase its life and usefulness. The author discusses the various steps leading to the successful application of wood preservation.

THE practice of wood preservation in the mining industry is not only desirable economy, but a requisite to the proper utilization of structural wood, which for many years has been the most popular material used in mine structures, due to its availability, lower cost, and ease of employment. These factors are now important, since the demand for finished-steel products has increased inordinately, and skilled labor is not always available. The average increase in prices of 22 metals since 1914 is said to be 124%, as compared with an increase during the same period of 20 to 30% in the prices of lumber products.[1] Furthermore the national need for steel products for war purposes compels the use of wood and the conservation of steel, wherever possible, as a patriotic duty. These circumstances combine to create conditions under which the practice of wood preservation is not only of greater material advantage than heretofore, but an actual necessity in many cases. Structural steel latterly has been widely used in mine structures because of its permanent character, while the decay of mine timbers, both above and below the ground, makes necessary continual replacements and repairs, although this can be obviated to a marked degree by the proper preservative treatment. It is obvious that in order to protect wood from decay and insects it must be neutralized, or chemically treated, so that the development of destructive agencies is arrested and made impossible. Therefore, paint, although it naturally gives a certain amount of protection to wood, not being a toxic agent, is not a preservative for the purposes under discussion.

A WOOD-PRESERVATION TREATMENT PLANT AT A MINE. SHAFT LAGGING BEING TREATED BY THE OPEN-TANK PROCESS

The average life of untreated surface timber structures must be placed at from 10 to 15 years to provide a conservative basis for figuring depreciation. Wood used underground is destroyed by decay in a much shorter period, the average natural life being from four to six years. This period does not take into consideration timber the usefulness of which is, previous to the expiration of its natural life, destroyed by mechanical abrasion. Wooden surface structures, shaft timber and "lath," sawed timbers used underground in permanent sets and for other purposes, are frequently destroyed by decay rather than by wear, so that preservative treatment of the timber is not only advisable but necessary. In mine shafts that have been lined with concrete and steel and in which timber has been used for cross-ties, longitudinal ties, or cushions, etc., the replacement of the timber involves considerable expense and interruption of traffic and preservative treatment is an important factor in prolonging the life of this material.

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*The Barrett Co., Chicago, Ill.

[1] L. C. Boyle in the "Lumber World Review," Sept. 25, 1917.

In general, underground timber and structural wood used in surface structures are classified alike, and the question as to whether creosoting is advisable may be decided by the following rule: Timber that is permanent in character; that is, which is not exposed to destruction by mechanical wear before the expiration of its natural life, or the usefulness of which does not cease before the advantages of preservative treatment can be realized should be creosoted.

Among surface structures may be classed tipples, elevators, trestles, shafthouses, headframes, tramways, ore bins, coal docks, coal bunkers, chutes, etc. Where wood or semi-wood mine cars and skips are used the parts not likely to be destroyed by wear may also be treated to advantage. Another field in which the opportunities for the use of creosoted wood are numerous is that of miscellaneous equipment used in concentrating mills, stamp mills, smelteries, etc., which are usually included in the plants of zinc and copper mines. Continuous replacements and repairs are necessary, and probably 90% of the wood requiring replacement has been destroyed by decay. The period of service of concentrating tables, launders, jigs, flotation machines, sand boxes, wooden screens, tanks, foundation timbers, floor planking, etc., could be doubled by the use of creosote.

METHODS OF WOOD TREATMENT

The method of preservation most available to mines at considerable distances from commercial creosoting plants is the nonpressure process, known as the open-tank system, which consists of hot and cold treatment of wood in refined coal-tar creosote oil, or the brush method of applying two or three coats of refined coal-tar creosote oil to points of contact and exposed surfaces. Creosoting is advisable under conditions where the mechanical abrasion is slight or entirely absent and a heavy impregnation of the wood, is, therefore, not required. The open-tank system is sufficient to preserve structural timbers and lumber used for miscellaneous purposes.

The brush method should be used when a temporary increase in life is sought; that is, when an average increase in durability of five years is sufficient, and when the open-tank system of treatment is not practicable. To obtain the best results the oil should be heated to a temperature of 150° F. However, a properly refined coal-tar creosote oil is liquid at what would be considered normally a low working temperature, which permits its use without heating during seasons of the year when climatic conditions are favorable to outside construction work. The open-tank process consists of alternate hot and cold applications of refined coal-tar creosote oil by immersion and continuous soaking in open tanks without artificial pressure. This requires no mechanical apparatus other than tanks, hoists (in some cases) and means of heating the oil.

The procedure in the open-tank process is as follows: After the lumber to be creosoted has been framed, bored and cut to size it is given the hot treatment, which consists of immersion in a bath of oil having a temperature of between 150° and 200° F., and this is continued for varying periods, depending upon the species of wood and the size of the timber. Immediately afterward the timber is immersed in a cold bath of refined coal-tar creosote oil, which is kept at a temperature not in excess of 100° F. for periods equal in duration to the hot bath. The theory of the open-tank process is that in the hot treatment the heat of the preservative expands and expels a portion of the air and water contained in the wood cells. Upon immersion in the cold bath, or when subjected to a change in temperature caused by the cooling of the creosote, there is a partial contraction and condensation of the air and water that remains, which results in a slight vacuum within the wood. This vacuum is aided by atmospheric pressure, combined with capillary attraction between the wood cells and the preservative, which achieves the actual impregnation.

ADVANTAGE OF THE OPEN-TANK SYSTEM

Modifications conforming to special requirements and local operating conditions are inevitable on all large jobs, and may be made without affecting the efficiency of the treatment, and this is one of the most important advantages of the open-tank system. Lumber of small cross-section often can be effectively treated by immersion for short periods in the hot bath alone, especially when of a species not particularly resistant to impregnation. Heavy timbers are most economically treated by continuous immersion in one tank during the entire process. Upon expiration of the hot treatment the timbers are not removed to a cold tank, but the steam is shut off and the bath allowed to cool. If an open fire is used to heat the oil it is quenched and both the oil and the wood are permitted to cool to about 100° F. If loblolly pine timbers or any species that readily absorbs creosote is to be treated, the cold-tank bath may sometimes be dispensed with.

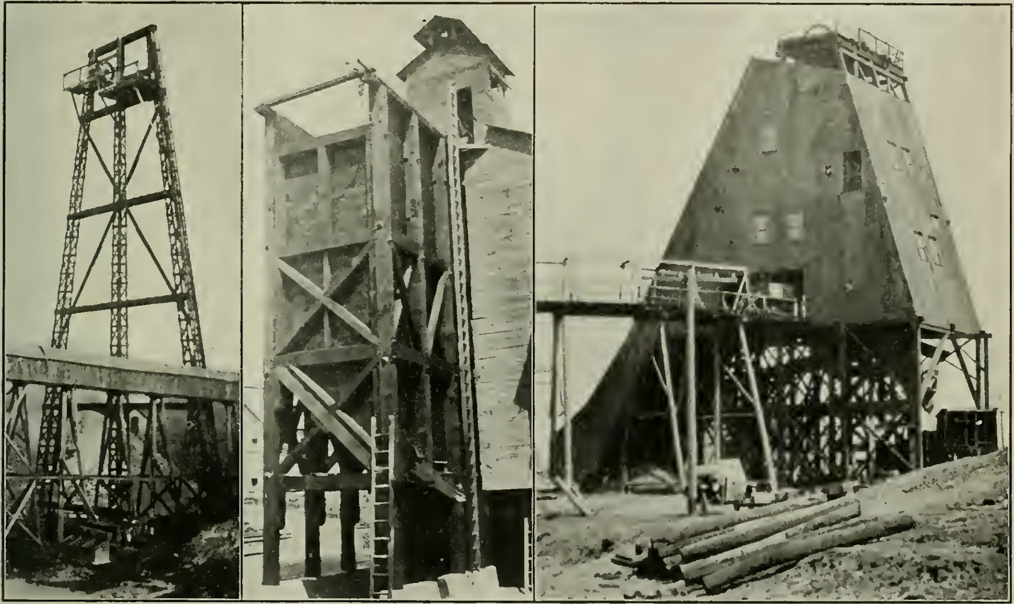
The dipping method is a modification of the open-tank system and is used when lumber of small cross-section and of a species easily impregnated is to be treated. It becomes a modification of the brush method, also, when timbers of a large cross-section are to be given a short immersion in order to eliminate the double handling required by the brush method. The oil should be maintained at a temperature of 150° Fahrenheit.

IMMERSION PERIOD VARIES WITH HARDNESS OF WOOD

In general the period of immersion in the preservative should be as follows: Close-grained woods naturally resistant to impregnation, one hour in the hot and one hour in the cooling bath for each inch of the largest cross-section. Species more easily impregnated require a quarter of an hour for each inch of the largest cross-section, and dimension lumber should remain from

10 to 30 min. in each bath, although in many cases the dipping method is sufficient for boards.

The proper preparation of wood is probably more important than the treatment itself, the effectiveness of the latter depending largely upon whether or not the timber has been satisfactorily seasoned. It is difficult to obtain satisfactory results by nonpressure methods in the treatment of green timber with the exception of sap and loblolly pine. If the wood cells are filled with moisture the creosote cannot penetrate unless the water is first expelled by artificial means. This is accomplished either by steaming, as in the pressure processes, or by continuous soaking in the hot bath until the wood has been heated throughout to the temperature of the oil, which must be between 200° F. and 220° F. The former process is not often available, as mines seldom have the necessary apparatus for creosoting by pressure, which requires more time than it is practicable to devote to the work. It is therefore self-evident that wood which is to be treated must be seasoned until air-dry.


Creosoted idler-pulley stands Creosoted ore bins at copper mine Shaft house constructed from creosoted timber

EXAMPLES OF MINE STRUCTURES IN WHICH TREATED WOOD HAS BEEN USED

Numerous cases have been observed where the attempt to treat practically green timber by short immersions in hot creosote oil resulted in failures for which the preservative was held responsible, or that were used as a basis for charging nonpressure methods of treatment with inefficiency, whereas the real trouble may be attributed to negligence or ignorance.

With few exceptions, such as a breakdown, etc., it is usually possible to purchase timber requirements sufficiently in advance to permit of proper seasoning; that is, seasoning for about six months previous to treatment. Seasoned lumber is more expensive than green wood or timbers direct from the saw, but the increased charge made for wood properly conditioned, or the interest on the investment resulting from storage of timbers for three to six months to allow proper seasoning, is more than offset by the increased value of the dry timbers and by the greater efficiency of the preservative treatment. If it is considered a burden to carry such extra charges in any other manner, they may be added to the cost of creosoting without materially decreasing the profit derived from the proper practice of wood preservation.

Wood Preservation at Mines

Although a number of copper and iron mines have to some extent adopted the practice of wood preservation they could widen their activities in this direction with profit. Some iron mines are creosoting large quantities of timber and lumber for surface structures, such as headframes, shaft houses, trestles, coaling plants, and material for shaft timbers, and "lath," and certain copper mines have creosoted surface structures such as wooden pulley stands, ore bins, trestles, coal bunkers, cross-country launders, etc., and also concentrating tables, launders, sand boxes, tank screens, tanks, flooring, etc., in concentrating mills, stamp mills and leaching plants. One mine, in particular, recently built over 100 concentrating tables, the lumber for which was creosoted by the open-tank system previous to assembling.

The zinc and lead fields offer many opportunities for the practice of wood preservation. A recent inspection showed that wood was used almost exclusively for surface structures and equipment for mills. Rock and ore hoppers, exterior and interior launders, jigs, sludge tables and catch boxes, elevator shafts, floor planking, foundation timbers, beams and girders, etc., are exposed to more or less severe conditions and require continual repairs and early replacement due to decay. Practically all of the timber used in this construction should be properly creosoted before erection. In addition to prolonging the life of the lumber, creosoting will eliminate the necessity of painting, thereby saving nearly enough to cover the entire cost of preservative treatment.

Underground conditions in zinc mines do not warrant the use of creosoted timber, excepting in special cases where the period of usefulness of the timbers is greater than their natural life. Operations in the zinc and lead fields often require removal of the entire plant, and it would seem under such conditions that it might not be economical to creosote the various materials referred to. However, in erecting them in a new location permanency is a desirable factor, and if the life of the lumber used in the construction of this apparatus is prolonged by chemical treatment the salvage value would be high and would leave a handsome margin of profit over the cost of creosoting.

Proper Preservation Essential

An important feature is the selection of the preservative to be used in nonpressure treatments. Pure coal-tar creosote oil, which conforms to standard specifications and is refined to meet the special requirements of nonpressure treatments, is most efficient. Wood-tar creosote or adulterated coal-tar products are not permitted by any standard specification in the wood-preserving industry today. In the case of surface structures the preservative must be effective for many years and it is necessary that the product selected have a clear record as to its efficiency. Experiments are no longer necessary and success from proper treatment with the right preservative is assured.

Refined creosote oil may also be used as a paint. Not only is it more economical than the cheapest of oil paints but it lasts longer on account of its hue and non-volatile nature. After application the color is an attractive dark brown.

Other building materials than wood are treated in accordance with the respective specifications or directions furnished, because it is fully realized that unless care is taken in their utilization a monetary loss and sometimes disaster may follow. Structural steel is given frequent attention to prevent deterioration, and it seems unreasonable that when structural wood is used an effort is rarely made to protect it against destructive influence. An ounce of prevention is worth a pound of cure. Creosoted timber is most economical for general building purposes, and is practically permanent.

Mining in the Joplin District

An article appearing in the *Journal* of Oct. 6, on p. 596, under the title "Mining Practice in the Joplin District," in referring to blasting methods, states that "the rounds are loaded with charges varying from 25 to 150 lb.," giving the impression that this charge constitutes the entire amount of powder placed in the round of holes. The statement should read "the holes are loaded," for the holes are chambered before final loading, and sometimes as much as three boxes of powder placed in each hole.

Chromium, Its Occurrence and Mining*

Metallic chromium is not known to occur in the native state, but as prepared artificially it is a light green, glistening, crystalline powder, showing tin-white crystals under the microscope. It has a specific gravity of 6.8. The fusion point is above 2000° C. and the fused metal is as hard and tough as corundum. It is non-magnetic; when ignited in the air or hydrogen is slowly oxidized, but in the oxyhydrogen flame burns brightly, emitting sparks.

Pure chromium was first obtained by Moissan in 1894, by reducing chromic oxide with carbon in the electric furnace. It is now more readily prepared by the aluminothermic process, which consists in reducing chromium oxide with aluminum powder. The chromium thus made is passive, that is, it is not attacked by hydrochloric, sulphuric or nitric acids. Chromium prepared in any other manner is very active and evolves hydrogen even in the cold with these acids.

Chromite, the Only Important Mineral

Chromite, having the formula $FeO. Cr_2O_3$, with 32% FeO and 68% Cr_2O_3, is the only chromium-bearing mineral of commercial importance. It crystallizes in the isometric system, but the octahedral crystals are rare. It lacks cleavage, is brittle, and has an uneven fracture. The hardness is 5.5, specific gravity 4.32-4.57, the color brownish black to gray or yellowish, the luster metallic to submetallic, dull or greasy, the streak, brown to grayish brown. It is opaque, feebly magnetic, and infusible before the blowpipe. Several investigators have prepared it artificially.

The common form of occurrence is as rounded grains, or more often massive granular masses, which resemble magnetite and have sometimes been confused with it, but differ from it in being at most feebly magnetic. It is a most resistant mineral to weathering. Varieties of chromite with little chromium (under 10%) are really to be classed as picotite or chrome spinel, $(Mg\ Fe)\ O.\ (Al\ Cr)_2\ O_3$. They are of no commercial value.

Other chromium minerals are of scientific rather than commercial interest. Among the best known is crocoite, the lead chromate. Associated with it in the Ural Mountains is the mineral vauquelinite, a phosphate of lead, copper and chromium. The silicates include chromiferous garnet (ouvarovite), mica (fuchsite), diopside and tourmaline, while clay-like silicates, having chromium as an essential constituent, are avolite, milosin, and alexandrolite. Knoxvilleite and redingtonite are sulphates; dietzeite is an iodate and chromate of lime from the Chilean nitrate beds. The only sulphide, daubréelite, is found in meteoric irons, and contains both iron and chromium.

Geologic Association of Chromite

Chromite is by no means an important element of the earth's crust, the average given by F. W. Clarke being .033%. It is almost entirely restricted to basic igneous rocks like peridotite, dunite, pyroxenite, or their derived serpentine. In these the percentage of chromium may range from 0.05 to 0.5. Chromium shows indeed a curious isolation, being rarely associated with other metallic minerals, except possibly magnetite and nickel minerals. Although it occurs usually in basic igneous rocks, it is sometimes found in titaniferous iron ores to the extent of several per cent.

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*Excerpt from an article by Heinrich Ries in "Mineral Foote-Notes."

Unlike many other ores which may show a varied mode of occurrence, or a variety of associated minerals, that of chromium is comparatively simple. Chromite, is found in commercial quantities either in basic igneous rocks, including their derived serpentine, in unconsolidated materials such as residual clay, or in stream materials obtained from these rocks by rain and stream action. The first may be referred to as magmatic segregations, the last two as residual deposits and placers. When occurring in basic igneous rocks chromite is found as disseminated grains, masses, or stringers. It is commonly regarded as a primary constituent of the igneous mass, and supposedly one of the first minerals to crystallize, in which case the masses represent segregations of chromite that occurred during the cooling and consolidation of the magma. Some believe, however, that much chromite may represent a late crystallization that was associated with the presence of mineralizers, and that it may not only have crystallized out between the earlier silicates, but in part replaced them.

ANALYSES OF SOME CHROMITE ORES

	Turkey	New Caledonia	California	Cuba
Cr_2O_3	51.7	55.7	52.68	50.00
FeO	14.2	13.2	15.30	18.57
Al_2O_3	14.1	16.2	11.40	12.44
MgO	14.3	9.8	16.23	13.38
SiO_2	3.5	0.2	3.40	3.82
CaO	1.7	0.25		2.16
H_2O	0.5	1.05	0.94	
MnO	....	0.2	0.15	
P_2O_5	..	0.05		0.45
S		.		0.69

MINING OF CHROMITE STIMULATED BY THE WAR

In the Thetford, Que., chromite area, where the ore mineral is found not only as disseminated grains in both peridotite and pyroxenite, but also in large masses usually in the transition rock between these two, it is thought that the grains may represent earlier crystallization products, and the masses later ones. This district has shown a greatly increased output since the beginning of the war. Chromite is now being actively mined also at St. Cyr, Que.

The California deposits, in which production rose from a few hundred tons in 1914 to over 40,000 tons in 1916, due to the war, are likewise associated with basic igneous rocks and their derived serpentine. In that state there are two main productive belts, one in the Klamath Mountains and Coast Range from Siskiyou County to San Luis Obispo County, the other in the Sierra Nevada from Plumas to Tulare Counties. The former has large orebodies and better rail transportation. Small amounts of ore have also been supplied by Oregon and Wyoming, the production of the former in 1916 having been about 3000 tons. Most of the Oregon ore, like that of California, averages 40% Cr_2O_3, and this is the basis of sale.

DEVELOPMENT OF WESTERN DEPOSITS

Lack of transportation has greatly interfered with the development of the Western deposits, and California will furnish the chief domestic supply for some time to come. The success of the Pacific Coast ores also depends on the possibilities of concentration. This is especially important for the ores of eastern Oregon, and Inyo County, Calif., which lie east of the Pacific mountain belt, and for Glen Rock, Wyo. deposits.

Important chromite orebodies are also found in Rhodesia, in both serpentine and talc. The Turkish deposits, which have contributed large amounts to the United States, also lie in serpentine. Other chromite deposits occur in New Caledonia, New South Wales, New Zealand, Newfoundland, Cuba and Alaska. The accompanying analyses give the composition of ore from several localities.

OCCURRENCES IN RESIDUAL CLAYS

In the weathering of basic igneous rocks and the derived serpentine, a residual clay may form, through which are scattered grains, lumps and masses of chromite. Owing to the washing away of the clay a surface concentration of chromite may occur that is misleading regarding the richness of the ore in the unweathered rock below. It is possible that some of the chromite found in weathered deposits may be secondary, but no silicates of chromium appear to be formed, as is the case with nickel under similar conditions. In New Caledonia much chromite is found in residual clay, as well as in serpentine, and one mine, Tiebaghi, is among the world's largest producers of this ore. This district is, however, better known for its nickel ore.

Residual clays containing chromite exist near Baltimore and the ore was obtained by washing. The sand, washed as much as five times, sometimes ran as high as 55% Cr_2O_3 when concentrated. This region is of historic interest, because it was the cradle of the chrome industry in America, beginning in 1827, though at that time the chromite was extracted from the serpentine rock. In fact, from 1828 to at least 1850, Baltimore supplied most of the chrome ore consumed by the world. Here also was begun the manufacture of chrome yellow in 1828. It was the development of the larger and richer Turkish deposits in 1860 that is said to have stopped the export trade from Baltimore.

CHROMITE PLACER DEPOSITS

Placer deposits are found in those areas where the more resistant products of weathering have been concentrated in stream channels, and where these drain areas of serpentine or basic igneous rocks. Thus along the Pacific Coast the black sands, which carry gold and platinum, may contain considerable chromite, so that on treating the tailings derived from washing the sand, in a magnetic separator, a chromite concentrate is obtained. A concentration plant of this sort has recently been established at Kerby, Ore.

The mining of chromite is somewhat uncertain on account of the pockety nature of the deposits, which do not show any regularity of occurrence. There may be one or many lenses of chromite scattered through the country rock. Thus in the famous Rhodesia deposits, more than 100 lenses, some of them over 400 ft. in length, have been found. Either underground mining or quarry working is followed, depending on the shape and size of the deposit, as well as its proximity to the surface.

Chromite after mining may require only hand picking to yield a product rich enough to send to the smelters or manufacturers. If not sufficiently high grade it is crushed and concentrated mechanically. In Canada, milling ore containing as low as 10% chromic oxide can be successfully treated.

Metallic chromium has no direct use, but raw chromite and chromium salts have a variety of applications. Owing to its great heat-resisting qualities, chromite is used as a basic refractory lining for furnaces, being made up either into bricks, or the ore lumps being packed in tight to make the furnace lining. Chromite stands changes of temperature well and also resists the attack of molten metals. For refractories, ore with 38-45% chromic oxide can be used. The most important use of chromite, however, is for the manufacture of the alloy ferrochrome or ferrochromium, which has been known since 1820.

Some idea of the importance of foreign sources of supply to the United States may be gained from the fact that the imports in 1916 amounted to 114,655 long tons. Of this Rhodesia supplied about 62,000 long tons, and New Caledonia about 34,000 long tons. The United States production rose from 244 long tons in 1913 to more than 47,000 long tons in 1916. California 40% Cr_2O_3 ore, in 1916, brought from $28.86 to $34.96 per ton at the eastern seaboard.

New Manganese District in Virginia

Special Correspondence

The discovery of high-grade manganese ore is the cause of a mining boom in the region about Bluefield, W. Va. The deposits are situated in the adjacent section of Virginia of which Bluefield is the business and railroad center, and just now the scene of lively speculation in ore lands and prospects as well as of other activities commonly to be observed in a new mineral district. The boom has its basis in the good fortune of a prospector who located some of the more productive deposits and who in the last few months has shipped about 3000 tons of ore worth about $50 a ton, all of it taken from surface workings at little more expense than for shoveling and hauling to the railroad. Two or three additional discoveries of good ore have since been made, and the district probably will ship over 5000 tons during the current year.

The deposits are peculiar in that they occur high up on the summit ridges of the Appalachians at an average elevation of around 3000 ft., instead of in the valleys where most of the manganese is usually found in this part of the country. They have the further characteristic that they are associated with sandstone, although undoubtedly derived from the weathering of overlying beds of a cherty limestone that has now disappeared except near the base of the ridges, where uneroded remnants may be seen in places. Evidence of the former presence of the limestone on top of the deposits is to be had in the inclusions of chert within the ore. Their occurrence is usually indicated by abundant float on the surface, ranging from the size of walnuts to blocks weighing several hundred pounds. As much as 50 tons of ore has been picked from the ground above one of the bodies, which extend downward into the lateritic decomposition products of the limestone and for some distance as well into the sandstone. It is probable that the deposits will be found to be quite shallow, a few tens of feet deep at most, since at such high elevations erosion has been almost as rapid as weathering.

There is not sufficient evidence as yet to define the bounds of the productive area. The deposits seem to be distributed rather sparsely, and there is a chance that additional ones will be brought to light in the outlying areas on the line of strike of the present known bodies, that is to the northeast and southwest, where the same geological conditions may be expected to occur. The region has been little explored and was hitherto considered as of little interest in a mineral way, although it is close to the great coal and oil fields of West Virginia. The large-scale map of the Virginia Geological Survey provides the only comprehensive basis for study of the geological features. The Tazewell Folio of the U. S. Geological Survey covers the area just beyond the southwestern end of the district. So far it has been established that the ore-bearing area includes several lines of ridges in Bland and Giles counties, southwest of New River, W. Va., forming a belt 25 or 30 miles long and six to eight miles wide. The district is traversed for nearly its whole length by the New River, Holston & Western R.R., which has recently been extended to Suiter, Va., a small mountain town 10 miles in an air line due south of Bluefield. The ore is shipped mainly from Suiter and First Ford and is transferred to the Norfolk & Western at Narrows, on New River.

Land prices in the district have advanced in a way which is wholly out of relation to the actual values for mining or for any other purpose. It is not unlikely that this will retard the development of the deposits, many of which could be worked profitably only under the present extraordinary conditions of the ore market. The richness of the bodies, which admits of shipping much of the product without expense of washing, is a decided advantage; on the other hand there is likely to be little permanency to individual deposits, and their situation involves high costs of haulage, ranging at present up to $9 or $10 a ton.

The ores for the most part are firm, fairly compact admixtures of massive and botryoidal psilomelane with coatings and interlacings of crystalline pyrolusite. They are occasionally intermixed with limonite or occur in the vicinity of the latter; but characteristically form independent bodies and are low in iron. Their content in manganese reaches up to 55%. A fairly high silica content is traceable in many instances to included fragments of sandstone and chert, the presence of which is revealed only by breaking open the specimen.

Silver Peroxide and the Valence of Silver

The black compound formed on the anode during the electrolysis of silver-nitrate solution, and to which the formula $2Ag_3O_4AgNO_3$ has been ascribed, is discussed by H. C. P. Weber, in a paper entitled "Silver Peroxide and the Valence of Silver," presented at the Pittsburgh meeting of the American Electrochemical Society. He considers the probable valence of silver in the oxide part of this formula, writing it either Ag_2AgO_4 by analogy to red lead, or $Ag(AgO_2)_2$ by analogy to magnetic iron oxide. Various electrolytic experiments lead to the conclusion that the last formula, $Ag(AgO_2)_2$, in which one-third of the silver is cathodic and diatomic and two-thirds are anodic and triatomic, is in harmony with his experimental results. This would make Ag_3O_4 the silver salt of an argentic acid

The Commonsense of Mine Management

By HENRY M. ADKINSON*

Imagination, judgment and initiative are demonstrated to be essential in mining, and expert opinion is quoted concerning the loss in efficiency due to lack of these qualities in business practice. Examples are cited of the failure of old methods to meet present-day needs, and of how effectually the way to progress may be blocked by self-sufficiency.

IT IS a truism dangerously close to a bromide to say that never in our country's history was there a time when the need for efficiency of effort and the necessity for conservation of time and material were so impelling as now. All must by this time appreciate the need for the highest degree of personal effort and community coöperation, but when, in a desire to "do his bit," one tries to lend a hand in his particular field he seems fairly to be groping in the dark and to be accomplishing nothing more than before this urgency existed. When one was doing all that he possibly could, now that conditions require added effort it is not apparent just how exertion may be intensified and the results increased.

Management a Prime Factor in Industry

The proper direction of a business—its management—is the most important factor in any industry. If this one factor can be stimulated through conscious excitation of the mental qualities which go to make up the successful manager, the whole business must necessarily respond to the spur. The importance of effective management cannot well be overestimated. This is not a theoretical statement but is intensely and essentially practical—how much so can be realized from the two quotations following, from competent authorities on the subject. Nothing could be more matter-of-fact nor have a more direct bearing on our day-to-day problems than the *Monthly Bulletin* issued by the National City Bank of New York. In the July number there appears this comment on "Industrial Efficiency":

> A well-known engineer who is an expert in industrial practice has recently gone on record with the opinion that the industries of the United States on an average are not realizing over 20% of their possible capacity. . . . He says that we have scarcely begun to appreciate the gains that are possible under more effective organization.

If the country is not getting more than 20% effective results out of possible capacities, who or what is responsible for the loss of the 80%? On this point A. J. Hemphill, chairman of the board of the Guaranty Trust Company, one of the largest trust companies in the world, throws a high-power spot-light when he says in the July issue of the *World's Work:*

> In considering employment of funds in any concern, the greatest emphasis should be placed on the ability of the management. I would say that the most important consideration in any investment is management, management, management, and again management. It is not enough to know that it is honest; its ability in that particular business should be established. Ninety-five per cent. of the worth of an undertaking, I should say, is in the management.

These statements indicate the source of a large part of the troubles and ineffective results encumbering modern business. If 95% of the worth of an undertaking lies in the ability and effectiveness of its management, and if only 20% efficiency is the measure of present possibilities, then of the lost 80% of effective results it is fair to attribute 76% to inefficient management. So management looms up as an important and indispensable factor.

Imagination, Judgment and Initiative Essential

Is it possible to take up any part of the slack in this business tackle? Are there any general principles of successful management that may be applied and amplified by executives through self-analysis and intensive training? Probably no ready-made formulas exist for success in business as each business presents its own problems, and even where the problems seem similar the same solution is not always applicable. But certain general principles hold the germ of success in all fields. A prominent financier makes certain mental qualities the basis of his selection of executives, and lays especial emphasis on imagination, judgment and initiative. Discussion of these qualties is bound to be philosophical. It cannot be scientifically exact. The essentially practical man will say that it is all very well to talk about imagination being necessary to the effective executive, but will want to know just how is imagination going to meet the problem of his payroll this week; just how is judgment going to help him on actual matters of fact where the answer is hard and fast, with only one way out, and how is initiative going to get him a supply of needed raw materials when there is none to be had.

The Futility of Ultra-Conservatism

Consider for the moment this point of view and grant that the objections are well taken, and that these qualities are altogether too philosophical and idealistic to be of value in meeting the problems of practical business. The alternative is to follow the customary business path, letting present methods direct each succeeding step, and following no plan imagined at the outset, no project preconceived and definitely outlined in the beginning. Such acceptance of conventional conditions inevitably creates the situation so well described by H. G. Wells in his analysis of the governmental attitude in "Mr. Britling Sees It Through," where Mr. Britling says:

> We had a government that seemed guided by the principles of Mr. Micawber, and adopted for its watchword, "Wait and see. . . ." We were too lazy, we were too negligent. We passed our indolent days leaving everything to somebody else. Was this the incurable British, just as it was the incurable Britling, quality? . . . Was the whole prosperity of the British, the far-flung empire, the securities, the busy order, just their good luck? It was a question he had asked a hundred times of his national as of his personal self.

Of course it isn't just "good luck." It may now plainly be seen that the answer lies in the fact that in a moment of national emergency, when everything seemed headed toward destruction, some imagination-judgment-initiative called Lord Northcliffe gets to work. It analyses the situation and puts a Lloyd George on the job as manager of Britain's war. Then it wonders, through its imaginative quality, if the same "in-the-rut" type of mind which had formerly been directing the military end might not also exist in the civil branch, the "wait-and-see" type, and finds it does. And the initiative quality of mind, in the face of apparently overwhelming opposition, shows the facts to the country—to the stockholders of the British Empire, so to say—and the board of directors is changed and a new Cabinet installed. The intensely practical management in charge of the nation's business couldn't analyze itself—thought it was doing the best possible under the circumstances—and the best results were obtained only when the executive mind trained in imagination-judgment-initiative supplanted the practical manager. The same thing is happening today in industries running below par in efficiency. Velvet rugs and mahogany furniture cannot substitute for the fundamental qualities, though for a time they may conceal their absence.

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Three Requisites as Applied to Mining

The observation concerns general principles, but concrete facts are necessary to drive them home. Therefore to illustrate these principles wherein my applications would lie, because of my work as a mining engineer, I am drawing on personal experiences in the mining field. It is not possible to draw a line of demarcation where one mental quality begins and another leaves off, but these examples will serve to show what the combined qualities that make up the proper executive may accomplish. For several years a certain mine had been operated on a profitable basis, and returned a good income to its shareholders. Neither the president nor the general manager was a man of imagination, and while matters ran smoothly they ran on a level much below the plane of high efficiency. A change of management was urged by some of the directors, and after much persuasion and pressure this was brought about. Within 30 days after the new manager was installed the output increased 260%, dividends doubled and the surplus mounted by leaps and bounds. In the first month the net profits increased $40,000, and soon they were mounting at the rate of three-quarters of a million a year. Now, the new management worked with no equipment other than at the service of the old management. It merely brought vision—imagination; if you will—to the problem and saw what could be done through simple and seemingly slight readjustments all through the organization. Of the changes made no single one seemed of particular moment, but all in combination put the entire business on a higher plane, and gave the immensely profitable result. It was judgment, knowing what rearrangements were feasible and proper; and it was initiative, getting out of the rut of the obvious routine. These qualities in 30 days returned an actual cash payment of $40,000—well worth while even to the "practical" mind

Executive Narrowmindedness Chokes Development

Again, a certain mine is owned by men having at their command all the money that is needed to accomplish a splendid piece of constructive work. Yet year after year, for 20 years, the mine has remained idle because they see it only as a small property and cannot imagine it as a large and highly profitable business, run as an independent industrial unit. They also lack the initiative to investigate the best metallurgical methods and do not understand how to engage the best brains and bring them to bear on the problem. This really doesn't seem a difficult thing, but it is. The best brains go with broad-gage minds, and the man whose mind leans toward doing things in a small way will get small men to help him, and he will achieve a small result. In this particular instance the product of the mine is silver and copper, both of which are now at supernormal prices in the market. It would seem that even a narrow judgment would appreciate that the obvious thing is to market these products now. But this particular judgment does not apparently realize that to a degree as never before has time become the essence of action and that all effort should be concentrated now without delay. Failure to grasp the situation is due solely to executive narrowmindedness, and not to lack of money or labor.

One more instance: A certain large mining corporation retains in an important executive position a man who does not get nor hold the goodwill of its customers. A competitor told me that even if this corporation felt that its manager was too expensive to be retained, it would be good business for the competitor to pay the salary of the corporation official because of the business which was diverted to the competitor through the unpleasant personality of the corporation manager. Needless to say the competitor is affluent, and has a broadminded, broad-gage management in its highest executives, but the corporation with the unpleasant manager held a place in the industrial procession two jumps ahead of the sheriff before the war prices of metals came and saved the day. This corporation represents millions of invested capital, and the wonder is that the executives at the top can remain either ignorant of, or ignore, the conditions of personnel which so profoundly affect its fortunes.

Old-Timer Not Always Best Man for the Job

I sat last month with a group of mine directors who had recently bought a property, and who were continuing as manager the man who sold them the mine. (Parenthetically I may say that mining engineers recognize this procedure as one of the most fruitful causes of mine failure. It is done on the theory that the man who has been in charge of the mine knows most about it, but this is a fallacy that has cost many men hundreds of thousands to unlearn.) This manager was the only "mining man" on the directorate. The suggestion was made to this general manager, a relic of the metallurgical days of the '70's, that he would greatly increase his profits by installing a flotation method to which his ore was peculiarly susceptible. His reply was that "flotation is yet in its experimental stages, and I propose to crush my ore with rolls and concentrate it with jigs." So he chose the method that would be certain to show the greatest losses, calculated at a minimum of $15,000 a month. The manager's judgment was faulty; it failed to recognize, and the initiative was lacking to learn, that on the basis of tonnage treated flotation is today the leading single metallurgical process. About 30,000,000 tons are annually treated by flotation, no other method equalling it in tonnage handled. The directors had thought their manager the best they could get for their business! Why did they not have enough imagination and initiative to appreciate that many hundreds of men are trained in that profession? Why did they not try to get the best manager possible, even though their choice might happen to fall on one who did not possess the happy qualification of being able to induce them to buy the mine?

AN INSTANCE OF SUCCESSFUL OPERATION UNDER LEASING SYSTEM

Not all examples that might be cited are along the line of carping criticism, and to maintain the proper ratio one good example will offset the four horrible ones. A certain company is operating its mine on a leasing system. This is commonly held to be the last resort and is used only when the orebodies are approaching exhaustion and the mine is *in extremis*. As a matter of fact the general manager is broadminded, and he believes so thoroughly in the efficiency of accurate accounting that he is able to select the most profitable method with no uncertainty. His operations on both the system of company operation and leasing operation gave exact figures, and by far the most money is made by the company, and larger dividends are paid, under the leasing system. So in the face of natural opposition he installed that system, with the result that his company is earning more money, the mine is in a better physical condition, the holdings of the company have been constantly enlarged, and the profits of the leasers are greater than they would be under the day's pay method. Therefore the workers are more contented, and the net result is an excellent industrial organization. Imagination-judgment-initiative have had their place in determining the attitude of the management, and the outcome is a highly profitable one from any viewpoint. These are elementary qualities, but backing them up and making them effective in mental make-up must be self-confidence, the confidence that, convinced of the accuracy of its judgment, goes ahead to develop along the lines aimed at. But self-satisfaction is a sure antidote to progress, and there, in all probability, lies the answer to the lost 80% in efficient capacity. Satisfied with present progress, no effort at self-analysis is made, and a chosen field of work develops its possibilities only when a new mind is brought to bear on the problem, a mind which has the qualities, even in a small degree, which make for better organization and more intensive results.

There are many volumes dealing with the development and training of mental qualities, but the first step is to recognize one's deficiency. As soon as this is taken, judgment and initiative begin to leaven the whole lump, and ways to reach the goal take form from within.

Progress of Alaskan Road

Before the end of next season the first regular train service over the coast end of the Alaska Government Ry. will be established, according to a statement by William C. Edes, chairman of the Alaska Railroad Commission. Mr. Edes said that because of unsettled war conditions, it was impossible to set a date for the completion of the road from Seward to Fairbanks, but that the work was considerably more than half finished, not having been curtailed so far because of the war. The railroad is to be 508 miles long.

The Cascade Method of Agitation for Selective Flotation of Sulphides

A method for the selective treatment of sulphide ores by flotation is described by T. H. Palmer, under the title, "The Cascade Method of Agitation," in the *Mining and Engineering Review*,[1] of Melbourne, Australia. Mr. Palmer, who is general manager of the Junction North mine, states that the process was conceived, perfected and installed at his company's mill at Broken Hill, N. S. W., and that it differs somewhat from that process employed at the Central mine, illustrations of which appeared on p. 393 of the *Journal* of Sept. 1, 1917. The Junction North plant consists of two sections, each with six pots, as shown in Fig. 2, for lead and zinc respectively. In each section the six pots are placed in series, in echelon one below the other, the pulp being delivered from an elevator into the top one and falling through the set by gravity. The plant was completed about August, 1914, and after being tested for nearly a year, was capable of treating 22 tons of ore per hour.

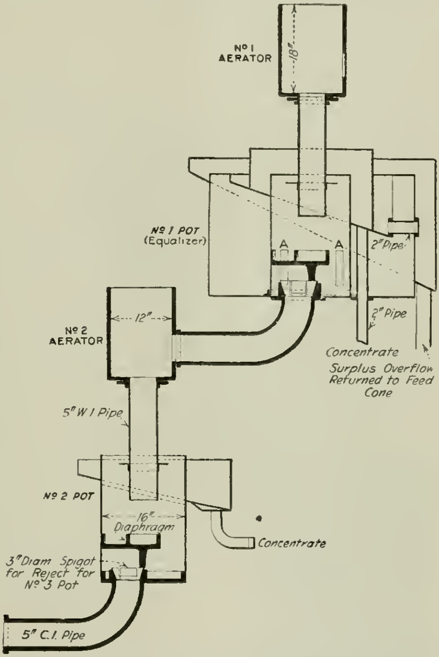

FIG. 1. SECTIONAL VIEW OF CASCADE-AGITATION APPARATUS AT JUNCTION NORTH MINE, BROKEN HILL, N. S. W

The pots are cylindrical in shape, 16 in. in diameter and 24 in. high. Immediately above each pot is an "aërator," consisting of an open receiving box, 12 in square, fed by a 5-in. bend leading from a 3-in. spigot in the bottom of the pot above. The square shape of the aërator causes the pulp to swirl, and entangle a quantity of air with it, as it drops into a 5-in. vertical pipe and down to a diaphragm splash plate in the center of the separating pot, where the air is churned into the pulp and forms the froth which carries the concentrate over the periphery of the pot into the tray and launder. The diaphragm arrests the falling pulp, distributing it throughout the pot and ensuring a thorough admixture with the entangled air. The cylindrical pots, having the concentrates overflow all around the periphery, permit short travel and rapid take-off of the aërated particles, which are said to be essential in the selection of sulphide of lead by a hot- or cold-water process, particularly with sandy material.

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[1] Vol. IX, No. 107, pp. 296-298, Aug. 6, 1917

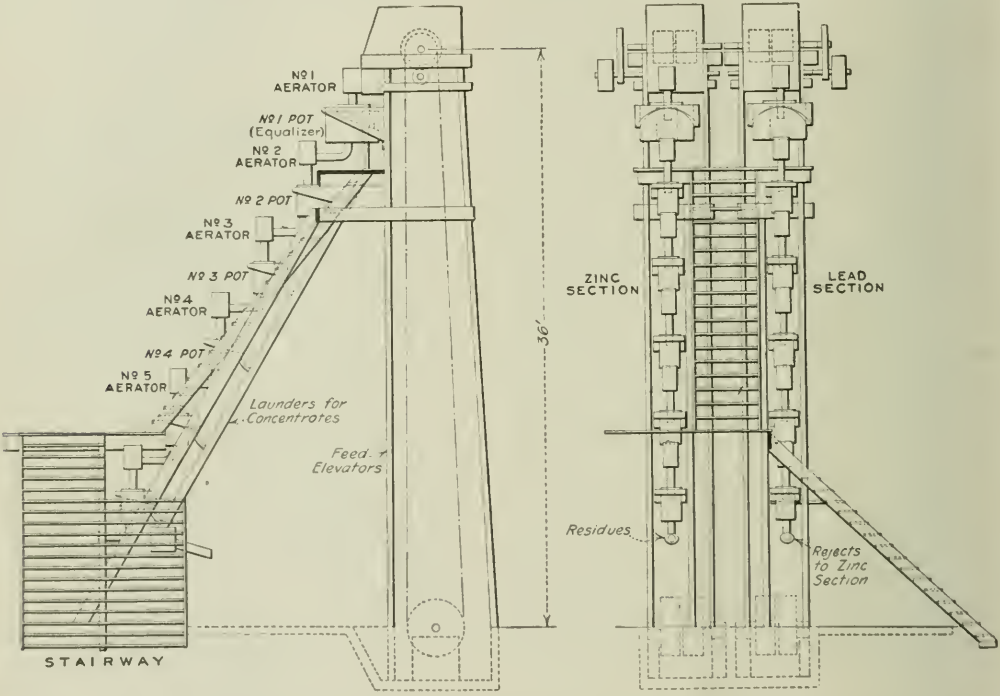

FIG. 2 SELECTIVE-FLOTATION PLANT, USING CASCADE METHOD OF AGITATION, AT JUNCTION NORTH MINE, BROKEN HILL, N. S. W.

From the first series of six pots a float of lead concentrates is taken and the rest of the pulp runs from the spigot of the last lead pot to the second elevator, with acid and oil additions[2] for delivery to the second series of pots, known as the zinc section. The first or top pot of each section is called the "equalizer," its special function being to balance any irregularities in the flow of the feed from the elevator, so that its discharge spigot will deliver a uniform feed to the second pot. It has four slots cut in its side near the bottom, two of which are indicated at *A* in Fig. 1. These open into a concentric cylindrical pot, 40 in. in diameter, provided with two annular overflow rings set slightly lower than the concentrates-overflow ring.

The whole system is said to be self-operating, requiring no attention. All pots have the same-sized spigot and the height of each successive pot is reduced slightly to allow for the concentrates removed from the pot above. The pots are thus kept full and the froth overflows constantly from each without any hand regulation or danger of excess overflow of liquor or gangue to spoil the grade of the concentrates.

Phases of Employees' Injury Suits

By A. L. H. STREET*

In affirming judgment for $7500 damages in favor of a miner for injuries—due to falling rock—sustained while operating a machine drill, the Idaho supreme court holds that, although it was plaintiff's duty to pick down and remove all dangerous ground around his place of work, it was not his duty to examine any other portion of the stope in which he was working beyond his immediate working place, and that he was entitled to assume that his emloyer had caused the proper inspection of such other portions of the stope to be made and had found them to be in a reasonably safe condition. (Cnkovch vs. Success Mining Co., 166 Pacific Reporter, 567.)

It is further decided by the court that, considering the fact that the accident complained of resulted in severe and permanent injuries which will prevent plaintiff from engaging in physical labor, and that he was only 31 years old and had previously earned $3.50 daily, an award of $7500 damages was not excessive.

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[2] [Presumably oil and alkali, or merely a minute quantity of oil should be added to the ore before feeding to the lead section.—Editor.]

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Mining Methods at Chapin Mine, Michigan*

The factors entering into the selection of a final method of mining are often only known after considerable experimentation. At the Chapin mine several standard systems were tried in combinations designed to meet local conditions and a final system was evolved that satisfactorily meets the requirements of both high extraction and low cost.

When the Chapin mine was first opened, little or nothing was known of the conditions that were to be encountered, but they were learned as mining progressed. Naturally, the early miners sought to apply such methods as they knew and had used in mines where they had previously worked. As mining progressed, they saw that the Chapin orebody had certain characteristics peculiar to itself and they made such changes in their mining methods as were necessary. Out of all these changes have grown the present methods, which are so well adapted. As these methods are the outgrowth of former ones, it is advisable to describe the latter in order to get a comprehensive idea of those now in use. The locating and sinking of shafts also played an important part in the history of the Chapin mine. A large number of shafts have been lost at the Chapin mine, owing to the fact that the early operators were not acquainted with the conditions existing beneath the surface. There were originally three companies at work—the Chapin, the Ludington and the Hamilton. The three fees were later acquired by the Chapin, and the whole has since been worked as one mine. During the time that the companies were operating independently, the Chapin and the Ludington owned the apex of the ore, the Chapin being on the east and the Ludington on the west. The Hamilton was north of the Chapin, and while the surface was almost wholly dolomite, it was certain that the dip of the formation would carry the ore on the property at depth. The three companies began the work of recovering the ore, the first two knowing that they would encounter it at shallow depths and the other knowing that it could be reached only at great depth and only by means of a hanging-wall shaft.

Conditions Governing Shaft Locations

Selecting a shaft location at the Chapin mine has always been a difficult problem. Not only are most of the ordinary problems to be solved, but there are others that are peculiar to the Chapin alone. Instead of there being one or two orebodies there are a number, and in order to mine from all these bodies to the best advantage, it is desirable to have each shaft easily accessible from all the bodies. But a shaft must be so placed that it will not encounter any ore or any caving ground, as the ore caves readily, as does also the adjacent slate with its seams of talc. Now that we are able to look back on facts not known to the early miner, it is evident that all the ground now caved would have caved ultimately regardless of the method of mining in use, and that all the shafts in the ground now caved would have been lost under any method of mining. In view of this knowledge all idea of any but foot-wall and hanging-wall shafts has been abandoned.

The difficulties of sinking in the hanging wall are pretty well understood. A shaft so situated will have to penetrate a thickness of dolomite, the amount depending on the distance of the shaft from the slate-dolomite contact. It will encounter talc slate and will have to contend with the difficulties caused by its swelling. After passing through the hanging slate, the orebody will be encountered where the shaft can be maintained only by leaving a large amount of ore as a shaft pillar. In the dolomite, watercourses are quite common and one of them may be encountered at any time. This is especially true near the talc slate which marks the contact. It might be suggested that it would be better to keep all shafts and all mine workings away from the dolomite, and thus avoid all the water known to be circulating in that formation. It would be poor policy, however, to attempt to leave so much water bottled up under the head that it is known to have, for sooner or later it would break through some weak point and flood the workings with amazing quickness and perhaps disastrous results. As a matter of fact the presence of the water in the dolomite is an argument for sinking a shaft in that formation rather than keeping away from it, because the water can then be conducted to the pumps at the shaft without conducting it across the orebody, which would be necessary if the shaft were located in the foot wall.

Sinking a shaft in the foot wall means sinking in the slate in which are scattered the lenses of ore that are to be mined. It is possible that a new and unexpected lens of ore might be encountered at any time. However, knowledge of the ground, gained from underground operations and from diamond drilling, makes it quite possible for the present-day operators to choose the best sites for shaft locations.

Freezing Method Used in Starting D Shaft

After the proper site has been chosen, shaft sinking has not been a serious problem, the surface being shallow and easily penetrated. However, there was some difficulty in getting D shaft through the surface, which difficulties were overcome by using a freezing process. At the point selected the surface material was known to be nearly 100 ft. thick—largely quicksand. The method employed was to freeze a wall around the ground through which the shaft was to be sunk and to work within the protection of the frozen wall. Twenty-six 10-in. pipes, on a circle 29 ft. diameter, were driven to ledge. In each of these pipes was placed a watertight 8-in. pipe closed at the lower end. The larger pipes were then drawn and the ground was allowed to close about the smaller pipes, whose distances apart were 3½ ft. from center to center. A freezing mixture was circulated through the pipes, causing the ground to freeze. Two qualities were necessary in the mixture used; it had to be a medium that could be made to circulate through the pipes, and it had to have a low freezing point. The mixture used was a saturated solution of $CaCl_2$ which has a freezing point of —40 . The solution was conducted to the bottom of the 8-in. pipe through a 1½-in. pipe, where it left the smaller pipe and returned to the surface through the larger. This cold solution in the larger pipe abstracted the heat from the adjacent ground and froze it The solution was cooled at the surface, its heat being absorbed by evaporating ammonia which had been previously compressed to liquid form. After 15 days of freezing, excavation was begun, and in 135 days the shaft had reached ledge, though it was necessary to do some further work under the protection of the frozen wall. The cylinder of frozen ground, in the center of which was the shaft, was found to be more than 50 ft. diameter. Troubles have at times been encountered in shaft sinking below the surface covering. Talc seams have caused trouble by swelling and crushing the timbers.

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*Paper presented by W. C. Gordon, geologist, Oliver Iron Mining Co., Iron Mountain, Mich., at the annual meeting of the Lake Superior Mining Institute, Birmingham, Ala., Mar. 13-16, 1917.

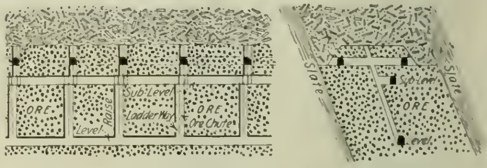
In the first attempts at mining at the Chapin mine the ore was removed from foot to hanging wall by back-stoping, the hanging wall being supported by stull timbers. It was soon learned that some changes were necessary because the hanging slate, being soft and friable, crumbled away from around the stull timbers and allowed them to loosen. To correct this, headboards were placed on the end of the stull timbers against the hanging wall so as to cover as much of the wall as possible. Even this did not overcome the difficulty. Moreover, the vein was becoming so wide that timbers long enough to reach across the excavation could not be obtained. To overcome this new difficulty a layer of ore was left along the hanging wall and the excavation was made only wide enough for the timber to reach across. It was soon evident that the layer of ore left could not be supported, and also that too much ore was being lost by this method of mining. A wholly new method was necessary.

Room-and-Pillar Method Abandoned

At this stage the room-and-pillar method was introduced. A drift was driven the length of the orebody, along the middle where the ore was wide, and near the foot where it was narrower. The ore was then laid out into rooms and pillars, the standard pillar being 18 ft. and room 20 ft., though there were many variations from this standard. In opening a room, a drift was driven from foot to hanging wall the full width of the room. The ground about this excavation was supported by sets made of large square timbers placed eight feet apart from center to center. Each set rested on a sill which extended two feet into niches cut into the pillar on either side of the room. Both the back and the sides were lagged. A raise connected the back of the room with the level above. After the first cut was taken from the room, a second cut was taken from immediately above and sets of timber placed in a similar manner. In this way cut after cut was taken from the back of the room until the room of the level above was reached, at which point the timbers of the two rooms were connected and the weight taken off the sill of the room above. While a room was being opened, the broken ore fell to the lagging on the lower set of timbers; from there it fell to the floor through openings along the side of the room and was shoveled up by the trammers. At a later date chutes were put in and the ore was drawn directly from above the lagging into the tram-cars. By this method room below room were joined together with the result that rooms and pillars were constantly growing higher.

Two serious difficulties were soon encountered in this method of mining. A vast amount of ore was being left in pillars which must be recovered and the pillars soon began to crush under their own weight. Ignoring the first difficulty, an attempt was made to correct the second by using square sets, the timbers of which were cut in lengths of six feet and framed together. But even these were not sufficient to hold the ground. There was soon such an increased amount of crushing that the surface began to give way. It became imperative that some method be introduced that would support the pillars until such time as the ore could be recovered from them. Furthermore, it was not advisable to open more rooms. It had come to a time when new methods were an absolute necessity.

This method was abandoned and new methods introduced which, it was hoped, would make possible the recovery of the ore left in the pillars, and also the mining of the other ore without encountering the difficulties incident to the "room-and-pillar" method. Accordingly, filling of the old rooms was begun. The first filling material was the surface covering of the orebody, which was stripped off and dumped into the rooms through a small shaft in the back of each. Sandstone was used to complete the filling. In this manner each room was filled, and a room thus filled became in itself a pillar which, it was hoped, would support the ground while the original pillar of ore was being removed.



LONGITUDINAL AND CROSS-SECTION OF CHAPIN OREBODY

The pillar was approached by a crosscut driven from a drift in the foot-wall slate parallel to the orebody. The drift was continued through the pillar close to the lagging of the sandstone-filled room. A cut the width of a drift and running with the formation was then taken from the base of the pillar along the hanging-wall side. The opening from which the ore was thus removed was filled to the back with sandstone which was brought down from the surface and shoveled into it. Another cut was then taken from alongside of, and on the same level with, the first cut and the opening similarly filled with sandstone. When a cut had thus been made across the base of the pillar of ore, a second slice was taken in a similar manner, the broken ore falling upon planking which was laid on the sandstone filling and from which it was shoveled. In this manner it was hoped to remove the pillar. The timber and sandstone required in the work were received through a raise in the pillar. Only a small amount of ore was removed in this manner because the ground was heavy, and the amount of filling required was great.

To recover the ore from the parts of the orebody that had not been attacked by the room-and-pillar method, a drift was driven in the foot-wall slate parallel to and only a few feet distant from the orebody. At the same time a similar drift was driven in the orebody. The two drifts were connected at intervals by crosscuts. The drift in the slate was the main haulageway, while the other was used as an opening from which the ore was attacked. The ore was removed by back-stoping, and the stopes were filled with sandstone quarried at the surface and sent underground. The rock that was taken from the drifts and other dead workings was also used for filling.

It took a large force of men to quarry the sandstone, load it into cars, send it underground and distribute it in the stopes. Where the orebody was narrow and firm, it was attacked by longitudinal stoping, but elsewhere transverse stoping was used; that is, the cuts were made across the strike of the formation. In each case the broken ore fell on planking laid on the sandstone filling which was always kept near the back. In the transverse stoping gangs of men were started at work 50 ft. apart in the ore drift, and each gang drove a crosscut from foot to hanging wall eight feet high and nine feet wide. The opening made was filled with sandstone, and a similar cut taken from alongside, and that opening was also filled. In this manner the work on the level was continued until completed. As the sandstone filling was put in, planking was laid on it for the broken ore to fall on. A second slice was taken from the back of the stope in the same manner as the first and the opening filled with sandstone. This work of slicing and filling was continued until the level above was reached. If at any time a part of the back appeared weak, it was supported by a prop. The sandstone used for filling was sent from the level above through a winze. The ore reached the main haulageway through a raise put up from the side of the slate drift and connected with the stope at the working elevation by a crosscut. The ore was trammed from the stope through the crosscut and dumped into the raise, the enlarged bottom of which served as a pocket from which it was drawn into cars. These stopes were large openings reaching from foot to hanging wall and for some distance along the strike. Beneath this immense back the miners worked breaking ore and the fillers trammed sandstone from the chutes.

This filling method had a great advantage over the room-and-pillar method in that there was a lower timber cost and no ore was left behind as pillars, which was more important. On the other hand, it necessitated a great amount of deadwork because of the drifting and crosscutting in the slate and the still greater amount of work necessary to furnish the sandstone filling. Moreover, the ground not only in the old pillars, but also in the main stopes, was very heavy. It was evident that a better and less expensive method of mining was needed for this orebody.

Conditions of Stoping Summarized

By this time the following factors regarding the Chapin orebodies had been determined: The ore was soft, prone to cave and methods of attempting to support it had failed. Not only would the undercut ore cave, but also the adjacent slate, and ultimately all the surface underlain by the caving ore and slate would cave. Any shaft in, or surface structure upon, this caving ground would sooner or later become valueless. Any method of mining that did not take all these facts into account could not be cheap and efficient. It was desirable to adopt a method in which the caving tendency of the ore would assist rather than retard the work. The present methods were adopted in the hope that they would answer all these requirements, and they have served the purpose well.

Combination Top-Slice and Sublevel Caving System Adopted

The working shafts are in either the hanging or the foot wall, and the orebody is approached from these shafts by drift or crosscut as required. The orebody is opened by a drift in the ore running throughout its whole length. This drift is the working level to which all the ore between it and the next level above is sent and along which it is trammed to the shaft and hoisted to the surface. Experience has taught that it is not advisable to make the level openings more numerous or elaborate than actually required because the constant crushing of the timbers makes a large amount of repair work necessary. Levels are laid out 100 ft. apart. The work of developing each succeeding lower level is planned so that the new level will be ready for mining work when the ore is exhausted from the higher level. After the level is laid out, raises are put up from the side of the drift to within about eight feet of the level above, but such of them as are required are holed through to aid ventilation or acquire traveling ways. The raises are generally in ore throughout their length, but there are cases where it is necessary to have part of a raise in slate. At the time the raises are being put up a sublevel is driven midway between the two levels, and connected with the raises by crosscuts. This sublevel affords easier communication between the stopes and facilitates the work of getting timber and supplies to the working places.

The openings are made for the actual mining ore near the tops of the raises and the number of men that can be put at work depends upon the number of raises in which work is being done. Every additional raise entails an additional expense for opening and maintaining. Evidently, then, it is desirable to have only as many raises as are necessary to work the number of men desired. The best practice seems to be to place the raises from 35 to 50 ft. apart. At a point about 15 ft. below the floor of the level above, a crosscut is driven from each raise to both the foot and the hanging wall of the ore. At each end of each crosscut a drift is driven in each direction in the ore. The drift along the foot wall is so located that the bottoms of the outside legs of the sets rest upon or close to the slate, while the hanging drifts are so located that the outside ends of the caps touch, or nearly touch, the hanging wall. If we assume that the raises, and therefore the crosscuts, are 50 ft. apart, then the drifts along either the foot or the hanging wall will meet when they have been driven 25 ft. from the crosscut. However, they are not driven to meet as a thin wall of ore is left. It is at the end of this short drift that the actual stoping of ore begins. As the miner stands at the end of the drift there is a thickness of eight or ten feet of ore in the back above him. He begins work by attacking the ore at the end of the drift. He fills his car as often as possible, and takes the ore back and dumps it into the raise. When he can get no more ore, he shoots out the last set that he put up in the drift, which allows the ground about it to fall from the sides and back, generally of its own weight, but if necessary, it is shaken loose with dynamite. It is then shoveled up and trammed to the raise. Set after set is shot out until all the ore back to the crosscut is mined. In like manner the ore on the other side of the drift is mined. Similar work is done at the end of the crosscut that has gone from the raise to the opposite wall of the orebody. As the ore is thus removed, the thick covering of broken lagging and other waste material that has collected above it settles down and fills the space from which it has been removed. This waste material covers the ore like a mat and keeps it clean. When the miner has taken the ore from around the first drift and has drawn back to the crosscut, he makes a second drift in the same manner as the first except that it is a few feet nearer the raise. The operation is repeated until all the ore is mined back to the raise. At such time as best facilitates the work a second crosscut is driven from the raise about 16 ft. below the one being mined out. The work of crosscutting, drifting and mining is repeated as it was done immediately above. In like manner work is done about all the raises. As mining continues, the orebody is lowered and the lower level is approached in cuts of about 16 ft. each. When the main level is reached, the ore is mined from about it in the same manner; the level really becomes a sublevel when the ore about it is being mined. The nature of the ore makes it advisable to remove the ore between the two levels in about six slices—that is, about 16 to 17 ft. to the slice—which means that from eight to ten feet of ore is drawn from the back of the drift. An attempt was made to divide the 100 ft. into four parts, but the results were not satisfactory.

HAULAGEWAY MAINTENANCE DIFFICULT

The orebody was opened on some of the main levels by two main drifts in the ore, one along the foot and one along the hanging wall, these being connected by crosscuts. It was hoped that this method would enable a more advantageous distribution of the working raises and would facilitate haulage on the level. The objection was that the numerous openings in the orebody made too much repair work necessary.

The methods described are followed in the main, but variations are always made to meet such exceptional conditions as might be encountered. In the work of removing the pillars from the old workings it is often difficult to select suitable sites for raises.

It is not necessary to support the ground around many of the openings for any great length of time; consequently, most of the timber used is small. However, those drifts in the ore which have to be held for some time require considerable repair work, even with the heavy timbers that are used; but they are not made any larger or more elaborate than is necessary. Ultimately they, too, are caved down and mining operations removed to a lower level. No pillars of ore are left behind; no ground is left in such a way that it is liable to cave and ruin the workings; and no great amount of heavy timber is used as with the room-and-pillar method; no great amount of dead work is done as with the filling method, nor is a large body of heavy ground undercut. There are some timber costs, and dead work is done, but both are small in comparison with past methods. Moreover, little or no ore is lost.

Control of Imported-Tin Sales

At the request of the War Trade Board the American Iron and Steel Institute has voluntarily and without compensation accepted the duty of acting as consignee of all importations of pig tin, chloride of tin and tin ore from foreign countries. A sub-committee in pig tin consisting of John Hughes (chairman), E. R. Crawford, John A. Fry, A. B. Hall and Theodore Pratt, with offices at 61 Broadway, New York, has been appointed to act for the institute in an advisory capacity. A bulletin (No. 1) covering the rules, regulations and forms to govern the importation and release of tin, as approved by the War Trade Board, was issued on Nov. 22, 1917. Consumers, jobbers, importers, dealers and producers of tin had added their request to that of the Government urging the institute to act in this capacity, as an insurance against interruptions to their business.

The institute has agreed: (1) To receive applications from consumers, jobbers, importers and dealers, to be approved by the War Trade Board as recipients of tin, and to transmit same to the War Trade Board for its decision. (2) To transmit the approvals, by cable if necessary, to representatives in London, or elsewhere, so that they may coöperate with the exporters, if required, in obtaining export licenses from foreign countries, and in making shipments in accordance with necessary regulations. (3) To supervise importations into the United States and sales therein, through necessary trade channels. All persons desiring tin are required to fill out and execute an application according to forms provided and to forward same to the institute, which will submit the names to the War Trade Board for approval. The original applications are to be filed at the New York office of the sub-committee on tin, and copies of the list of approved names will be filed with representatives of the institute at the Rialto Bldg., San Francisco, at the branch offices of the War Trade Board through the United States, and with American commercial attachés, consular representatives and diplomatic officers in foreign countries from which tin is imported, who are authorized, with custom-house power of attorney, to endorse bills of lading, as required by the U. S. Treasury regulations. These representatives will endorse bills of lading covering importations of tin consigned to the institute only when the guarantee requirements have been satisfactorily fulfilled and the endorsement of such bills of lading has been properly authorized.

All importations of tin from foreign countries are to be consigned to the American Iron and Steel Institute with marginal bill of lading clause reading "notify," followed by the name of the owner. Upon receipt of documents by the importer or receiver in this country, the bills of lading are to be presented to the American Iron and Steel Institute or its nearest authorized representative by the importer, accompanied by an undertaking and guarantee, in one of the forms approved by the War Trade Board.

A record will be kept by the American Iron and Steel

Institute of all importations of tin released to consumers, jobbers, importers and dealers under the guarantees which will show the particulars of importation, indicating the shipper, the importer, the consumer or jobber to whom the tin has been released, and any other data necessary to indicate its final disposition and consumption. Furthermore, on parcels of tin released for jobbing purposes, this branch of the trade will be required to take guarantees from customers and furnish monthly statement to the institute of all sales or forms provided for that purpose, so that the final disposition and consumption of each parcel will be accounted for. Parcels of tin not to exceed 25 gross tons may be released to importers or dealers to carry in stock for resale to consumers in lots of five gross tons or multiples thereof.

The record of the quantities of tin released to each consumer, jobber, importer and dealer will be constantly compared with consumers' and jobbers' actual requirements as reported to the institute, and will be checked from time to time by the Government inspection of consumers', jobbers', importers' and dealers' books and records. Reports at regular intervals will be required from consumers, jobbers, importers, dealers and producers, showing stocks on hand at a given date, actual consumption and other particulars. A compilation of these reports will be made by the American Iron and Steel Institute for the information of the War Trade Board. Since issuing the above-named regulations the Government has commandeered all tin assaying over 99.75%; tin below that grade is not to be attached.

Desert Haulage Problem Solved by Caterpillar Tractors

The cost of transport over long stretches of desert country has long been a barrier to the profitable exploitation of known mineral deposits. For years this was the case with the White Mesa copper mine in northern Arizona. This silicate-of-copper deposit is situated in Coconino County, about 120 miles northeast of Flagstaff, at an elevation of 7000 ft. on what is known as the White Mesa. The deposit is now being worked by the Navajo Copper Co., which has been shipping 15% ore. The deposit is expensive and the ore carries from 2½% upward of copper. It occurs in a white sandstone and the outcrop, about 600 ft. wide, may be traced for 10 or more miles. The present workings are 97 miles from the nearest railroad station, the Arizona Lumber and Timber Co.'s camp No 1, and available water is 24 miles distant. The existence of this deposit has been known for more than 40 years, and several attempts to work it have been made.

About 10 years ago ox teams were used to haul the ore, but the project was a failure on account of the high cost. Two years or so ago motor trucks were given a trial. The road to Gap, 24 miles from the camp, is extremely sandy, and teams were used to this point; motor trucks completed the haul to Flagstaff, a distance of 100 miles, over fairly good roads; but the cost is reported to have been over $100 a ton, and the project was soon abandoned. Tractors similar to the present caterpillar type were introduced later, and the ore was hauled in trains 59 miles to the bridge spanning the Little Colorado River. The remaining 38 miles to the railroad was covered with motor trucks. The work was done under contract and reduced the hauling cost to $35 per ton, a substantial saving over the former method, but at best a high tax on the profits. About this time the engineers of the Holt Manufacturing Co., made an examination of the problem and reported recommendations which have proved successful; according to *Caterpillar Times*, the Holt house organ, the cost of hauling over the distance of 97 miles from the mine to the railroad has been cut to $11.40 per ton.

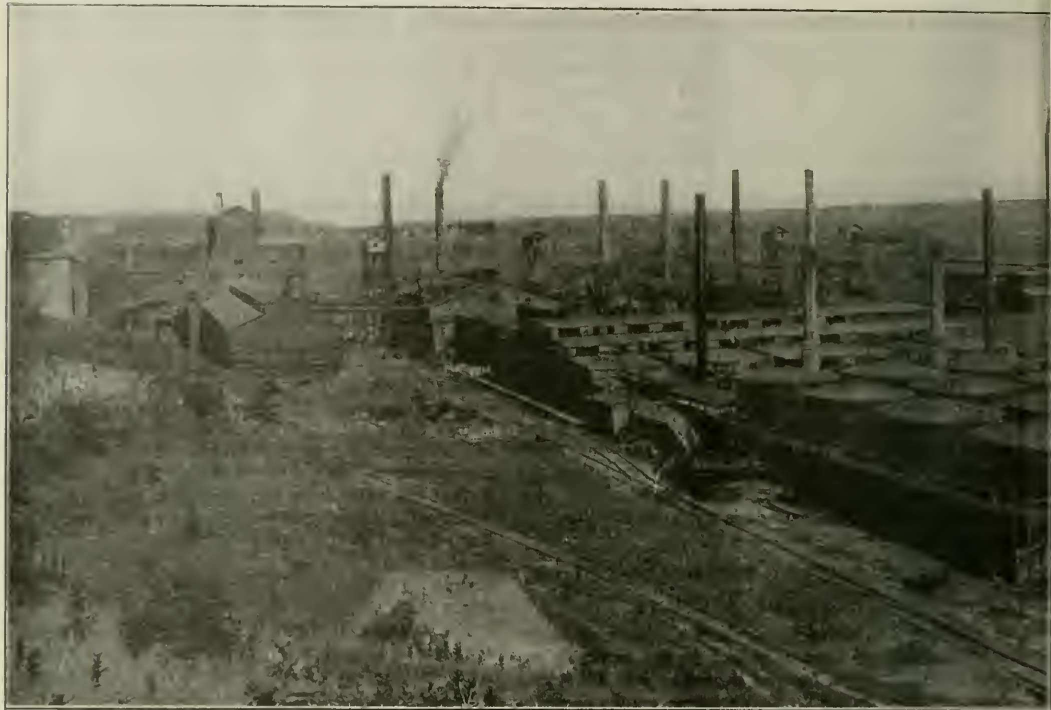
The haulage system adopted provides for a capacity of 1500 tons of ore per month. The route from the mine to the railroad at camp No. 1 is divided into three sections, as follows: From the mine to Gap, 24 miles; from Gap to the bridge, 35 miles; from the bridge to camp No. 1, 38 miles. At the mid-point in each section a relay station has been established. The entire distance is covered by caterpillar No. 75 tractors, hauling wagon trains in pairs. From the mine two tractors with 24-in. tread start daily for Gap with trains of ore. At the same time from Gap two more tractors with 20-in. tread start for the bridge with similar trains. Simultaneously two tractors drawing empties start back toward the mine from Gap. At the relay station midway between the mine and Gap, the four tractors meet, each having traveled a distance of 12 miles. Here, relief operators change shifts with the drivers, and, changing tractors, on account of the tread difference, complete the trips respectively to Gap and to the mine. The same schedule is followed in each of the three sections, the loaded trains being passed on toward the railroad and the empties returned to the mine. Five tractors are used in each section, four being in constant service and one in reserve. The men work 10-hour shifts and each tractor works three shifts per day.

The success of this enterprise in reducing wagon haulage costs to a figure within the limits of profitable operation on 15% copper ore should add materially to the potentialities of many deposits heretofore neglected on account of the transportation problem.

British Guiana Bauxite

The British government is now taking a firm stand with regard to the exploitation of the bauxite discoveries in British Guiana, according to *Empire Trade Notes*, and is determined that the first call on this mineral, the source of aluminum, shall be reserved for the British Empire. The British Empire Producers' Organization has already pointed out that no further applications for bauxite lands in British Guiana are to be granted till after the war. But it appears that the government has gone further than this. A portion of the bauxite won by holders licensed before the above regulation came into force must be placed at the disposal of the British government at a certain price. The government, moreover, reserves the right to limit the export to countries other than British, and at its discretion to prohibit export altogether. A large export shipment to a foreign country of British Guiana bauxite won by a company in which foreign interests are partly represented was recently held up. This determination to conserve in the future the mineral wealth of the empire for the empire is in line with the policy of the British Empire Producers' Organization.

General Views of Mineral Point



ZINC SMELTING PLANT, COMPRISING 9068 RETORTS, AND 250-TON

DISTILLATION PLANT OF THE MINERAL POINT ZINC CO

Zinc Co. Works at Depue, Ill.

ULPHURIC-ACID PLANT OF THE MINERAL POINT ZINC CO.

SUBSIDIARY OF THE NEW JERSEY ZINC CO., AT DEPUE, ILL

Chronology of Mining for November

Nov. 3—Announced that a special mining regiment known as the 27th Engineers would be raised by voluntary enlistment.

Nov. 5—I. W. W. headquarters raided in Tulsa, Okla., oil fields and nine members arrested, subsequent to the dynamiting of the home of J. Edgar Pew, general manager of Carter Oil Co.—Maximum prices approved by the President for cold-rolled steel, wire, tin plate, pipe, sheets and scrap, as agreed upon by War Industries Board and steel producers—Embargo at two Murray sampling mills of Utah Ore Sampling Co. lifted.

Nov. 6—National Fuel Administrator H. A. Garfield issued order requisitioning 10% of output of every coal mine in United States.

Nov. 8—Seventeen I. W. W. members flogged, tarred and feathered in Tulsa, Okla., by a band of masked men.

Nov. 12—Osage Indian Oil leases covering area of 20,000 acres sold.

Nov. 15—Law regulating manufacture, sale, storage and use of explosives became effective, F. S. Peabody being appointed to take charge of its enforcement.—Report that United States Government is arranging with silver producers of this country for purchase of 100,000,000 oz. at price around 85 cents.

Nov. 17—Oliver Iron Mining Co. announced that part of town of Hibbing, Minn., will be removed to facilitate mining of underlying orebody.

Nov. 18—The Mexican government during this week prohibited any new denouncements of mining claims.

Nov. 20—In Butler County oil fields of Kansas, 50 I. W. W. workers were arrested in connection with labor troubles.

Nov. 25—Mexican decree issued establishing damage claim bureaus to adjust claims arising during the revolution.

Nov. 26—U. S. Government attaches all tin assaying over 99.75% stored in warehouses.

Nov. 28—President Wilson proclaimed sundry imports, including many metals and ores, subject to license.

Nov. 30—Price of tin at New York jumped to 88c. per lb.—President's Mediation Commission during this week announced an agreement between operators and miners in Jerome district similar to one made in Globe-Miami and other Arizona districts

Ontario Metalliferous Production

The Bureau of Mines of Ontario furnishes the following statistics regarding the production of the metalliferous mines and works of Ontario for the nine months ended Sept. 30, 1917. For purposes of comparison, figures for the corresponding period of 1916 are also given. Notwithstanding the falling off in the output of gold, silver and copper, the aggregate value for the nine months was, according to the report, about $2,000,000 more than for the same period in 1916. High prices for silver, copper and nickel are largely responsible for this increase.

The gold output for the first nine months of the year was about 20,000 oz. less than for the corresponding period of 1916. Of the total production, the Hollinger mine yielded 161,702 oz.; McIntyre, 59,779 oz., and Dome, 58,978 oz. Gold, having a fixed price, was the only metal which did not share in the general advance. The high costs of labor and supplies have, for the time being, lowered the rate of expansion for this branch of the industry.

Shipments of silver from various important mines were as follows: Mining Corporation of Canada, 3,831,211 oz.; Nipissing, 2,839,462 oz.; Kerr Lake, 1,708,921 oz.; Coniagas, 976,315 oz.; O'Brien, 925,000 oz.; McKinley-Darragh-Savage, 775,566 oz.; Miller Lake-O'Brien, 757,132 ounces.

Production of nickel and copper shows that the nickel contents of the mattes for the nine months of 1917 were a little larger than for the same period in 1916, but the copper contents were about 1000 tons less. The International Nickel Co.'s new refinery at Port Colborne is well under way, and is expected to be turning out refined nickel before next spring. The mines of Sudbury are now, and have been for some time, working at maximum capacity.

SUMMARY OF ONTARIO METALLIFEROUS PRODUCTION, FIRST NINE MONTHS OF 1917

Product	Quantity 1916	 1917
Gold, oz	363,955	343,490
Silver, oz	16,203,091	15,236,002
Cobalt (metallic), lb	172,055	295,866
Nickel (metallic), lb	17,435	166,921
Nickel oxide, lb	54,152	10,831
Cobalt oxide, lb	378,732	276,769
Other cobalt and nickel compounds, lb	57,026	276,217
Molybdenite, lb	15,845	65,827
Copper ore, tons	1,715	2,658
Nickel in matte, tons	31,046	31,064
Copper in matte, tons	16,989	15,928
Ire ore (exported), tons	*	98,757
Pig iron from domestic ore, tons	*	48,820
Lead, tons	*	540

* 1916 figures are not available.

The iron ore and pig iron statistics show that, in addition to ore exported, 138,808 tons were shipped to Ontario smelters. Of the total of 983,321 tons of ore smelted, only 93,536 tons, or 9.5%, was Ontario ore. The total pig iron produced was 513,232 tons, as compared with 501,410 tons for the corresponding period of last year.

Foreign Trade in Copper

Exports of copper from the United States in August, September, 1917, and the first nine months of the year, are reported by the Department of Commerce to be as follows:

	Aug Lb	Sept Lb	Jan.-Sept Lb
Ore and concentrates, contents	351,420	444,684	4,300,492
Unrefined, in bars, pigs, etc		2,017,818	6,164,637
Refined, bars, etc	95,733,812	60,601,801	789,430,395
Old and scrap	29,752	4,347	889,714
Plates and sheets	1,642,529	2,817,476	23,915,037
Pipes and tubes	2,289,320	570,999	*5,642,574
Wire, except insulated	1,425,638	667,310	18,998,550
Composition metal, copper chief value	8,400	1,179,589	*1,187,996
Total	101,480,871	68,304,046	850,549,415

* Figures cover period beginning July 1

The weight of ore exported in September was 4472 long tons, and of concentrates, matte and regulus, 283 long tons.

Imports of copper in August, September and the first nine months of 1917 were as follows:

	Aug Lb	Sept Lb	Jan.-Sept Lb
Ore and concentrates, contents	11,814,430	13,279,521	111,647,770
Matte and regulus, etc	1,632,918	3,613,346	16,504,106
Unrefined, in bars, pigs, etc	34,546,504	21,409,698	271,163,555
Refined, in bars, etc	1,395,268	620,752	6,025,620
Old, etc., for remanufacture	464,068	752,254	16,016,099
Composition metal, copper chief value	161,176	13,997	367,072
Total	50,014,564	39,689,568	421,724,222

Ore imported in September weighed 36,222 long tons; concentrates, 12,976; matte and regulus, 2631 long tons.

Correspondence and Discussion

Is Gold Mining Necessary During the War?

I understand that there is a movement afoot to ask Government officials and Congress to adjust the war tax so as to stimulate gold production in the United States. I ask, Is this action wise? Do we really need to produce gold to help win the war? Is it not coal, iron, copper, lead, spelter, and possibly silver, that we need? Is it not better that our gold miners, for the duration of the war at least, engage in mining those things that we really need?

I observe that the president of the Dome Mines, Ltd., has issued a notice to the stockholders and the public stating that, on account of the high cost of supplies and the difficulty of securing labor, their mines will cease production for the present.

It may be quoted in objection to my point that Great Britain is doing all she can to stimulate gold production in the Rand. I am quite willing to admit the sentimental or even the commercial value of increasing the gold reserves of Great Britain, but I doubt if she would encourage the production of that metal in Great Britain itself. It is very different in South Africa where there is an organization engaged in producing gold which has no other industry upon which it can fall back, but in the United States and Canada it does not seem to me that these conditions exist. J. PARKE CHANNING.

New York, Dec. 3, 1917.

Folly of Temporizing with the Saloon Propaganda

The article entitled "Some Observations on Arizona Strikes," by Charles F. Willis, which appeared in the *Journal* of Oct. 13, seems to be the first direct discussion appearing in this magazine of what the working classes consider the big problem of the time, and the one to be fought out as soon as the present squabbling of nation against nation is over. Remarks about the usefulness of the saloon inspire me to state how the question appeals to one who has worked among the miners as a miner in most of the principal mining camps of the continent, and has given particular thought to the cause and remedy of the unrest among the wage-earning classes.

ENVY THE ROOT OF SOCIAL DISCONTENT

Fundamentally this discontent is based on that conspicuous trait of human nature, envy. We resent seeing another person have what we would like to have. We see him sail by in his automobile, and cannot understand why he should have one and we not. We miners resent that the college graduate, fresh from school, so readily passes the practical miner, and that as opportunities to the college man for advancement increase those for the miner decrease. We cannot see how the man with the fine home or the auto got these things, and we feel sure that all the learning acquired by the college man at school is not really as valuable as our years of practical experience. We only know that we are down and cannot seem to get up.

In past generations children were told that it was proper for the king to have all his pomp and accommodation, because he was king. It was natural to feel that this was proper and even to feel a pride in him, much the same as we now feel a pride in our splendid public buildings. The landlord should ride in a coach because he was rich, or the official should be decked out and ride because of his position. They felt no resentment because the class to which they belonged had its limitations. There was no class preaching that these more fortunate ones derived their superiority from the sweat of our brows, or if such thoughts were expressed we were educated to think otherwise. If some of the present generation were old-fashioned enough to attend Sunday school, we were probably taught that envy was a sort of sin—or at least we learned something of the folly of letting it breed hate against those more fortunate. At present it is more likely that children hear their parents preach the injustice of existing economic conditions, so that their first idea is that the social arrangement of today is all wrong. In recent years, particularly, we have been told from street corners and in saloons that the rich gained their wealth by dishonest means, that wealth is an indication of theft, and that the poor laboring man has been robbed to feed the stockholder of the rich corporations.

EVIL RESULTS OF APPEALS TO CLASS HATRED

Why this recent increase of unrest among hired labor? Beginning about 1906 and 1907 (thanks to the wave of prosperity that swept the country at that time) a few magazine writers found it immensely profitable to exploit a field of literature which had not been overworked and to write most appealing and sensational tales of the poor laboring class being downtrodden by the powerful and rich classes above. Many daily papers were quick to realize that the subject appealed to the mass of the people. There was enough truth mixed with the chaff to attract the average person, and the ranker the chaff the greater its influence upon some elements. Then there are politicians always seeking to gain votes by class propaganda and at this particular time it seemed as if every type of politician or representative of the people had enlisted in the trust-busting escapade.

It is the nature of many, especially among the more ignorant, to wish to be convinced that those things are true which they would be pleased to have true, but which their own minds realize are not so. The weight of statements from other persons finally breaks down their personal judgement, and they chronically force themselves to believe what they do not want to hear refuted. Modern socialistic propaganda—pleasing to this type of mind, conceived and promoted by those who know better, and persisted in because of the advantage in it to themselves—is the root of the present unrest.

Many of the malcontents do not read the current newspapers at all and those who do not receive this balancing influence are the most prejudiced and unwilling to take any other view than that capital is the cause of all suffering and poverty. How have they reached this state of mind? It has surprised me to find so many miners who appear intelligent, good workers, and apparently reasonable in most things, display such a lack of reason when it comes to questions of social economics or politics that it would seem impossible to believe that such ignorance and prejudice could exist. The condition shows that any propaganda can convince the masses if persisted in and not neutralized by corrective educational influences.

There are probably more politics and economics taught in the saloon than anywhere else, and it is all of the false, socialistic sort. The saloon-keeper preaches the doctrine that "the dollar is round and made to go around." Therefore, spend your money, boys; and if the cursed capitalist were only made to do the same, how much happier we should all be! The more men it takes to do a job, the more jobs for all the boys and the more drinks to be bought every evening. Thus the feeling has been created that it is treason to his class for a workman to do more than the least possible.

It is in the saloons that public questions are discussed most often by the workingman, and frequently elections are thus won or lost. Here reason is at the minimum but minds are receptive, especially to the popular clamor that all should share wealth equally, and not allow the fellows who never come out among the boys to get it all. The saloons take up the dirty work which the periodicals began and the cheap politician is carrying on, each spreading lies for its own gain or patronage. Many men, lacking sufficient reason to discriminate, often become loyal followers, their hatred for the upper classes and their general discontent becoming a part of their nature. So long as some people, smarter than those they are working on, can benefit themselves by spreading hate, falsehoods and dissatisfaction, one must expect growing unrest unless this influence is balanced by education along opposing lines.

Proper Educational Work Indispensable

If these are the causes, what is the remedy? Education is the only remedy. First the periodicals must run dry. People must become immune to the incessant hammering about the hardships of the "poor abused laboring man." The papers should take up other themes and should explain the real causes of poverty and failure, the high cost of living, etc., which it has been so popular to lay to the "trusts."

It is hard for enlightened persons to understand how it is possible to deceive so many of the people all of the time or practically all the people so much of the time; how questionable publications or dishonest propaganda can make headway against the obvious truth; for we are not permitted to observe the method by which public sentiment often is molded for some one's personal gain. We feel immune from that sort of influence, yet none of us is wholly free from it, susceptibility being in ratio to understanding and reasoning power.

Men need to get out among other men, not only of their own stamp, but of other classes who may look at matters from different viewpoints. Here is the good and the bad of the saloon. Men get together and exchange ideas in the saloon, but, after all, they are all of a type. Only one class patronizes these resorts to any extent. Here mental attitudes of the most vicious sorts are cultivated and minds are filled with false impressions. The saloon may be a temporary relief to the troubled mind, but it is the breeder of chronic disease. To close the saloon will not change the mental attitude of the old patrons who spent evening after evening telling how the big, brutal company was getting rich out of the sweat of their brows, but it will stop the poisoning of new minds. Young men growing up will have a chance to see things as they are. Their ambition will not be sapped by drunkenness. Their time and money will be spent in less demoralizing recreations. If not baseball or other athletics, there is the bicycle, the motor-cycle and the automobile.

Many Substitutes for the Saloon

Mr. Willis is afraid there can be no substitute for the saloon. To feel that this is the best place the miner can enjoy his evenings, simply because this is the way he has been spending them, is to shut one's eyes to all the possibilities open to him. There is the home, with books and magazines; social association with his neighbors; the club; the church; the soft-drink and ice-cream parlor; the movie show; the community house; athletic attractions; the garden, or a little travel. If a man is married the home deserves about all the spare time he has. If he is not married and has no motor-cycle or automobile or other affinity, there are generally as many unmarried females looking for men as there are men looking for female companionship. Only degenerate specimens of humanity need become dependent on the saloon, and it is not worth while to poison the whole for the sake of allowing these to continue in their favorite element.

In the opinion of one who has studied the miners from first hand for the last 10 years the yellow journal, the saloon, and the cheap politician are the causes of the present unrest. The removal of one or two of these conditions will gradually bring about a more healthy state as new generations take the places of the elements now infused with the more rabid socialistic notions. The better-educated class should do something to counterbalance the effect of self-seeking agitators.

A Technical Miner.

Hibernia, N. J., Nov. 15, 1917.

Engineer Artillerymen

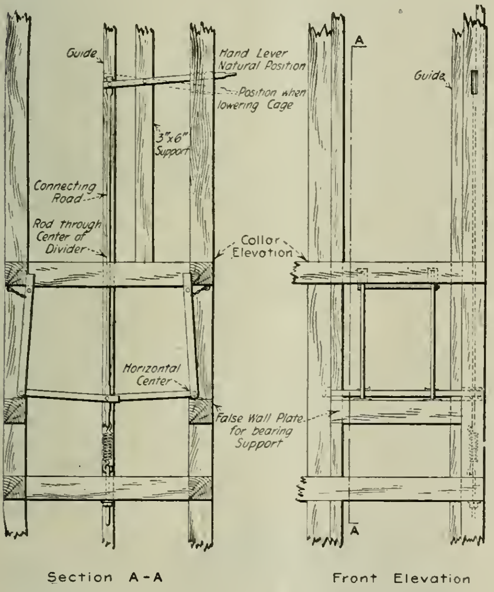
I would like to call attention to two exceptionally comprehensive books on field artillery drill and fire practice that are available either by purchase or from the Carnegie libraries. Any engineer who is not subject to draft but who may be before the war is over can put in his spare time studying these books to advantage and with interest. The books are of 1917 publication and up to date. They are "Drill and Service Regulations for Field Artillery" by the Chief of Staff, published by the Military Publishing Co., 42 Broadway, New York; and "Field Artillery Detail," by Moretti and Danford, published by the Yale University Press.

New York, Dec. 4, 1917 H. W. Kitson.

Details of Practical Mining

Cage Chairs for Shaft Landings

By W. F. Fancy*


Guide
Hand Lever Natural Position
Position when lowering Cage
3"x6" Support
Connecting Road
Rod through Center of Divider
Collor Elevation
Horizontal Center
False Wall Plate for bearing Support
Guide
A
A
Section A-A
Front Elevation

CAGE CHAIRS FOR SHAFT COLLAR

In a development which had to be carried on through winzes, owing to the nature of the formation, because there was not enough hoisting to warrant a cage tender the chairs shown in the illustration were designed primarily for the collar of the winze. The arrangement indicated calls for a spring bolted to one of the wall plates below the collar set. This spring is under constant tension and is fastened to a connecting rod, which is bolted to the operating lever at the landing station. The chairs proper consist of two pairs of supporting arms, each pair keyed to a shaft which is linked to the connecting-rod. When the cage is resting on the chairs, the entire weight is taken by the four supporting arms, which, in turn, are supported by iron plates resting on false wall-plates so that the remainder of the mechanism is released from all unnecessary strain. With the operating lever in its natural position, the tension of the spring throws the connecting-rod down and forces the chairs "out" into the shaft. When the cage is hoisted, it will pass through the chairs, but on lowering, the chairs will have to be thrown "in" from the shaft before the cage can be lowered beyond the collar. This latter operation is performed by pushing down the lever.

These chairs have been in use at the Lake mine, Ontario, for months and are giving excellent satisfaction. By means of a cable leading from the lever over a small sheave to the hoist room, the hoistman can withdraw the chairs from the shaft when necessary. While this method has not been tried out on intermediate levels, it should be simple to reverse the spring and produce an opposite action of the chairs which would keep them "in" instead of "out."

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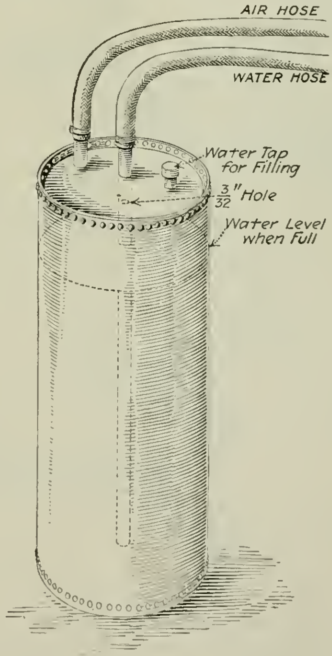
*Mine Captain, Lake Mine, Cobalt, Ont.

An Improved Water Tank for Machine Drills

The common form of tank for supplying water to machine drills may be improved by a simple alteration that makes the water supply to the drill hole more effective in blowing out the sludge. In ordinary operation when the tank is filled with water and the drill running the air pressure in the tank forces the water through the water hose to the drill and into the drill hole. While the water is effective in allaying dust and will wash out holes in hard ground which point upward, the pressure is not strong enough to clean downward-pointing holes, or holes in ground that makes a sticky sludge. To remedy this, a simple change was made,

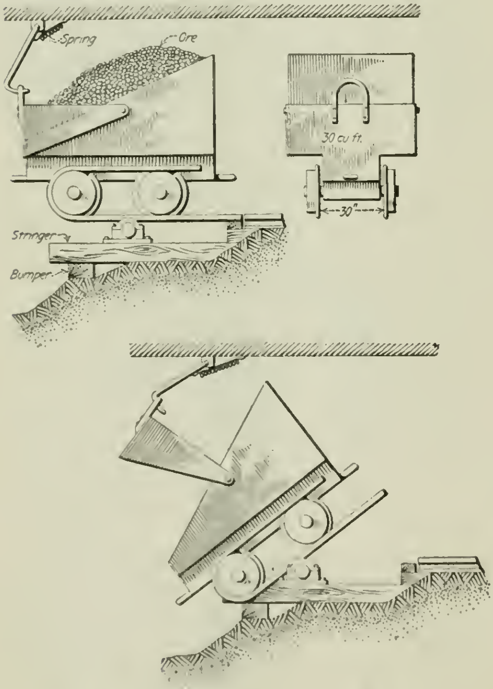


WATER TANK FOR MACHINE DRILLS

which works satisfactorily and is shown in the accompanying illustration. A $\frac{3}{32}$-in. hole was drilled in the water-feed pipe above the highest water-level, so that as the air pressure is applied to the tank, bubbles of air enter the water as it passes through the pipe to the drill. These bubbles of air burst when they reach the bottom of the drill hole and the mixture of air and water is more effective in throwing the sludge out of the hole than the water alone. The hole in the water pipe must be small in order not to admit too much air, which would reduce the pressure on the water.

Two-Ton Car and Tipple

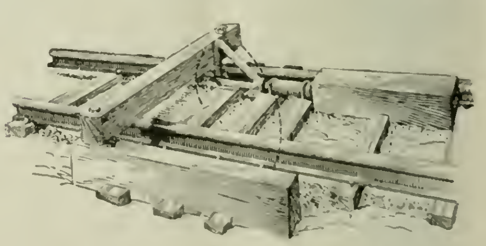
A car of unusual shape is used with a tipple at one of the mines in the Southeast Missouri disseminated-lead district, where the cars are loaded in the stopes by Myers-Whaley underground electric shoveling machines and trammed by mule to a storage pocket. The cars are heap-loaded to maximum capacity, hold from 1½ to 2 tons of crude ore, and are equipped with Whitney Wonder roller bearings. Track is 30-in. gage, with 30-lb. rail. The car-box bottom is set rigidly to the journals, the wheels being sunk into shoulders at the sides of the car bottom in order to gain greater capacity. The sides of the car are in the shape of a right-angle triangle, as shown in the accompanying sketch. At about the center of the hypothenuse a gate with triangular sides is hinged, which, when closed, forms the front and sides of the head end of the car. A large round-iron loop or yoke is riveted to the top of the car gate, the purpose of which is to engage a hook suspended from an eyebolt in the roof above the tipple. The tipple consists of two U-shaped flat iron bars rounded to engage both wheels on each side of the car and is pivoted directly below the rail bar by an axle set in journal boxes resting on stringers. The lower end of the U forming the track of the tipple is made sufficiently long to preserve a normal position with respect to the track when empty and rests upon a tie at the extremity of the car track. The cars are run into the tipple at a fair rate of speed, the mule stepping to one side after being unhitched and the car being braked by means of a sprag. As the loaded cars enter the tipple the gate loop passes over the hook and the center of gravity of the car moves beyond the axle of the tipple, causing it to overbalance with the car, thereby raising the gate and discharging the contents into the pocket. The angle of dump is governed by a bumper timber set below the outer end of the tipple at the required distance. The discharged car and tipple remain in the position of dumping until righted by hitching the mule to the rear-end coupling and drawing the car and tipple back to a normal position. The suspended hook is returned to its normal position by a coil spring attached to it by a clamp and to the roof by an eyebolt. The spring prevents the hook from slipping out of the gate yoke while dumping. Cars are dumped in this manner with considerable rapidity and have the advantage of a large capacity for the weight of the car, its track gage and the amount of head-room available at the discharge belt of the power shovel



SELF-DUMPING TIPPLE AND MINE CAR

Safety Car Stop

A car stop that has been found convenient for use on steep grades in the Alberta district, Canada, is described by M. Cranston in *Coal Age*. Occasionally loaded cars will bump against the stop, and on certain types of stops when the trip does this it is necessary to push them back again, in order to secure sufficient room to open the stop block and pass the trip over the knuckle. With the stop shown in the illustration, this labor is avoided, since by simply turning the bar to the right and pulling the block over by the ring, clear of the rail, the trip is released.



CAR STOP FOR USE ON HEAVY GRADES

The stop is made of 1½-in. steel bar working in a sleeve secured to the ties. A bolt is fastened in the block near the ring to prevent the bar going over too far. This safety stop is quite simple in construction and can be made from material that could not be utilized for any special work.

Events and Economics of the War

Immediate war upon Austria was asked by the President in his message to Congress which reopened at noon on Dec. 3. The budget for the fiscal year 1919 was presented by Secretary McAdoo to both Houses upon reassembling and is estimated at 13½ billions. The stamp and parcels-post taxes imposed by the War-Revenue Act became effective Dec. 1. By order of the President, the importation of many articles will hereafter be subject to license. In an effort to ease the coal situation, producers throughout the country have been asked by the Fuel Administrator to give priority to orders for coal for plants doing Government and other essential work; the price of anthracite has been advanced 35c. per ton by the President. The railroad brotherhoods and railway telegraphers have made specific demands on the roads for wage-increases, the former requesting an answer by the end of December.

In France, a German counter-attack south of Cambrai regained a small part of the ground lost, the British forces retiring from Masnieres. Berlin claims 4000 captured in the operation. The Allied war council held in Paris has concluded its deliberations. The Italians stand fast on the Piave, but a greater Teuton offensive is expected. The Bolsheviki have met with partial success in their endeavors to bring about an armistice on the Russian front, and have published what is alleged to be Italy's treaty with the Allies, giving the terms upon which she entered the war.

Stamp Taxes of War-Revenue Act Now Operative

The new stamp taxes imposed by the War-Revenue Act, including those on parcel-post packages, became effective on Dec. 1. The documents affected by the new taxes are as follows: Bonds of indebtedness, debentures, or certificates of indebtedness; bonds of indemnity and surety; capital stock issues; capital stock sales or transfers; produce sales on exchanges or boards of trade; drafts or checks payable otherwise than at sight or on demand; promissory notes; conveyances, deeds, instruments conveying lands, tenements, or other realty; entry of goods at Custom House; entry for withdrawal of goods from Customs bonded warehouse; passage tickets; proxies; and powers of attorney. Parcel-post packages on which the postage amounts to 25c. or more are subject to a tax.

The new documentary stamps may be purchased from the Collectors of Revenue of the various districts, and in due time will be on sale at post offices and at the various banks designated as United States depositaries.

Proper cancellation of a stamp is thus described: Whenever an adhesive stamp is used for denoting any tax, the person using or affixing same shall write or stamp, or cause to be written or stamped thereupon, the initials of his or its name, and the date upon which the stamp is attached or used. If the stamp is of the value of 10c. or over, three parallel incisions with a sharp instrument should also be made lengthwise so that the stamp may not again be used. Proper perforations are permissible in lieu of the incisions mentioned. The penalty provided for violation of the law is a fine of not less than $100 for each offence.

The War-Revenue Act was approved by the President on Oct. 3. Some of the taxes provided for, including those on hard and soft drinks, incomes and excess profits, have been in effect since that date. Many others directly touching the majority of persons became effective on Nov. 1 and postage rates on letters and cards were advanced on Nov. 2 pursuant to the law. Except for the increased rates on second-class mail, postponed until July 1 next, the entire act is now in operation. Samuel Untermyer, of New York; John Barton Payne, of Chicago, and A. A. Ballantine, of Boston, have been appointed legal advisers to the Commissioner of Internal Revenue in connection with the War-Revenue Act. They will serve without compensation.

Industrial Unrest in Great Britain

The report of the British Commission of Inquiry into Industrial Unrest, which has been reproduced in a bulletin of the U. S. Department of Labor, emphasizes as the leading cause of discontent the fact that the cost of living has increased disproportionately to the advance in wages and that food distribution is unequal. Another cause regarded as particularly serious is the restriction of personal freedom under the Munitions of War Acts, by which workmen have been tied up to particular factories and have been unable to obtain wages in proportion to their skill; in many cases the skilled man's wages were less than those of the unskilled. The requirement of leaving certificates was reported as one of the chief causes of dissatisfaction, but this restriction has been abolished by an order of the Minister of Munitions, and any munitions worker may now leave his present employment for other war work by giving a week's notice, or such longer notice as is provided for in his existing contract of service.

Dilution of labor and lack of confidence in the government growing out of the surrender of trade-union customs and the fear that promises regarding the restoration of pre-war conditions will not be kept, are given special attention. It is stated that the irritation caused by the withdrawal of the trade-card scheme under the Military Service Acts has subsided, but there remains much anxiety regarding the working of the schedule of protected occupations. All the reports refer to the lack of coördination between government departments in dealing with labor, and considerable complaint on account of the delay in dealing with disputes and the difficulty of securing prompt awards is reported.

Other causes of unrest, such as inadequate housing, liquor restrictions, and industrial fatigue, are mentioned as acute in some districts. Mention is also made of lack of proper organization among the unions, inconsiderate treatment of women as regards wages, delay in granting pensions to soldiers, and inadequacy of compensation under the Workmen's Compensation Act.

The Commissioners recommend that there should be an immediate reduction in food prices, the increased cost of food to be borne to some extent by the government, and that there should be a better system of distribution. The necessity of reducing hours, readjusting wages to a fairer basis for skilled as against unskilled workmen, the fuller use of trade-union machinery, and renewal by the government of the declaration that trade-union rights and privileges which have been interfered with on account of the war shall be restored after the war, are insisted upon. The establishment of industrial councils for each of the organized trades is strongly urged, such councils to be composed equally of employers and employees. Regarding the settlement of disputes, various suggestions are offered, to the effect that one central authority should be constituted, that local arbitration tribunals should be formed, that local commissioners with technical knowledge to settle disputes should be appointed, and that workshop committees should be established. It is also recommended that when an agreement is drawn up between representatives of employers' federations and trade-unions it should be binding on all in the trade concerned.

Embargo Placed on Imports

By proclamation of the President on Nov. 28 an embargo was placed on the import of many articles into the United States except under license granted by the War Trade Board. Among the number are included the following:

Antimony, antimony ore, or any chemical extracted therefrom; asbestos, balata, chrome, chrome ore, or any ferroalloy or chemical extracted therefrom; cobalt, cobalt ore, or any ferroalloy or chemical extracted therefrom; industrial diamonds, all ferroalloys, gutta joolatong, gutta percha, gutta siak, iridium, manganese, manganese ore, or any ferroalloy or chemical extracted therefrom; mica, molybdenum, molybdenum ore, or any ferroalloy or chemical extracted therefrom; naxos emery and naxos emery ore, nickel, nickel ore, matte, or any ferroalloy or chemical extracted therefrom; sodium, potassium, or calcium nitrates, optical glass, platinum, plumbago, pyrites, rubber, raw, reclaimed, waste or scrap; scheelite, spiegeleisen, tin in bars, blocks, pigs, or grain, or granulated; tin ore and tin concentrates, or any chemical extracted therefrom; titanium, titanium ore, or any ferroalloy or chemical extracted therefrom; tungsten, tungsten ore, or any ferroalloy or chemical extracted therefrom; vanadium, vanadium ore, or any ferroalloy or chemical extracted therefrom; and wolframite.

Priority Asked for Coal Needed for Essential Industries

Requests have been sent out by the U. S. Fuel Administration to 5000 operators representing virtually all of the coal production of the country, except that of the Rocky Mountain region, asking them to give preference for 30 days on all shipments for Government account, railway fuel, domestic requirements, public utilities, munition plants, steel plants, byproduct coke ovens and tidewater shipments to New England. This in effect is a curtailment of coal shipments to the less essential industries, says the *Sun*. The filling of contracts will begin with the industries named. The others will have to wait until the war needs are satisfied, if the request of the Fuel Administrator is honored. In some cases it is possible that the coal operators in acceding to Dr. Garfield's request will fail to fulfill some of their contracts to the industries not included in the preferential list. They will be safeguarded against liability, however, since their action will be at the instance of a Government agency.

Eastern Railroads Pool Tracks and Equipment

The committee appointed by the Railroads' War Board to put into operation the plan to pool tracks and equipment of Eastern railroads for the period of the war took radical action to facilitate transportation at its first meeting on Nov. 28, according to the *Times*.

Orders were issued affecting the various railroads operating in the territory east of the Mississippi and north and south of the Ohio and Potomac Rivers as follows:

To embargo immediately the shipment of all export steel billets, bars, plates, scrap and pig iron, except that intended for the use abroad of the U. S. Government.

To divert all through freight which would normally pass through the congested Pittsburgh gateway between the East and the West to the railroads north and south of that district.

To discontinue the Pennsylvania's fast New York-Chicago train, the Broadway Limited, effective Dec. 1.

To suspend immediately the running of fast freight lines.

To furnish only box and stock cars for team track loading of coal.

Denial that the proposed plan of operation contemplated a pooling either of traffic or earnings was made by Fairfax Harrison, chairman of the Railroads' War Board, who explained that what the roads are attempting to do is not a violation of the Interstate Commerce Law inasmuch as it is only a partial pool of their physical facilities.

"We have merely arranged for the use of physical facilities in common at places and to the extent necessary to enlarge sufficiently the capacity of the Eastern railways," said Mr. Harrison. "If the word 'pool' is applicable, what we have partially pooled are the physical facilities."

Effect of the War on Manufacturing

The effect of three years of war upon the manufacturing industries of the United States can now be measured, in some degree at least, by official data which render possible comparison of conditions in 1917 with those of 1914. An analysis by the National City Bank of New York of figures of export of manufactures compared with those of 1914 indicates a wonderful development in the exports and evidently a large growth in the manufacturing industries of the country in that short period. Manufactures exported in the first nine months of 1917, for which figures are now available, are more than four times as great in value as in the same months of 1914. Finished manufactures ready for consumption exported in the nine months ended September, 1917, amount to $2,063,000,000, against $466,000,000 for the same months of 1914. Manufactures for use in manufacturing are $957,000,000, against $262,000,000 in the corresponding months of 1914. Thus the total of manufactures exported in the first nine months of 1917 is $3,020,000,000, against $728,000,000 for the corresponding 1914 period.

While this large increase occurs, to a considerable extent, in strictly war material, it also applies to a large proportion of the classes of goods produced by our manufacturers. No official census of manufactures in the United States has been taken since 1914, but the large increase in production is illustrated not only by the increased imports of manufacturing material and increased exports of manufactures, but also by the fact that the quantity of pig iron produced in the country in the eight months ended with August, 1917, was 25,660,000 tons, against 16,355,000 tons for the same months of 1914, and that the quantity of cotton used by the factories of the United States has increased approximately 25% in the same period indicates that the actual quantity of manufactures turned out has enormously increased, while the advance in prices has still further increased the total value of the output as compared with the pre-war period.

Navy Releases Seized Tin

Protests of canners against the recent act of the Navy Department in commandeering all tin in New York warehouses have been met with promises that the tin would be released. The canners were backed by the Department of Commerce, which maintained that essential industries would be handicapped seriously by lack of the metal, particularly food-canning factories.

The American Iron and Steel Institute, designated by the War Trade Board as consignee of all imported tin, will endeavor to obtain another supply for the Navy's needs, and in future the Navy will look to an institute sub-committee for tin needed in naval construction. It was said this agreement would put the tin supply of the entire country under centralized control, thereby assuring allotments to Government departments and private individuals on an equitable basis. Further easing in the visible supply of the metal is expected to result soon from cable negotiations now being carried on by the Department of Commerce with London, seeking the release of approximately 3500 tons of tin purchased by American firms, but which had been held up by the British committee regulating exports of the metal.

Put Electric Roads on War Footing

The American Electric Railway Association has announced the creation of a war board to operate the electric railways of the country, especially suburban and interurban lines, during the war in coöperation with the steam roads. The Railroads' War Board, in charge of the war operation of the steam lines, has suggested that the electric lines can do much good in supplementing the transportation service of the steam lines by extending their freight hauling, especially in the carrying of food from farms to cities.

The steam roads have also announced an approaching material further curtailment of passenger trains, and it is the intention of the electric railways to replace the service of curtailed local trains. The steam roads have supplied the Government with a list of some 400 or 500 nonessential commodities for embargo, and the electric lines believe they will be able to handle some of this business.

There are 41,000 miles of electric railway in the United States, of which 16,000 is interurban. It is this latter of which the greatest use will be made in increasing the transportation facilities of the Government. It is the purpose of the managers of the electric roads to arrange with the steam roads a system of interchange of traffic, and it is understood that the steam roads are ready and willing to enter into such an agreement. C. Loomis Allen, ex-president of the American Electric Railway Association, has been named director of the association's war board.

Must Not Handicap American Vessels

"The removal of all inequalities and injustices from the American navigation system, enabling American shipping to maintain itself upon an equitably competitive basis with other nations, with due regard to American standards of living and compensation, is absolutely essential to the permanency of the forthcoming rehabilitation of the American merchant marine," asserts the National Foreign Trade Council in a resolution submitted to the U. S. Shipping Board. Accompanying the resolution is a report prepared by the council's committee on merchant marine, and signed by James A. Farrell, chairman of the council, and president of the United States Steel Corporation, and P. A. S. Franklin, president of the International Mercantile Marine Co. Edward N. Hurley, chairman of the Shipping Board, is a member of the council.

The report calls attention to the fact that six months after the proclamation of peace the emergency powers delegated to the President end, and that five years after the end of the war all operation of merchant vessels by the Emergency Fleet Corporation must cease. Thereafter the Shipping Board "may sell, lease, or charter" Government vessels to private citizens, and must not undertake their operation through Government agencies until after a bona fide effort to secure their operation through private enterprise has failed. The report continues:

"The question, when peace comes, will be of operation rather than of provision of more ships. The shipbuilding industry of the country, enormously stimulated by war conditions, will face curtailment rather than further expansion. The huge development for construction of wooden ships, made possible only by war and the ravages of the submarines, must be almost wholly abandoned or reorganized for other services."

Price of Anthracite Advanced

A general increase of 35c. a ton was added to the price of anthracite at the mines on Dec. 1 by President Wilson to meet a proposed wage increase for anthracite miners. The new prices were effective immediately. The wage increase was agreed on by operators' and miners' representatives in Washington three weeks ago, contingent on higher coal prices to absorb the raise. When their negotiations were ended the operators and miners turned over to the Fuel Administration their agreement and estimates of what it would add to the cost of production. They asked that prices be raised at least 45c. a ton. Dr. Garfield stated, in recommending the advance to the President, that he expected it would be possible to order, April 1, 1918, the customary reduction in anthracite prices.

Industrial News from Washington

By Paul Wooton, Special Correspondent

Work at the Experiment Stations of U. S. Bureau of Mines

Experiments have been started at the Salt Lake City station of the U. S. Bureau of Mines on the flotation of certain oxidized minerals which so far have not been successfully floated and recovered from their ores. The tests on chloride volatilization of lead and other low-grade ores that are being made on a large scale are reported to be progressing satisfactorily. No difficulty has been found in volatilizing lead, copper and gold, but to obtain similar results with silver and zinc has been found to be an entirely different matter.

Crushing machinery and other equipment have been installed at the Moscow station, in Idaho, for conducting tests. At present, experiments are being made on Cœur d'Alêne ores. The Tucson, Arizona, station has obtained satisfactory results in the employment of hot sulphuric-acid gases as a solvent for oxidized and siliceous ores. Tests of this nature have been made on ores and mill products of the Ray Consolidated Copper Co. The experiment station at Fairbanks, Alaska, will be completed much earlier than was expected. The general office and offices of members of the staff have just been occupied. An extensive mineral exhibit has been opened. The Seattle station has received a shipment of tin ore from the Black Hills for ore-dressing tests.

Official Ruling Diverts Technical Men from Their Proper Field

Despite efforts that have been made to keep scientifically trained men from going to the front, it is apparently the fixed policy of the War Department not to allow their exemption. While some men with such training have been returned for special work, the number is not large when compared with that now with the colors. The War Department declines to allow even the scientific branches of the Government service to specify the man or men they wish for war work. In case an explosives expert is wanted, for instance, the War Department will detach a man from his regular unit and assign him to the bureau in need. Usually a person so detached does not meet the requirements. Until permission is granted, therefore, to specify by name an individual whose qualifications are known, those in charge of the Government's scientific war work must draw their men from those above military age.

The most recent expression of authoritative opinion on this subject is a letter sent last week by the Secretary of War to Dr. Hollis Godfrey, of the Advisory Committee of the Council of National Defense. In this letter Mr. Baker said:

> The successful outcome of the war is so dependent upon the applications of science that the United States can ill-afford at this time to risk any diminution of this supply of technically trained men. Such diminution we must in part suffer by reason of the fact that class exemptions in the execution of the Selective Service Law are prejudicial to its general success; but I have constantly in mind the fact that the Government service will demand more and more scientifically trained men, and so I hope those who are in charge of scientific institutions will impress upon the young men the importance and desirability of their continuing their studies except to the extent that they are necessarily interrupted by a mandatory call under the provisions of the Selective Conscription Law.

On Dec. 15 another ruling goes into effect that will make it still more difficult to take advantage of the special training that men of military age may have. The ruling puts an end to voluntary enlistments on the part of men subject to draft but who have not been called by their local boards for examination. It also stops the practice of "inducting" into a specfic unit men who already have been called. This latest ruling will hamper to a considerable extent the formation of the mining regiments.

Resignations of Defense Council's Subcommittees Accepted

That the Council of National Defense has abandoned all idea of utilizing war-service committees made up of men closely associated with industries is indicated in a letter written by Director Gifford to the U. S. Chamber of Commerce which reads in part, as follows: "The several committees appointed by the Council of National Defense and by the Advisory Commission have in each instance tendered their resignations and, in order to prevent a continuance of the embarrassing situation wherein members of the committees were called upon to act both as Government agents or advisors and at the same time as representatives of their respective industries, these resignations have been accepted. For the purpose of furthering the valuable work instituted by the Government committees, however, it is most desirable that representative committees of the industries be formed by the industries themselves at the earliest possible moment." The National Chamber of Commerce has issued a call to every industry asking that representatives be sent to Washington for the purpose of appointing war-service committees such as those which formerly were integral parts of the Council of National Defense. Dec. 12 has been set as the date for opening this convention.

Large Imports of Spanish Pyrites in October

Returns received by the Committee on Chemicals show that 100,000 tons of Spanish pyrites were imported during October in 23 vessels. Importers handling 90% of the Spanish ore report that they are meeting the requirements of their customers fairly well. The committee points out, however, that the price of pyrites is likely to advance, due to the fact that Spanish operators will probably have to pay more for their coal.

Editorials

Some Data of Economics

THIS article comprises some figures that are fundamental in any consideration of present economics. We summarize them, without any attempt at coördination and without any special analysis and discussion, simply to enable our readers to get some broad views of things.

The wealth of the United States is variously estimated from 230 to 250 billions of dollars. This is represented chiefly by fixed investments—railways, houses, factories, mines, etc. The annual saving of the American people before our entering the war was roughly estimated at about six billion dollars. This also was put into fixed forms, being used for increasing the nation's housing capacity, railway facilities, etc.

This year we are spending about 12½ billion dollars for military purposes of our own, and are lending about six billion to the Allies. It is estimated that the expenditures for the following year will be about the same. Not all of our own direct military expenditures are wasted; for example, the very large expenditure for ships will represent an increase of our material possessions.

We cannot pay for the war out of existing capital, for that is chiefly represented by houses, railways, etc., which must remain as they are, although they furnish a sound basis for credit. As was correctly pointed out during the flotation of the first loan, the real payment for the war must be made out of the savings in the future. This is why thrift is being preached to the American people. It is hoped to increase the annual saving by five billion dollars or more.

The Director of the Census has furnished us with an estimate of 33,500,000 males, 16 years of age and over, employed in gainful occupations July 1, 1917. Of these, about 11,000,000 were employed in agriculture, 200,000 in the operation of electric and street railways, and 1,800,000 in the operation of steam railways, if the same proportion obtained as at the time of the census of 1910. There were, therefore, about 20,500,000 men employed otherwise. There are now about 2,000,000 men under arms. Assuming that the men engaged in agriculture and transportation be left undisturbed, the other working force has been diminished about 10%. However, that is not a correct assumption, for the draft has taken men from the farms and the railways, as from elsewhere. But it is a fact that the total working force of the country has been diminished by about two million men, although the net loss is not so great (and maybe there is no net loss) owing to offsets. The offsets are the increased employment of boys, of old men, and of women, and the forcing to work of the habitually idle, the number of whom is estimated at a high figure. Strange as it may seem, reliable accounts agree that even now there is much idleness among men who do not habitually avoid employment. One of the pressing problems of the time is to transfer these men from industries that are slack to others that are shorthanded.

The subject of man power is extraordinarily confusing. Not only is there the matter of absolute number, but also there is that which is even more important; viz., the quantity of work performed per man per day. It is notorious that along with the general increase of wages men have worked in many cases but five days a week, have reduced their effective work per day, and besides wasting time have wasted material. On the other hand, the administrators of business have offset this to some extent by increasing their own efficiency. The most noteworthy example is perhaps that of the railways, which in the second quarter of 1917 handled with each locomotive 16.1% more, and with each freight car 15.3% more revenue ton miles, than in the corresponding period of 1916; the gain being equivalent to the addition of 4985 locomotives and 361,000 freight cars to equipment, this being an even more astonishing showing when it is considered that a year ago the maximum car-producing capacity of the country was estimated at about 265,000. In other industries, the managements, spurred by necessity—the shortage and indifference of labor—have achieved important things. It will be seen, therefore, that it will be quite impossible to summarize man power until we are able to obtain fairly complete statistics of production.

It is manifest, however, that the prosecution of the war implies the transfer of men from one industry to another. A. C. Miller, a member of the Federal Reserve Board, stated in a recent address that a competent authority had advised him that it takes the labor of four men working in industries of one kind or another producing military and other necessary supplies to maintain one soldier at the front. This means that an American army of one million men will require the output of four million men working in factory, field and foundry. Besides this, there is the requirement of millions of our men for the munitioning of the Allies. All of this means the subtraction of men from nonessential occupations. The number of men so engaged in the United States is estimated at four million; we do not know on what authority.

Consideration of these figures forces the conclusion that it is impossible for the United States to continue "business as usual." We shall do very large business, probably in the aggregate more than ever before; but it will be concentrated in essentials, while business in many things that are not essential will be greatly contracted. During the period of change and readjustment there will naturally be troubles. As a corollary to the above conclusion is the theory that the harder people work, and the more efficiently they work, the better off will be everybody, labor included.

The second great conclusion is that the nation is bound to become thrifty. Unless it does, it will be unable to finance and fight the war at all. If it does, the new principles of living thereby inculcated in the American people will be of incalculable benefit. As President Wilson himself remarked recently, they may be worth to the nation all that the war will cost it.

Mining Is a Matter of Engineering Rather Than of Democracy

IN AN effort to learn the truth regarding the labor troubles in the Far West, which gave rise to reports of a vast anti-American conspiracy under the auspices of the I. W. W., the *Evening Post* commissioned Robert W. Bruere to make a first-hand investigation and report his findings without fear or favor. His conclusions have been published in a series of articles in the *Post*. There has been but little published criticism of them, for the reason that Mr. Bruere's statements have not impressed those who are acquainted with Arizona conditions as being the observations of one who looked deeply and thoughtfully. The findings of Mr. Lenine and Mr. Trotzky, alias Braunstein, on such a mission would not attract any great attention, for example.

However, one of the subcaptions given to Mr. Bruere's last article—"Copper Companies Regard Mining as a Matter of Engineering Rather Than of Democracy"—engaged our attention. Mr. Bruere reported an interview with a mine manager whose idea was that if mine managers played with democracy they would never get out the ore. He did not consider mining to be either a problem of democracy or autocracy, but simply a problem in engineering. The dream of this manager was of a mine from which the ore might be extracted by automatic machinery, just as it is now crushed and concentrated and smelted by machinery.

We think that Mr. Bruere is for once right when he reports that copper companies regard mining as a matter of engineering rather than of democracy. If they did not so regard it there would be mighty few mines, either copper or lead, or any other kind, in operation today, and the world would be wondering about its metal supply. There are big mines today whose output is needed, that we cannot manage to work, but hope that we can if we succeed in getting them more mechanicalized. Yes, Mr. Bruere, you are right in grasping the idea that mining is an engineering job; but we do not believe you know the meaning of the idea. If you have any notion about running mines by democracy, you may examine what the workmen are doing with the Spassky, Kyshtim, Ridder and other great mines of Siberia. You are wrong, however, in your fantastic notion that "democracy implies intelligence, initiative; and these are precisely the most undesirable qualities in a mucker, the man who shovels the ore deep down in the stopes and drifts, the man who feeds the machines." On the contrary, you may learn, if you will take the trouble to do so, that the great effort of enlightened managements everywhere is to increase the intelligence and initiative of the men and enable them to draw more pay for the simple reason that they earn it.

It seems scarcely worth while to try to educate Mr. Bruere, and certainly we are not going to discuss his ideas of economics and sociology; but we cannot fail to draw attention to his reprehensibility in implying that mine managers deprecate the disappearance of the saloons, without which "the muckers have too much time to think of their troubles." If Mr. Bruere had been interested in making a real study of conditions he would have found that the mining companies of the United States, as well as industrial companies generally, have for many years back been in favor of the prohibition of alcoholic drink on economic grounds, and have done effective work in bringing that about.

Missouri Lead Mining Wages

THE mining companies of the Southeastern Missouri lead district are the first to make a reduction in wages. Heretofore wages have been going up steadily and steeply, but on Dec. 1 the Missouri companies put into effect a reduction of 75c. per day. This sounds like a good deal, but when it is considered in the light of a correction of extravagance and in comparison with pre-war conditions, the wages that these companies now propose to pay look generous.

Before the war the base rate for wages in this district was $2.40. During 1916, when the price for lead rose to about 7½c., the base rate was raised to $3.12½. During the extravagance of the lead market last summer, when the price for lead rose to 9c. and then went higher, wages were advanced to $4.20. The present reduction brings them back to $3.45, which is high in comparison with the rate of a year ago, although at present the price for lead is a cent a pound lower. It is estimated that the present rate is fully commensurate with the increase in the cost of living.

Evidently Great Britain, even after three years of war, is still experiencing the same troubles from the interference of bureaucrats in commercial affairs that we have been having. As a step in the organized protest against the extreme control of business interests by a multiplicity of new departments, a meeting of representative merchants was held recently in London. One speaker remarked that some of the departments at Whitehall affected a knowledge of business that they did not possess and he considered that much of the trouble in Great Britain was due to people doing jobs that they did not understand. This has a familiar sound.

The 11th Engineers, U. S. A., is a New York regiment, in which our distinguished friend Arthur Dwight is senior major, while Irving and Stehli, geologist and metallurgist respectively, are captains. This regiment, or part of it, ran into the thick of the recent fighting near Cambrai and covered itself with glory. It suffered losses, and we await fuller news with anxiety. But we rejoice over its bravery and achievements. One of the first regiments to go, it has been—in its capacity as a railway regiment—the first to work right up to the front, and it has shown itself as expert with the rifle as with the pick and shovel. Here's to the 11th Engineers!

Mr. Adkinson's article on "The Commonsense of Mine Management" does not read as if it had been composed in any Bolsheviki atmosphere. On the contrary there is a fine old-fashioned American flavor about it, the recognition of the spirt that made American industries great and will make them greater. The Socialists who are so anxious to reduce all industry to the fertility of Sahara, out of their indignation over some hard-working and thrifty people having become rich, neglect to consider that neither Capital nor Labor will prosper without the assistance of Brains. The Bolsheviki are trying to run Russia without Brains. The philosophy that puts the cleaner of sewers and the bacteriologist on the same level as servants of the public health is lunacy. Although Mr. Adkinson had no intention of discussing this broad subject, his commonsense has a bearing upon it.

BY THE WAY

"Whatever job I had," says Henry P. Davison, "was to me always the very best job in the world and I tried to fill it. I made no elaborate plans for the future. If I had any system in my labor it was first to do my own work; second, to teach the fellow below me how to take my place; third, to learn how to fill the position ahead of me."

Of 14 men of foreign birth employed in the sampling department of the Raritan Copper Works at Perth Amboy, N. J., there was but one American citizen before the war started. Today, according to the *Ingot*, every man in the department is a citizen. Thirteen of these men subscribed to the first Liberty Loan, and 11 to the second, so that at present every man in the department owns at least one bond. The sampling department has surely set an example that others might well emulate.

The will of the late Grant B. Schley, who put the Britannia copper mine on its feet, was filed for probate at Somerville, N. J., on Dec. 3. It was written on a half sheet of note paper and disposed of an estate said to be valued at more than $5,000,000. It was dated Mar. 29, 1913, and gave the estate in equal shares to the surviving children, one daughter and three sons. A fourth son, Chaloner Schley, was named in the will, but his death preceded that of his father by a few months.

A company working under Government contract pays its men for an eight-hour day. The workers get "time-and-a-half" for overtime. During the overtime, for which they receive, on an average, about one-third of their total day's pay, they frequently stand about and discuss literature and music and such other topics as workmen are given to discussing, and do such work as inclination dictates, says the *Evening Post*. The company does not so greatly mind. It figures that it can get at least a little work out of the men on overtime, and that places it so much to the good. Under the contract the Government pays all overtime.

Electrified railroads in the United States have meant important savings in coal to the nation. The St. Paul electrification over the Continental Divide is not only demonstrating remarkable results from an operating standpoint, but in the year of coal shortage has saved 200,000 tons. It has been found on the St. Paul electrified Rocky Mountain division, for instance, that the electric engine handles about 3½ times as many ton miles per month as the steam engine, and that the electric engine cuts from the time to do a given business 30%, partly by faster running and partly because of its ability to haul heavier trains.

The old adage about "sending coals to Newcastle" has been realized on a small scale in San Bernardino County, Calif., only in this instance it has been modernized into sending scheelite ore to the Atolia district, which has become noted in recent years for its production of this tungsten ore. The shipments were made from Los Angeles and reveal a peculiar situation. It seems that during a period of high-grading, the thieves shipped a great deal of scheelite ore to Los Angeles and got some of the Los Angeles buyers into trouble. Now scheelite that accumulates at Los Angeles stands reshipment to Johannesburg, from which point and Atolia it is safe to ship to Eastern markets. In other words, the Eastern buyer is a little bit afraid to purchase direct from a Los Angeles buyer.

In explaining to Congress, in his annual report, the wisdom in having released miners from their assessment work, Franklin K. Lane, the Secretary of the Interior, cites the following instance: "A stalwart westener came in early in May to say that he would like to enter the Army, but if he did he could not hold his mining claim. He was a typical prospector, of steel-frame construction, without a superfluous pound of flesh, and the long-range eye of the man who lives in the open—the very stuff of which the best soldier is made. But the fruit of his life's work was all to be found in a few holes in the ground and a few pieces of paper tacked on trees or posts in the mountains of the West. He was willing to take his chances of returning if the Government which wished him to go would be good enough to hold his property until his return without exacting the yearly labor which the law required."

During last summer a mass of high-grade pyrite was found near the rails of a narrow-gage tramway on a sugar estate in the northern part of the district of Oriente, Cuba. The lump of ore weighed about 70 lb. and had every appearance of containing at least 45% sulphur. The owner of the estate, being interested in mines in other localities, spared no effort or expense in endeavoring to trace the source of the "float" rock. One puzzling feature of the case was the fact that the specimen was not oxidized. Yet investigation brought to light no news of any excavation that could have produced the sulphur ore. At length some smaller pieces were found near the blacksmith shop of the cane-grinding mill and the mystery was solved. A vessel that took pyrites from Huelva to an Atlantic port had been hastily unloaded and at once took on a cargo of coal for the port of Antilla, Cuba. Some of the coal reached the sugar mill and the local blacksmith, finding the pieces of pyrite undesirable as fuel, had tossed them aside and forgotten their existence. In the course of the search for sulphur ore, the investigation uncovered a small vein of chalcopyrite and also a deposit of chromite. The latter has yielded some fair specimens and will be developed in due time.

Join the Comfort Club

Those who have contributed to the fund to buy comforts for the men of the 27th Regiment of Engineers have done so without thought of gain. It is called patriotic to buy Liberty bonds, war-saving stamps and the like, though in all these things, one simply invests and will receive back his principal with interest. But mining men now are called on to give. There will be no reward or profit save the knowledge of duty done, the duty of taking care of one's own. Engineers at home must second those at the front by standing directly behind them. That they will do this and are doing it is evidenced by the fact that the subscriptions received have already swelled the total to almost $3200 though the campaign is but 12 days old. The following gifts have been received to date:

Engineering and Mining Journal	$1000.00
New York Engineering Co.	1000.00
A Friend, Nov. 23	5.00
H. H.	5.00
D. E. Charlton	5.00
H. W. Hardinge	1000.00
Frank N. Spencer	5.00
W. L. Coursen	5.00
J. H. Polhemus	5.00
J. H. Janeway	10.00
Albert D. Beers	10.00
J. E. Hayes	10.00
J. A. Van Mater	25.00
L. Vogelstein & Co.	100.00

Capt. Percy E. Barbour, the deputy-superintendent of the New York State Constabulary, has written us expressing his approval of the scheme of adopting the 27th Engineers. Capt. Barbour says:

> I want to tell you how glad I am about the scheme for adopting the 27th Regiment, as given in your editorial in the current number of the *Journal*. I think it is "bully" and hardly know which I prefer, whether to be in the regiment or be in your office pushing the adoption of the scheme. I am also much pleased with the insert in the *Journal* this week, and the editorial with reference to it.

Congress has voted billions for troops but none of it is spent on the little things that men need to keep cheerful. Unless these are provided through some such means as the Comfort Club, they will in a large measure be wanting. Picture to yourself what a lack of such comforts means when the hardships of life at the front must be borne. Bear this in mind and join the Comfort Club and get others to join. Your check drawn to the order of the *Engineering and Mining Journal* is all that is necessary. Back up the Twenty-Seventh.

Price for Silver To Be Fixed

Treasury officials on Dec. 3 held the first of a series of conferences with Western silver producers looking to the ultimate fixing of a standard price for silver, effective for one year, and to Government acquisition of options on practically the entire output of the United States. The plan contemplates Government control of American silver at a fixed price. Jewelers and other silver users would continue to receive a supply under the tentative Government plan, probably at the standard price. Details of the arrangement are yet to be worked out, however, and officials emphasized the statement that for the present the Government is interested mainly in obtaining sufficient silver for its own and Allied coinage needs.

Raymond T. Baker, Director of the Mint, Charles S. Hamlin, member of the Federal Reserve Board, and Albert Strauss, foreign exchange expert and the Treasury's representative on the War Trade Board, represented the Government in the conference. In addition to the silver producers, most of whom were from Nevada, there were present Senators Pittman, Smoot, Ashurst, Newlands and Shafroth, and Governor Boyle of Nevada. Producers from other Western states were expected to join in the conference during the week.

Australian Mineral Production

The 1915 production of minerals in the six states of Australia and the Northern Territory, as reported by the Commonwealth Bureau of Census and Statistics, is shown in the accompanying table:

THE 1915 MINERAL PRODUCTION IN AUSTRALIA

Substance	Unit	Quantity	Substance	Unit	Quantity
Alunite	Tons	(a) 1,420	Kaolin	Tons	2,378
Antimony	Tons	11,943	Lead (pig, etc.)	Tons	33,687
Bismuth	Tons	274½	Limestone flux	Tons	293,360
Coal	Tons	11,415,451½	Manganese	Tons	1,260
Coke	Tons	(a) 417,753	Molybdenite	Tons	129
			Platinum	Oz.	(a) 56
Copper ingot and ore	Tons	45,324	Salt	Tons	(b) 64,000
Diamonds	Carats	(a) 839	Scheelite	Tons	35
			Shale	Tons	(a) 15,474
Diatomaceous earth	Tons	439	Silver	Oz.	3,713,488
Gold	Fine oz.	1,947,002	Silver-lead ore	Tons	293,391
Gypsum	Tons	20,590	Tin ore	Tons	7,576½
Iron, pig	Tons	(a) 76,318	Wolfram	Tons	613
Iron oxide	Tons	238,496	Zinc	Tons	(a) 190,923
Ironstone flux	Tons	46,858			

(a) All from New South Wales.
(b) Exclusive of Victoria, figures of which are not available

The total value of the principal minerals produced in the Commonwealth in 1915 was reported as £22,396,782, of which New South Wales contributed £9,598,179.

Idaho Mining Association Protests War Excess Profits Tax

At the meeting of the Idaho Mining Association in Wallace, Idaho, on Nov. 24, 1917, for the consideration of business, political and industrial matters affecting the mining industry of the State of Idaho, and incidentally of the nation, the association recorded its conviction that the mining industry should bear its just and equitable proportion of all expenses of government, national, state and municipal, under which it is protected, and that it should and does stand ready to meet all taxes imposed upon it by constituted authority, and particularly those taxes imposed by the War Revenue Law passed by the Congress, and the assurance was expressed that the industry will support all war burdens imposed by the Government even to the limit of the confiscation of all its property, if that be necessary, to bring about a successful termination of the war.

The association declared, however, that the war tax should be levied under a fixed principle to the end that all shall be equally taxed, and the following resolutions were ordered spread upon the minutes:

> Whereas, Examination by business men, expert accountants, lawyers, auditors and professional men from the ranks of all industries, professions and business connections has resulted in the unanimous condemnation of the measure now upon the statute books, and particularly that section of it described under Title 2, War Excess Profits Tax; and
>
> Whereas, It is the unanimous opinion of those persons, companies, corporations, partnerships and firms which are called upon to pay the taxes described, that the so-called new War Excess Profits Tax Law is unfair, discriminating and impossible of uniform interpretation; and

Whereas, An examination of the law in question reveals that its provisions will cause unjust discrimination in favor of heavily capitalized companies as against companies having small capitalization; for example, we find in attempting to apply the principles of the War Excess Profits Tax to the mining industry that a company with a large capitalization will pay only 5 to 15% of its net income, while another company, owning a mine of the same value, and realizing the same profits, but having a small capitalization, will be compelled to pay from 40 to 75% of its net income, according to the many constructions that may easily be read from the law; and

Whereas, Investigation of the history of this legislation in Congress reveals that it was hastily and ill-advisedly framed; now therefore be it

Resolved, That the Idaho State Mining Association, in meeting assembled, does hereby condemn and denounce this so-called War Excess Profits Law as being so vague, ambiguous and contradictory as to be practically incapable of understanding and unworkable; and we call upon Congress to repeal this unfair and unworkable law, and substitute therefore a special War Income Tax on substantially the same plan or principle now adopted in the case of individuals, and regardless of pre-war conditions, regardless of capitalization and based solely upon income, in accordance with a graduated scale, and permitting such exemption as may be equitable.

War-Tax Exemption Suggested for Gold-Mining Companies

The case of the gold miner is presented by the Oatman Bureau of Mines, of Oatman, Ariz., in a circular, in which the claim is advanced that it is just and fair under present conditions to exempt gold-mining companies from paying any extraordinary war tax to the Government. There are, of course, gold-mining companies still able to operate at a profit even with the high prices prevailing, but the Bureau contends that the constantly decreasing output of gold for the entire country is indisputable proof that the gold-mining industry as a whole is seriously threatened.

During the past three years, the average prices of commodities have increased, it is stated, more than 40%. Gold, however, remains at $20.67. Thus gold will buy only 60% as much as it would three years ago. On the other hand, the cost of producing this gold has increased about 35%. For example, a certain mine contains ore averaging $4 per ton in gold. For years its average operating costs have been $3, leaving a net profit of $1 per ton. Now, however, costs have increased 35%, or slightly more than $1 per ton, wiping out the profit. If gold were taken out it would buy only 60% as much as could have been purchased three years ago with the same amount. It has therefore been wisely decided to shut down until a return to normal conditions.

But the most serious phase of the case is that relating to the partially developed gold property or prospect. There are many such with proven deposits of ore in sight, but the outlook is not such as to encourage further development and production. Capital cannot readily be induced to invest in an industry subject to increasing costs, and heavy war taxes besides, without any opportunity to take advantage of enhanced value of the product.

It is this combination of unfavorable circumstances that is causing the depression in the gold-mining industry and the reduction in the output of gold. For the first six months of 1917, the total production is stated to have declined more than 15% as compared with 1916, which was much below the average for the past 10 years. Unless some assistance is extended to the industry, this decrease will continue at an accelerated pace as long as war conditions prevail.

On behalf of the gold-mining industry in general, and the allied interests dependent thereon, the Bureau therefore asks that some measure of relief be devised by the Government, in order that gold production may be maintained. As one means of attaining this end, the exemption of gold-mining companies from paying any extraordinary war tax to the Government is urged.

Engineers in Action Near Cambrai

American engineers, thought to be members of the 11th Regiment of Engineers, who were working in the region of Gouzeaucourt, south of Cambrai, joined the fighting ranks of the British when the latter were surprised by the German onslaught on Nov. 30 which resulted in Gouzeaucourt being enveloped for a time. The attacking forces was greatly superior in numbers and every man was needed to resist its onward sweep, says the press dispatch. Hundreds of Americans and several trains operated by them were in this section when the Germans, without warning, swept forward in masses toward the town. Many Americans working in the rear areas immediately provided themselves with rifles, and joined the hard-pressed British, or turned their hands to other important work.

One of the trains run by an American crew was west of Villers-Guislain, which was the first place through which the Germans charged on the southern flank of the offensive. Shells suddenly began to fall about the engineers, and almost immediately they saw a horde of gray-coats charging toward them. The engine driver saw there was no time to linger, and ran for a nearby shell hole. His four helpers sought similar shelter, where all five lay for hours, with the Germans all about, and only escaped after the British had counter-attacked and driven the enemy back.

The crew of another train near Gouzeaucourt had an exciting experience with a German airplane. The aviator swooped down on them from the north and began firing with a machine-gun. The airman's fire became so hot that the engineers were forced to run for shelter.

After the British had pushed the Germans out of Gouzeaucourt and back from the ridge to the east, the engineers were asked to furnish volunteers for patrol work during the night. As only a limited number was required, nearly a hundred were selected and armed. All night they kept the watch amid shell fire and bullets from the machine guns and rifles. They could have done no better if they had been picked troops from regular infantry, and their work was commended highly.

Several American units, working in the back areas, came under very heavy shell fire as the German attack progressed. The latest reports say that several Americans were actually captured by the Germans, but escaped after a few hours, and made their way back to the British line.

The 11th Regiment of Engineers was recruited in New York last May and was one of the first to be sent abroad. At that time the colonel commanding was Charles H. McKinstry and William Barclay Parsons was a major. The mining industry is represented in this regiment by Maj. A. S. Dwight, and Captains John Duer Irving and H. J. Stehli.

Personals

Victor G. Hills is making a mine examination at Chloride, Arizona

J. D. Chynoweth, of Houghton, Mich., has received a commission as second lieutenant of infantry

Joseph Stringham, Jr., has been commissioned a captain and is at the Rock Island Officers' Training Camp.

Dr. Horace B. Patton has recently completed investigations of oil lands in Wyoming and northern Colorado.

Rush T. Sill, of Los Angeles, has just returned from a business trip to Mexico City and Pachuca, Mexico.

Harry J. Wolf, of the Malm-Wolf Co., is investigating manganese and vanadium properties in southwestern Colorado.

Garrett F. Johnson, lately instructor at the Michigan College of Mines, has been commissioned first lieutenant in the field artillery.

A. C. Harnett expects to go to France at an early date for service in the American Expeditionary Force as a topographical draftsman.

George T. Fonda, safety engineer for the Bethlehem Steel Co., Bethlehem, Penn., has been appointed director of labor and safety for all plants of the company.

Corey C. Brayton and **E. R. Richards** have temporarily closed their San Francisco offices in order to give more time to their operations at Midvale, Utah.

C. H. Cooper, assistant superintendent of the Calumet & Hecla smeltery at Hubbell, Mich., has been appointed a captain in the Coast Artillery, U. S. Reserve.

A. H. Meuche, recently superintendent of the Cass Copper Co., in northern Michigan, is on the staff of the Hollinger Consolidated Gold Mines, Ltd., at Timmins, Ontario.

William H. Jobe, formerly of Crystal Falls, Mich., has been appointed superintendent of the Raimund mines at Bessemer, Ala., belonging to the Republic Iron and Steel Co., of Birmingham.

Robert R. Wiggins, recently in Nicaragua, and **Raymond C. Mahon**, lately at Iron River, Mich., have been commissioned first lieutenant and second lieutenant, respectively, in the Signal Corps, Aviation Construction Division.

S. Kawasaki, chief government geologist in Chosen, has been investigating mining conditions in the Cobalt, Porcupine and Sudbury districts of Ontario for the Japanese Government and was recently in Toronto on his way back.

F. Julius Fohs, oil geologist, who recently opened an office at 60 Broadway, New York, announces that members of his staff completed investigations in Louisiana, Southeastern Texas, Northern Texas, Oklahoma and Kansas during November.

Dr. Raymond F. Bacon, director of the Mellon Institute of the University of Pittsburgh, will be commissioned a lieutenant-colonel in the ordnance division of the War Department, and will be directed to take charge of the chemical work for our armies in France.

C. P. Perin, of Perin & Marshall, New York, who has been in India for some months in connection with new construction at the works of the Tata Iron & Steel Co., Sakchi, Bengal, will probably remain in India until some time in 1919. **T. W. Tutwiler**, general manager of the company, will leave India for the United States early in January and plans to be in this country a considerable part of next year. In the meantime, Mr. Perin will have charge of operations at Sakchi.

Charles T. Main, a consulting engineer, of Boston, has been elected president of the American Society of Mechanical Engineers. He was born in Marblehead, Mass., in 1856 and was educated at the Massachusetts Institute of Technology from which he was graduated in 1876. Since 1892 he has practiced as a consulting engineer, with offices in Boston, being associated until 1907 with F. W. Dean in the firm of Dean & Main. Mr. Main has designed and supervised the construction of numerous industrial, steam-power and water-power plants, among his largest undertakings being the Wood Worsted and Ayer Mills in Lawrence, Mass., and four hydro-electric developments for the Montana Power Co., aggregating about 280,000 hp. He became a member of the American Society of Mechanical Engineers in 1885, and served on its board of managers for the last three years. He is also a member of the American Society of Civil Engineers and a number of other engineering and technical societies.

Obituary

Abraham Gibson, one of the oldest residents of Haileybury, Ont., and a prominent mining man, died suddenly on Nov. 25. He went to the Cobalt camp in its early days and was successful in South Lorrain. He held claims in many places in northern Ontario.

Emory H. Diehl, assistant general manager of the United Alloy Steel Corporation, Canton, Ohio, died Nov. 20 after a short illness, age 33 years. He was graduated from the Pennsylvania State College in 1906 and was connected for a time with the Carnegie Steel Co., which he left four years ago to become associated with the Canton plant.

Societies

American Institute of Mining Engineers, Columbia Section, held its seventh annual meeting on Nov. 17, at Kellogg, Idaho, in the Y. M. C. A. building. Officers for the ensuing year were elected. R. S. Handy, presented a paper on "Hand Sorting of Mill Feed."

Engineers' Society of Western Pennsylvania held a meeting in the Union Arcade Bldg., Pittsburgh, Penn., on Dec. 4. A paper entitled "Manufacture and Use of Die Castings" was presented by Charles Pack, chief chemist and metallurgist of the Doehler Die Casting Co., Brooklyn, N. Y.

American Chemical Society, New York Section, will hold its third regular meeting jointly with the New York Sections of the American Electrochemical Society and the Society of Chemical Industry on Dec. 7, in Rumford Hall, New York. National wastes that can be prevented by the application of chemistry will be the theme of discussion with especial reference to raiment. Papers on leather, textiles and waterproofed and protected fabrics will be presented by Allen Rogers, of Pratt Institute, J. Merritt Matthews, editor "Color Trade Journal," and H. P. Pearson and F. Sundermann, of Cravenette Company.

United Engineering Society—A general meeting of the American Society of Civil Engineers, the American Institute of Mining Engineers, the American Society of Mechanical Engineers and the American Institute of Electrical Engineers was called for Friday evening, Dec. 7, in the Engineering Societies Auditorium, 29 W. 39th St., New York, for the purpose of welcoming the American Society of Civil Engineers into the fraternity of founder societies and into occupancy of the enlarged Engineering Societies Bldg. Appropriate ceremonies were announced to signalize the association of the four societies under one roof.

Alaska Mining and Engineering Society held its annual meeting on Oct. 17, 1917, at Thane, Alaska. The society was the guest of the Alaska Gastineau Mining Co., of which the president of the society, G. T. Jackson, is manager. The following papers, descriptive of the practice at the Gastineau mill, were read: "General Mill Practice," by E. V. Daveler, mill superintendent; "Flow Sheet in the Mill," by R. Hatch, assistant mill superintendent; "Mechanical Department," by H. E. Garlock, master mechanic; "Sampling, Assaying and Refining Methods," by Fred Hodges, chief chemist; and "Electrical Operations," by Emil Gastongway, chief electrician. Officers were elected for the ensuing year, as follows: John Richards, president; Earl Daveler, vice-president; C. K. White, secretary-treasurer. W. S. Pullen and C. E. Davidson were elected members of the executive committee.

Colorado Chapter of the American Mining Congress was organized at a meeting held on Nov. 28 in Denver. A board of 15 directors was elected as follows: To serve two years: Samuel D. Nicholson, Charles A. Chase, R. S. Ellison, Irving T. Snyder, Rens Schirmer, of Idaho Springs, Robert M. Henderson, of Breckenridge, and Max Schott; to serve one year: Frank Bulkeley, George L. Nye, E. A. Colburn, Walter [illegible], of Leadville, Nelson Franklin, of Rollinsville, George E. Collins, M. S. MacCarthy and J. F. Welborn. A meeting of this board was announced for Dec. 1, for the purpose of electing a governor and three vice-governors. A committee was appointed to attend the Utah state conference in Salt Lake City on Dec. 1 to discuss the stabilizing of the metal market on silver, lead and spelter, and to outline amendments to the war-tax law. A telegram was sent to the Washington headquarters of the American Mining Congress urging the selection of a mining man on the newly appointed advisory board of the excess war-profits administrative council.

Industrial News

Asbestos Protected Metal Co., of Pittsburgh, announces that it is now represented in the State of Georgia by J. F. Schofield's Sons Co., of Macon.

Stewart & Holmes Drug Co., Seattle, Wash., has opened a new store for its assay-supply department at Third Avenue South and Main Street.

Mark R. Lamb is buying belt conveyors, transmission belts and transmission machinery for Bolivia. About $11,000 is involved in the present order.

Sullivan Machinery Co. announces that Wallace T. Roberts, hitherto sales manager for the company in lower Michigan, northern Ohio and northern Indiana, has been appointed district manager at Denver, succeeding Capt. Matthew R. Blish, Ordnance Department, U. S. A., acting manager at Denver since last May. George W. Blackinton, manager at Denver up to May last, is captain commanding Third Battalion, 353rd Infantry Regiment, N. A., Camp Funston, Kansas.

Pacific Electro Metals Co., of San Francisco, has put into operation a plant for manufacturing carbon electrodes from petroleum coke on San Francisco Bay, at Bay Point, Contra Costa County, Calif. The electrodes are for use in electric furnaces and possess a high conductivity on account of the low-ash content of the raw material. Another plant for making ferro-alloys is in course of construction at the same place and will be in operation within the next 30 days and will consume at the start approximately 10,000 kw. The alloys to be produced include: Ferrosilicon, ferromanganese, silicomanganese, ferrochrome, ferromolybdenum and ferrotungsten. Raw materials for all these alloys are available in abundance on the Pacific Coast. The company is a Nevada corporation, although exclusively represented by California capital. The plants have been designed by the Beckman & Linden Engineering Corporation

New Patents

United States patent specifications listed below may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

Conveyor. Robert E. Briggs, Columbus, Ohio, assignor to the Jeffrey Manufacturing Co., Columbus, Ohio. (U. S. No. 1,247,365; Nov. 20, 1917.)

Draftsman's Lamp. Ralph Leon Rizer, Cumberland, Md. (U. S. No. 1,247,454; Nov. 20, 1917.)

Electrolysis of Zinc—Electrodeposition and Extraction of Zinc. Urlyn Clifton Tainton, London, and John Norman Pring, Chester, England. (U. S. No. 1,247,179; Nov. 20, 1917.)

Excavating Apparatus. Thomas Spencer Miller, South Orange, N. J. (U. S. No. 1,247,309; Nov. 20, 1917.)

Explosive Charges—Device for Inserting Explosive Charges in Earth. Edwin K. O'Brien, Charlottesville, Va. (U. S. No. 1,247,567; Nov. 20, 1917.)

Iron Alloy Containing Uranium. Joseph M. Flannery, Pittsburgh, Penn., assignor to Standard Chemical Co., Pittsburgh, Penn. (U. S. No. 1,247,252; Nov. 20, 1917.)

Liquid Gage. Tetsushiro Nakamigawa, New York, N. Y. (U. S. No. 1,247,293; Nov. 20, 1917.)

Manganese Carbonate, Process for the Oxidation of. Morduch L. Kaplan, Brooklyn, N. Y. (U. S. No. 1,247278; Nov. 20, 1917.)

Maps—Apparatus for Carrying and Exhibiting Maps, Charts, and the Like. Charles Hamlet Cooper, Wimbledon, England. (U. S. No. 1,247,227; Nov. 20, 1917.)

Mill—Combination Stamp, Crushing, and Grinding Mill. Arthur F. Levitt, South Pasadena, Calif. (U. S. No. 1,247,293; Nov. 20, 1917.)

Mold-Heating Furnace. Jacob M. Roth, Pittsburgh, Penn. (U. S. No. 1,247,015; Nov. 20, 1917.)

Open-Hearth Furnaces, Method of and Apparatus for Tapping. Melton A. Smith, Vandergrift, Penn. (U. S. No. 1,247,606; Nov. 20, 1917.)

Ore-Feeding Means for Furnaces. Glen A. Williams and Homer A. Thayer, Pittsburg, Kan. (U. S. No. 1,247,050; Nov. 20, 1917.)

Ore Treatment—Treatment of the Ores of Certain Metals. Robert Lance, Paris, France. (U. S. No. 1,247,113; Nov. 20, 1917.)

Editorial Correspondence

SAN FRANCISCO—Dec. 1

Activity in Oil Lands is marked by recent permits issued by the State Corporation Department to the California Oil Co., of Oakland. The company is permitted to issue 1,000,000 shares of common stock, 500,000 shares of preferred stock and $500,000 worth of five-year gold notes to the B. B. & E. R. Dudley Petroleum Co., in exchange for oil lands in Lost Hills and Belridge oil fields in Kern County. Also additional shares for 40 acres of oil lands and leases in the Pismo or Tiber oil fields in San Luis Obispo County and lease covering 199.33 additional acres in Pismo oil fields. A permit to sell 600,000 shares preferred stock at $1 was granted on condition that common shares previously issued be deposited in escrow pending further order of the commissioner. It is provided that $75,000 out of the sale of the preferred stock shall be used in sinking, operating wells and increasing the present equipment in the Pismo oil fields.

High-Grade Comstock Ore extracted from the Union Consolidated is again attracting the attention of operators. Stope No. 2 in the south drift on the 2400-ft. level produced 95 tons which sampled $50.35 per ton. In another stope 30 tons sampled $48.15. During the week ended Nov. 24, the mine put through the mill 393 tons averaging $29.14, and 118 tons second-class ore averaging $16.65. But little ore was extracted from the other Comstocks. In the Consolidated Virginia, the west drift on the 2700-ft. level was advanced 13 ft. and passed through 6 ft. of vein matter of quartz, clay and porphyry, with a strong flow of water. The quartz assayed from $1.91 to $2.97 per ton. The Andes saved 77 cars of low-grade ore. In the Gold Hill district, the Jacket surface tunnel produced 22 cars of fair-grade ore. The mill continued work on new equipment and building and the old cyanide plant operated during the week.

Demand for Molybdenite has encouraged prospecting and development in San Diego County in the region of Cottonwood Creek, east of Ysidro Mountains. The present development by the Tecate Mining Co., is on four claims situated between Cottonwood Creek and Potrero. The company has obtained permission from the commissioner of corporations to issue 80,000 shares common stock to owners of the mining claims, in exchange for the property, and to sell 60,000 shares preferred stock at $1 per share; the shares are to be held in escrow, pending further orders of the commissioner. The claims are situated on what is assumed to be an extension of a broad diorite dyke in which are indications of molybdenite. Records of the State Mining Bureau show that molybdenite is widely distributed in California, occurring in small flakes and leaves in quartz and crystalline rocks. Molybdenite is found with malachite and chalcopyrite at Potrero in San Diego County and in granite at Campo, which is about 10 miles east. The two districts lie along the Mexican border but well within California. The mineral is also found in the Grapevine district in this county. Other counties in which molybdenite is found are El Dorado, Fresno, Inyo, Madera, Mariposa, Mono, Napa, Nevada, Placer, Plumas, Shasta, Tulare, Tuolumne and Riverside, making a total of 16 counties in which there has been little development and of which there are no extensive records. This and other special minerals have not been largely prospected for in California until the war created an increase in the demand, although chrome and manganese had been mined prior to the war. The failure to develop and mine special minerals in California has for many years been due almost solely to the lack of transportation at reasonable cost. In fact, there are many minerals in the state that have remained undeveloped for this reason.

BUTTE—Nov. 28

Owners of Silver Properties are preparing strong protests to Washington against fixing the price of silver as it is argued that this metal does not enter into the manufacture of articles required by the Government for war purposes and therefore it is not proper that the Government should interfere. There is a movement on foot to join with the Nevada operators in sending a delegation to Washington to enter a formal protest against fixing the price at a rate per ounce of anything below $1. Some of the silver-mine owners who have had their properties idle for years have taken steps to organize a campaign against the Government fixing a price.

Copper Costs are the subject of much discussion just now among mining men. It is said that with the Government price of copper fixed until the first of the year at 23½c. per lb. the Anaconda Copper Mining Co. with all its economic installations in the last three years is making only a little money. Three years ago the miners were being paid $3.50 a day and today they are receiving $5,25 and everything entering into production has increased from 30% to 300%. There is no doubt the Anaconda company is making some money, but its profits are small compared with three years ago. The small operators in some cases have a hard job making both ends meet. There is a general feeling that the Government realizing the existing conditions at the first of the year will increase the price to at least 25c. per lb. In this district the output is gradually working back to normal, but the demand of the Government for copper has been so heavy of late that it is contended that there is very little on hand to supply the local consumption and at the same time keep the Government demand up to requirements. By the first of the year the North Butte company is expected to again enter into the producing class at the normal rate, as by that time the Granite Mountain shaft will be in operation after the fire of last June. At present the North Butte is hoisting at the rate of about 45 carloads a week through the Speculator shaft.

SALT LAKE CITY—Nov. 30

Old Coal Mines for several years idle in Weber and Summit counties are experiencing a revival and new properties are being brought in here, as the demand for coal increases. At Coalville in Summit County, the old mine, formerly operated by the Superior & Briquette Co. but closed down for five years, is being worked under the name of the Summit Fuel Co., The Weber mine has a large number of teams at work hauling coal to the railroad at Coalville 1½ miles away. A railroad spur is being built to this property. A new property, 9 miles from Coalville, is producing 140 tons of coal daily, Chapelle Bros. being the operators. The Grass Creek mine is producing at capacity.

The Utah Coal Route opened for traffic today, and it is expected that operation by this road will soon make itself felt in the betterment of the coal situation. The new railroad has its terminal at Provo, where it connects with the Denver & Rio Grande, the Salt Lake Route, and the Orem electric line. A large part of the rolling stock has arrived and the remainder is coming in, although there is necessarily some delay, owing to Government requirements. Four out of the six locomotives are on hand and the two remaining are expected within two weeks. The cars which are of the all-steel, "dump" type, of capacity of 100,000 lb. each, will be made to carry 125,000 lb wherever this can be done.

Oil-Shale Exploitation may be hastened by the present rapid consumption of oil and gasoline without the accompanying discovery of new oil fields to take the place of those in danger of exhaustion. There is no question but that there is a large reserve of oil fuel available, both in this state and in Colorado, as soon as a suitable and economical process of distillation shall have been found. Certainly effort in this direction has been stimulated. Experiments conducted for some time at the University of Utah—along the lines of a process, which has for many years been in successful operation in Scotland—are said to indicate the possibility of profitable recovery by means of steam distillation. The experiments have been made in what is described as a somewhat crude apparatus, consisting of an upright cylinder about a foot in diameter, surrounded by masonry, with a furnace underneath. The shale and sand, superheated by steam, are subjected to a heat of from 900° to 1000°. The oil and the gases pass through a series of pipes and the ammonium sulphate, gas, naphtha and crude oil are segregated. It is stated that the process has been so far improved that the various grades of oil can be segregated, although this has not been done in the testing plant on the University grounds. The average results of the tests made at the University plant, on shales from near Elko show the crude oil per ton of shale to be 45 gal. and gasoline from gas—if desired—14 gal., making a total of 59 gal In addition to the gasoline from gas, tests are said to show 80% of gasoline can be extracted from the crude oil. Coincidentally, with the above results two other processes have been announced, one of these by a Nevada man and the other by a local engineer, but details as to these have not been given out It may be of interest here to note that the early Mormon pioneers operated a still for the extraction of oil from shale, before the date of the Pennsylvania discoveries; and the ruins of an old still near Juah are said to remain. Oil shales are found extensively in eastern Utah, and there are large beds in Utah, Sanpete and Juab counties. Oil sands occur near the San Wayfall swell, and in parts of Wayne and San Juan counties.

DENVER—Nov. 30

Excess Profit Tax provision of the income-tax law is regarded by Colorado mine operators as an unfair discrimination, which places proportionately heavier burdens upon producers with small invested capital than upon those of large capitalization. It is pointed out that a strict administration of the excess-profits law will penalize conservative financiers and create considerable confusion and restrictive conditions detrimental to the industry.

Fixing the Price of Silver by the Government is viewed with alarm by Western mine operators who are interested in the production of silver, and who have undertaken the development of silver properties These operators claim that the unsettled price of silver is sufficiently disquieting to the silver-mining industry, without adding price fixing by the Government. There seems to be some difference of opinion as to the ultimate value of price fixing, but all agree that if a commercially profitable price is not allowed on silver, then silver producers will be heavy losers.

Issuance of New Securities should not be interfered with during the period of the war, as advocated by the American Defense Society, unless the lawmakers think that it will be an advantage to the Government to stop all vital and legitimate promotions of new enterprises. The move to force the passage of a law in the coming session of Congress prohibiting the issuance of new securities except by Federal license is ill-advised according to most enterprising mining men of the West. Such a law would practically stop all mining and oil promotions, good or bad. Bad promotions should be prevented in some other way, it is felt here, than by placing restrictions on the development of new and worthy enterprises which may be of advantage to the Government in the near future.

WALLACE, IDAHO—Nov. 30

Idaho Mining Association took definite and positive action with the view to impressing Congress with the necessity of practically rewriting the section of the war-revenue law imposing a tax on excess profits. The meeting of the association was called to take action on various subjects that are of special interest to the mining industry, but most of these were passed up for the reason that it was the unanimous opinion that a change in the excess-profits law was of far more pressing importance. The action of the meeting is reviewed elsewhere in this issue of the "Journal." The meeting of the association in this city was thoroughly representative of the industry of the state Among the important operators present were James F. McCarthy, manager of the Hecla Mining Co.; Frederick Burbidge, manager of the Federal Mining and Smelting Co.; F. A. Behling, manager of the Empire Copper Co., Mackay, Idaho; Senator I. E. Rockwell, of Bellevue, prominent operator of Wood River mines; Harry L

Day, of the Hercules Mining Co.; Jerome I Day, manager of Tamarack and Custer Mining Co; Charles L Bishop, manager of the Douglas mine of the Anaconda company Robert N Bell, inspector of mines, and F A Thomson, dean of the Idaho School of Mines, were also present.

VIRGINIA CITY, NEV.—Dec. 1

Nevada Silver Producers led by Governor Emmet D. Boyle, Whitman Symmes and S. H Brady are on the way to Washington to confer with the Secretary of the Treasury McAdoo and Raymond T Baker, director of the Mint. They will offer the protest against any effort to make a British-American corner or control of the price of silver Committees from Arizona, Idaho, and Utah will also take part The Nevada silver producers do not object to sharing the burdens of taxation imposed by the war, but they are opposed to scaling of prices which may mean practical confiscation of many of the silver mines in the West

HOUGHTON, MICH.—Dec. 1

Production of Copper from Lake Superior mines for 1917 is estimated at 225,000,000 lb. providing there is no let-up in the present scale of operation. There is much speculation in the Lake Superior copper district as to the action of the Government relative to the price of copper following the conclusion of the agreement on a 23½c basis which ends Jan. 1 That there can be a further reduction in the price seems out of the question, which would mean suspension of more mines or a cut in wages Mines now are paying good bonuses to their employees and while no official announcement has been made there is every reason to believe they will continue to do so. Few of the mines are working full forces All of them could use more men to advantage Lake Superior mining men believe that stimulation to production might be secured by increasing the price to 25c. per lb, but they hardly expect any such action from the Government, notwithstanding the impending shortage.

HIBBING, MINN.—Nov. 30

Iron Ore Under Lake Syracuse is being negotiated for by F. D. Snyder, of St. Paul. The iron ore under this lake is owned by the State of Minnesota and is estimated at three million tons, which should bring to the state, one and a half million dollars in royalty The offer to purchase the ore under Lake Syracuse is the first made under the new law providing machinery for the sale of such ore, the title to which is held to be in the state The law fixes a minimum royalty of 50c. against the 25c. minimum that obtains in most of the iron-ore mine contracts that are now affecting the state.

Ore Production for season just closed for the Chisholm district will amount to almost 3,250,000 tons of iron ore The Oliver Iron Mining Co. heads the list with a total tonnage of 1,750,000 tons. The Shenango Furnace Co totals 1,003,000 tons and the M A Hanna Co produced 466,000 tons. Shipments from the Hibbing district for the month of November will go down in Range history as the one that saved the 1917 ore-shipping season. Taking full advantage of the fine weather, the U. S. Steel Corporation and independent mines shipped to capacity in order to make up for the October setback due to the bad storms. The second Saturday in November was the biggest shipping day of the season when 52 ore trains left the Mitchell yards for the ore docks

JOPLIN, MO.—Dec. 1

Sale of Property of the Fifteenth Street Mining Co. in the eastern part of Joplin to Oklahoma City investors for $100,000, has just been announced. The mine was developed by O. W Sparks, of Galena, and associates, and was of especial interest both for its richness and for the further fact that it is located on one of the veteran mining tracts in this district Some of the first big zinc mines in Missouri were developed on this ground 40 years ago The mine has been operated for several months with a battery of nine hand jigs, and with this and a small amount of custom milling, from 70 to 80 tons of high-grade zinc concentrates have been made weekly. The product has been averaging between 63 and 64.90% metallic zinc, and is lead free Operations are carried on at about 150 ft H C. Murphy, of Clinton, Okla., heads the purchasing company.

TORONTO—Dec. 1

Ownership of Tailings dumped on adjoining property was decided by Justice Middleton on Nov. 29, in the action brought by the Peterson Lake Mining Co. against the Dominion Reduction Co. The question involved was the ownership of a quantity of tailings deposited by the Dominion Reduction Co and its predecessor, the Nova Scotia Mining Co. in Peterson Lake. The property of the Peterson Lake Co. includes the bed of the lake. The Nova Scotia became the owner of the land adjacent to the east arm of Peterson Lake, and in 1909 erected a reduction mill which went into operation in 1910. Tailings were at that time of no commercial value and were deposited in the lake In 1912 the Nova Scotia company made an assignment and its assets became the property of the Dominion Reduction Co In 1914 the manager of that company wrote to the Peterson Lake company, asking permission to continue the dumping of the tailings into the lake, which was granted Subsequently, in May, 1915, the Dominion Reduction Co requested permission to remove the tailings if they were of any value, and received a reply that "this would be satisfactory if the Peterson Lake company had the right to direct the point of deposit of the tailings." In June last, the present Peterson Lake directors secured an injunction to prevent the Dominion Reduction Co. from removing tailings from Peterson Lake territory The Dominion Reduction Co. claimed the ownership of the tailings and the case was tried early in October The judgment is to the effect that the Peterson Lake company is entitled to ownership of all tailings or slimes from the Dominion Reduction Co's mill, formerly the Nova Scotia mill, which were dumped upon Peterson Lake territory prior to July 2, 1915. As the dumping was in progress for five years previous to that date, and those of the earlier period were rich in silver content, it is estimated that the value of the slimes secured by the Peterson Lake may exceed one million dollars. In pronouncing judgment, Justice Middleton stated that the case was analagous to that of an owner of land, who in building a house secured permission to dump earth from the excavation upon the neighboring property, he would not afterwards be allowed to remove it. The judgment is regarded as a test one as several other Cobalt companies, including the Beaver, Temiskaming, McKinley, Darragh, Hudson Bay and Coniagas have also disposed of their tailings on adjacent properties. It is probable that the decision will be appealed

The Mining News

ALABAMA

Jefferson County

WOODWARD IRON CO. (Woodward)—Stripping soft ore at Spaulding mine. Thomas Worthington, of Birmingham, has contract.

TENNESSEE COAL, IRON AND RAILROAD CO. (Birmingham)—One thousand carloads of piling and 5,000,000 ft. of platform lumber purchased for shipyard at Mobile. Work will begin when material arrives.

ALASKA

ALASKA GASTINEAU (Thane) — Ore milled in November amounted to 175,960 tons, assaying $1.08, and yielding 88.12c. per ton, comparing with 191,610 tons milled in October, assaying $1.07 per ton, and yielding 85.4c. per ton.

ARIZONA

Cochise County

DOS CABEZAS GOLD RIDGE MINING CORPORATION (Dos Cabezas)—Gold and silver ore found near surface; No 1 air shaft cut 4-ft vein at 125-ft. point; No 1 tunnel cut vein with 4-in. streak of high-grade ore, also cut by No 2 shaft at 300-ft depth; No 2 tunnel cut 12-ft vein, carrying gold, silver and copper, the last 150 ft being in low-grade ore. A. J Welty, manager

Mohave County

UNITED EASTERN (Oatman)—Shaft completed Sump will be 80 ft deep when finished.

UNION BASIN (Golconda)—Plans for new mill to replace one recently destroyed by fire nearly completed.

TOM REED (Oatman)—Recent discovery of ore in Gray Eagle claim is most important development since strike on Aztec claim a year ago. Discovery made at 100-ft. level of Gray Eagle shaft, believed to be faulted apex of Aztec-Big Jim vein. First crosscut shows vein to be 12 ft. wide.

Pima County

MILE WIDE (Tucson)—A 100-hp. engine and compressor to be installed at Copper King shaft. New shaft to be sunk on Margareta claim.

SAHUARITA (Tucson)—Old Sahuarita smeltery to be blown in again shortly. Recent developments in Twin district indicate sufficient tonnage. Glance, Pandora and Morgan mines are principal producers.

Pinal County

RAY CONSOLIDATED (Ray) — Produced in November, 7,600,000 lb. copper, comparing with 7,700,000 lb. in October.

TROY ARIZONA (Kelvin) — Climax shaft reached 175-ft point Station to be cut at 500-ft. level and crosscut started for orebody

MAMMOTH (Casa Grande)—Macia & Williams operating, situated between the Lake Shore and Jack Rabbit and have found continuation of original orebody.

GILA DEVELOPMENT (Kelvin)—Larger pumping plant to be installed and shaft continued to 200-ft level, where more development will be done. Over 300 ft. of development done to date on 100-ft level.

Yavapai County

JEROME-PORTLAND (Jerome) — Sulphides reported on 500-ft. level. Annual meeting Dec 3.

DUNDEE (Jerome)—Work delayed for few days by unusual flow of water Arranged pumping facilities to prevent further delay Shaft now at 520-ft level Sinking to continue to 950-ft level Shipments of three cars daily continue to Humboldt smeltery.

JEROME VERDE (Jerome)—Contract with United Verde Extension expires Dec 23, for hoisting through Edith shaft. Contract may be extended

ARKANSAS

DIXIE QUEEN MINING CO. (Rush)—Working two prospects; one on Buffalo river, the other on Rush. Milling and free ore being taken now from both prospect tunnels.

BEAR HILL (Dodd City) — Just completed 5000-ft. water line, to supply mill. Mill ore shot down in drifts during installation of pipe line, will keep mill supplied for some weeks.

DEEP MINING CO. (Yellville) — Recently leased 4000 acres on Cowan Barrens between Yellville and Rush; making geological survey preparatory to deep drilling, in charge of Capt. Charles La Vasseur Water of deep wells and springs being analyzed.

CALIFORNIA

Alpine County

CONSOLIDATED MINES CO (Markleville)—Reported that William Sharp, engineer for company, closed negotiations for recently developed Curtz mine.

Amador County

CENTRAL EUREKA (Sutter Creek)—High-grade ore disclosed at points above 3350-ft level Large amount of ore in sight, ranging from $1 to $15 per ton Shortage of labor necessitates hanging up 10 stamps of 40-stamp mill, but improvement in grade of ore compensates.

Butte County

FORBESTOWN DISTRICT again active Gold Queen development continued at cost of several thousand dollars and mine operated under lease for several months. Gold Bank is in good condition. J. A. Lewis, of Los Angeles, added to holdings immediately east of Gold Bank; mill is idle but developing. A. B. Hall of Los Angeles, who recently purchased claims from Fred Beik has done a large amount of development in last few months. Carlisle mine operated during season while water was sufficient for driving the stamp mill; developing. Southern Cross, owned by Mr. Rosenthal, of San Francisco, being developed. J. C. Gateman, of San Francisco purchased claims of Arthur Buckbee. Richard Grass Co., purchased by San Francisco men, being developed by tunnel and shaft. Florence group, near Southern Cross, reported sold to John Springmeyer, of Reno. Alfred Mullen developing property adjoining Shakespeare. Bootjack group, optioned by R. Schumann, of San Francisco, in litigation over payments. Antrim Consolidated has been connected with county road by 1½ mile cross road. Midas being developed by Fred Bachmann. Denver mine reported optioned by San Francisco men. New Burlington owned by W. C. Ralston expected to be in operation early next year.

Calaveras County

ANGELS CAMP DEEP MINING (Angels Camp)—Permitted to sell 6000 shares at 25c. on condition that 664,496 shares heretofore issued be restored to treasury and 314,000 shares outstanding, be deposited as escrow. Purchased Pat and Johnny unpatented claims and optioned Pioneer mine and Morse tract, the purchase price of which is $33,400, payable on Sept. 26, 1921. Warren Rose tract also optioned, the purchase price, $25,000, to be paid in monthly payments between April, 1918, and October, 1921. Sinking two-compartment shaft on Pioneer to 130 ft.; will deepen main shaft to 500 ft. and develop by crosscuts. Company is a Nevada corporation and previously issued all of its 1,000,000 shares in exchange for two claims and options on the others.

El Dorado County

BREALA COPPER (Placerville) — Ore assaying 4½% copper, $2.53 gold and $1.11 silver developed in mineral zone 18 ft. wide between walls. Developed 40 years ago by 100-ft. shaft, and recently unwatered by Victor E. Bonnefoy. Arranging for hauling ore to Breala station, a mile east, for rail shipment.

CINCINNATI (Placerville)—Situated in Kelsey district. Installing 60-ton quartz mill, 5-ft. diameter, of arrastre type, but similar in action to Chilean mill but provided with balls. Will require 7 hp. oil engine for driving. Ore is soft crumbly quartz in large porphyry dyke, developed by 250-ft. tunnel and by crosscuts and raises. Ore is low grade and friable.

Kern County

YELLOW ASTER (Randsburg)—Erecting crushing and screening plant to replace all hand sorting and thus reduce operating costs per ton.

BUTTE LODE LEASING CO. (Randsburg)—Recent report in "Journal" that Butte mine was being operated under management of John M. Taylor, and good ore opened, was incorrect. No good ore found and none being extracted; Mr. Taylor severed all connection with company several months ago, having sold all his interests. John M. McClintock, of Altadena, Calif., is present manager and company expects to treat ore on dumps, estimated at 30,000 tons, of less than $20 per ton, with 10-stamp mill now on property.

Nevada County

PITTSBURGH-GOLD FLAT (Grass Valley)—Permitted to sell 28,289 fractional shares at 10c. net; proceeds to be used for development work.

GRASS VALLEY CONSOLIDATED (Grass Valley)—Shaft unwatered to 900-ft. level; pumps installed for operation on levels above that depth in Allison Ranch mine. Permitted to sell 149,991 shares capital stock at $1, to provide substantial development fund. Includes Stanton, Mary Ann, Croesus, Minnesota, Keystone, Hill and Croesus Extension, and option on Benoit.

Plumas County

DELAWARE MILL (Frawley) — Overhauled and testing molybdenum ore from Joe Bryant mine.

HAZZARD (Seneca) — Reported International Smelting Co., of Utah, optioned property and preparing for extensive development. Same company operates Walker copper mines near Portola.

Sacramento County

NATOMAS (Natoma)—Dredge No. 2 being dismantled for reconstruction. Will have new wooden hull and be rebuilt after design of No. 1 and No. 4, for resoiling of land coincident with recovery of gold. No. 2 was one of the early boats built by Folsom Development Co., and operated on flat lands near Fairoaks. Was dismantled and reconstructed several years ago and large part of machinery still in good order and can be replaced on newly constructed dredge. The field near Fairoaks has been worked out and dredge, when ready for operation, will be installed near Nimbus in same neighborhood as No. 4 is digging.

Tuolumne County

CONFIDENCE (Sonora) — High-grade ore disclosed between 900- and 1000-ft. levels; vein 15 ft. wide carrying sulphurides. Mill under construction; building to be 120 x 25 ft.; 25 men working two shifts.

NONPAREIL GOLD SYNDICATE, LTD. (Sonora)—Suit by George S. Smith against Orris M. Sweet to recover $10,000 for himself and other creditors. Plaintiff agrees to undertake sale of property and settlement of accounts.

COLORADO

Gunnison County

ANACONDA (Iola)—Shipping copper ore.

VULCAN (Iola)—Operations resumed by new company.

AKRON (White Pine)—Shipments made via Sargents, on Denver & Rio Grande R.R. Auto-truck haulage used.

Hinsdale County

BLACK CROOK (Lake City)—Mine and mill operating.

HIGHLAND CHIEF (Lake City)—Operations at this lead mine in Henson Creek section resumed.

GOLDEN FLEECE (Lake City)—Mill alterations completed; now operating successfully.

La Plata County

MARY MURPHY (Durango) — Large shoot shipping-grade copper-silver ore reported opened between first and second levels. Sinking from second level to connect with tunnel level. Prospecting disclosed other shoots at different places. Owned by Cave Basin Mining Co.

Mineral County

MINERAL COUNTY (Creede)—Working Happy Thought; ore treated in Humphreys mill.

CREEDE EXPLORATION CO. (Creede)—Subsidiary of American Smelting and Refining Co., has lease on Amethyst below Wooster adit level and on portion of Commodore. Amethyst shaft being unwatered Commodore shaft will be unwatered when machinery is installed. Power plant built at Humphreys mill.

Montrose County

RADIUM ORE SAMPLING CO. (Montrose)—New organization incorporated by O. B. Willmarth, C. J. Moynahan, and R. E. Diemer, to build and operate sampling plant in Montrose. Building will be three stories high, equipped for sampling and testing carnotite ores. O. B. Willmarth, manager.

San Juan County

COMING WONDER (Silverton)—Development in last year; opened orebodies now being mined. Tramway built to loading station near railroad to allow operation throughout winter.

RED MOUNTAIN MINES (Silverton)—Organized as subsidiary to Mary Murphy Mines Co. to take over and operate Genesee-Vanderbilt, Yankee Girl, and other properties opened by Joker tunnel at Red Mountain. Equipment has been overhauled; motor-driven air compressor being installed at Genesee mine. About 40 men engaged on development which will be continued during winter. George E. Collins, manager; W. C. Prosser, of Silverton, superintendent.

San Miguel County

ALTA MINES (Telluride)—Situated in Gold King Basin; taken over by Tonopah-Belmont interests; development and mill reconstruction under way. John M. Fox, local manager.

SCHLESINGER RADIUM CO. (Naturita)—Recently purchased 22 carnotite claims from Crucible Steel Co. Development in progress under management of Charles L. Harrington. Karl L. Kithil, of Denver, vice president and general manager.

Summit County

BROOKS SNIDER (Breckenridge)—Working through mill-level adit.

MOLLIE (Breckenridge)—Shipments of gold, silver and lead ore being made from this Yuba Dam Flat mine.

BIG RESERVE MINING CO. (Breckenridge)—Remodeling mill; expect to be operating soon. Flotation to be installed. Frank Peabody, manager.

EVANS DREDGE (Breckenridge) — Equipping with machinery; expect to have dredge in operation in November. Yuba Construction Co., of California, building dredge.

TONOPAH PLACERS CO. (Breckenridge)—Constant prospecting with churn drill being done ahead of dredge No. 1 in Blue River valley. Believed blanket vein of Iron Mask mine may be found in this area.

Teller County

BIG TOAD (Cripple Creek)—Alterations to Reid mill nearly completed; electric machinery will be installed. Expected to be treating low-grade ore from Dante mine by Nov. 15.

VINDICATOR (Independence) — Net earnings, for third quarter, $49,000, being less than past quarters due to high cost of supplies, and smaller production because of labor shortage. Drifting on La Bella vein cut in crosscut from 20th level of Golden Cycle shaft. Surface tramway built to transport milling-grade ore.

IDAHO

Shoshone County

IDAHO-NEVADA (Wallace) At 200-ft depth in drift from shaft, considerable lead with copper showing. Being developed by local company through two-mill assessments levied every 60 days.

CHICAGO-BOSTON (Wallace)—Day interests abandoned option taken about a year ago, being refused more time. Shaft sunk 200 ft. and vein explored on 100- and 200-ft. levels, showing shoot 400 ft. long in lower one. Wanted time to sink 200 ft. further. Another company is ready to take option if sufficient stock is pooled.

INTERSTATE-CALLAHAN (Wallace)—Announced quarterly dividend of 50c. per share, payable Jan. 2. Earnings amounted to $1 a share for third quarter, but dividend passed to provide surplus to meet war tax. New flotation plant in operation will add 300 tons to milling capacity. Tailings dump, estimated at 200,000 tons, will be reground and treated by flotation.

MICHIGAN

Copper

SOUTH LAKE (Houghton) — Shipped 6000 tons of ore in October.

LAKE (Point Mills)—Shipments for October were 7300 tons.

ALLOUEZ (Allouez)—Shows slight increase this month; 2100 tons daily is shipment record at present.

WOLVERINE (Kearsage)—Handling 37 cars of ore daily, compared with 32 last month.

WHITE PINE (Ontonagon)—Production for 1917 will be over 4,000,000 lb., about equal to output last year.

WYANDOT (Houghton) — Accumulated stockpile wil be sent to Winona stamp mill.

FRANKLIN (Demmon)—Has made improvements at mill, including longer trestle, holding 16 cars.

AHMEEK (Ahmeek) — Production for 1917 estimated, will amount to over 30,000,000 lb., comparing with 24,000,000 lb. last year. Rock averages better than 22 lb per ton. Shipping about 4600 tons daily.

HANCOCK (Hancock) — Production for November estimated at 340,000 lb., comparing with equal amount for September. Could use increased force of one third underground. No indication of any immediate betterment in labor situation.

CALUMET & HECLA (Calumet)—Shipping daily average of 9500 tons of ore; 21 stamp heads in use. Ahmeek shipments are handled at mill with eight stamp heads now exclusively used for this rock. Calumet & Hecla mills handling large amount of conglomerate, as shipments include Tamarack as well as regular conglomerate from old mine; stamps average 500 tons daily on latter class of rock, being harder than any other ore from these mines.

MINNESOTA

Mesabi Range

MAJORCA (Calumet)—Pickands Mather Co. constructing two eating and sleeping camps to accommodate employees engaged in constructing washing plant and sinking shaft.

DRAPER IRON ORE CO. (Coleraine)—Another new mine to be opened in Itasca County. Test pitting and drilling on NW¼, Sect. 10-56-23; plan to start operations at once.

ASH IRON CO. (Duluth)—Certificate of incorporation filed. Walter B. Congdon, James Wanless, and Charles A. Humbert, of Duluth; David T. Adams, of Chicago, and Kay Todd, of St. Paul, incorporators. Capitalized at $500,000.

MISSOURI

Joplin District

CRESCENT (Quapaw, Okla.)—Constructing new 300-ton mill on lease in Oklahoma, south of Baxter, Kan.

LEAD BOY (Quapaw, Okla.)—Has new 200-ton mill almost completed on Hickel lease of Quapaw land, south of Baxter, Kan. To be in operation by Dec. 15.

MIOKA (Miami, Okla.)—Incorporated for $50,000. Started drilling on three 40-acre leases, one north of Picher, one south of Baxter, and one at Lincolnville. George C. Brown, president.

LUCKY STRIKE (Miami, Okla.)—Sinking two shafts; building mill on lease southeast of Quapaw. Has two of richest drill strikes in history of district. Mill to be ready for operation Jan. 1. R. L. Austin, Miami, president.

KELTNER (Joplin)—Purchased 500-ton Milton mill and will erect on lease adjoining Picher-Bingham tract at Picher, Okla. Mill was built in sheet-ground field at Carterville in 1916 at cost of $82,000 and sold for $35,000. Keltner company will make improvements. One shaft on lease into ore and two others will be started at once. F. W. Evans, Joplin, president.

GREENING MINING AND MILLING (Oklahoma City, Okla.)—Construction started on new 300-ton mill on lease southeast of Douthat, Okla. Ore found at 120 ft. Company is subsidiary of Hare Mining and Milling Co., which has in operation new mill west of Picher, Okla. Alfred Hare, Oklahoma City, president and general manager of both companies.

MONTANA

Lewis and Clark County

SCRATCH GRAVEL GOLD (Helena)—Shipping to smeltery.

ECONOMY (Helena)—Stoping gold-bearing ore at 300-ft. level; building mill.

MARYSVILLE GOLD SYNDICATE (Marysville)—Thirty tons a day to St. Louis mill from Blue Bird-Hickey tunnel.

HELENA MINING BUREAU (Helena)—Producing 100 tons silver-lead ore per week from Helena mine.

NEW YORK ENGINEERING AND TESTING PLANT (Helena)—Concentrating 100 tons a day of manganese ore for shipment East.

Silver Bow County

ANACONDA (Butte)—Bell and Diamond mines, shut down since recent strike, resumed operations Nov. 26 with 600 men for the day and night shift. On Nov. 28, two shifts started in Berkley mine, bringing production to nearly 92% of normal. Leonard was down for few days following discovery of gas on Nov. 22, that broke into 1300-ft. level through bulkheads used to confine the mine fires. Gas spread through stopes in upper levels. The places in danger were bulkheaded again and mine put in shape for safe resumption of work. Twenty-two of the 28 mines of company had no accidents during September.

NEVADA

Nye County

TONOPAH ORE PRODUCTION for week ended Nov. 24 was 10,125 tons, valued at $177,187, comparing with 10,093 tons, the previous week. Producers were: Tonopah Belmont, 2372 tons; Tonopah Mining, 2750 tons; Tonopah Extension, 2380 tons; Jim Butler, 750 tons; West End, 1211 tons; MacNamara, 507 tons; Rescue, 66 tons; Cash Boy, 50 tons.

WHITE CAPS EXTENSION (Manhattan)—Making preparations for cutting station on 400-ft. point in shaft and putting in 20-ft. sump. Bunk house for 16 men completed.

MANHATTAN CONSOLIDATED MINES DEVELOPMENT (Manhattan)—Recently opened some high-grade ore in Consolidated workings, east orebody from fourth level developed for 53 ft., showing considerable high-grade ore.

White Pine County

RED HILLS SILVER MINE bonded by Tex Hall and a Mr. Rossell, developing.

A. B. WITCHER AND D. McDONALD working new lead in Snake River, just north of Sacramento Pass, preparing to discontinue.

TUNGSTONIA MINES (Tungstonia)—Producing a little ore, only company mining tungsten ore, as price is too low.

NEVADA CONSOLIDATED (McGill)—Production for November amounted to 6,900,000 lb. copper as compared with 7,000,000 lb. in October.

NEW MEXICO

CHINO (Santa Rita)—Produced 6,313,[illegible]72 lb. copper in November comparing with 6,333,000 lb. in October.

OREGON

MANGANESE PROPERTY near Wimer, recently owned by Earl M. Young, of Rogue River, sold to Seattle steel men, who will develop. Ore occurs in several veins running through serpentine.

QUEEN OF BRONZE (Takilma)—This copper mine shipping high-grade ore; 60 men employed. John Hampshire, manager.

WASHINGTON

O. K. (Metaline Falls)—Expects to cut main vein in lower tunnel during winter.

OLD MORNING AND MAMMOTH (Metaline Falls)—Have sold all machinery and equipment.

LEAD AND ZINC CO. (Metaline Falls)—Filed petition in bankruptcy. Olaus Jeldness of Spokane, named as receiver.

UTAH

Beaver County

CEDAR-TALISMAN (Milford)—Six shipments silver-lead ore during November.

MOSCOW (Milford)—Temporarily closed down with 150 tons of ore on hand, owing to low price of lead.

CREOLE COPPER (Milford)—Mining some copper ore. Property 25 miles west of old Horn Silver.

BEAVER COMBINATION (Milford)—Stated to have broken into adjoining Moscow property several hundred feet beyond lines. Question of boundary line may be brought to court for settlement. Also possible consolidation suggested.

Juab County

TINTIC SHIPMENTS for week ended Nov. 23 amounted to 230 cars, as compared with 219 the week preceding, more cars being available. In lifting embargo, stated that some smelters are considering limiting mines to certain fixed tonnages, to avoid future embargoes. Reported that in the case of Eagle & Blue Bell, which during September shipped only five cars, a daily limit of three cars will be set, although mine is able to ship much more.

TINTIC STANDARD (Eureka)—Important strike made on 1300-ft. level, 30 ft. from new working shaft; new orebody opened for four sets in width and six sets in length. About 300 tons shipped and 70 mine cars ready for shipment. Ore is shipping grade carrying silver, gold, copper and lead. Similar ore on 1170-ft. level.

Salt Lake County

SILVER SHIELD (Bingham)—Car of lead-silver ore carrying gold and copper shipped by lessees from upper workings. Shaft down 200 ft. and bottom in mineralized ground.

VICTOR (Salt Lake)—Drifting toward so-called Cardiff limestone contact; has been following 6-ft. vein for 50 ft., showing altered limestone with some lead ore. Expects to reach Victor fissures shortly.

EMMA CONSOLIDATED (Alta)—Sullivan 1340-cu.ft. compressor installed. Diamond drill to be set up in Emma Copper crosscut near fissure cut last year, showing shipping ore carrying silver, lead and copper.

WASATCH MINES (Alta)—Owns 900 acres, including former producers, namely, Columbus, Flagstaff, etc. Driving drainage and operating tunnel, at present 1350 ft. underground with objective point 2000 ft. ahead, to get under old Columbus stopes. Progress nine to 10 ft. daily.

Summit County

THREE KINGS (Park City)—Shaft down 570 ft. passing through black limestone. Objective is contact of limestone with Ontario quartzite; making 4 to 5 ft. daily.

SILVER KING CONSOLIDATED (Park City)—Shipments reduced from 50 to 40 tons daily, owing to embargoes. Carload of concentrates also from mill weekly. Spiro tunnel to open Thaynes Canon section in about 4600 ft., averaging about 10 ft. daily, at present slower, owing to loose ground and necessary timbering. Considerable flow of water.

Tooele County

DEEP CREEK SHIPMENTS showing increase. Western Utah Copper again shipping chiefly copper ore with some lead. Shipments begun from Western Utah Extension. Woodman Mining continues to send out ore from its Chief mine at Ferber, 12 miles west of Gold Hill station, shipping about 36 tons daily of lead-silver ore, hauling to Gold Hill.

WOODMAN MINING (Gold Hill)—Shipping from Frankle property.

TOOELE-GOLD HILL MINING (Gold Hill)—Strike of copper ore reported on Goldstone claim, but extent not determined. D. L. Runyon, manager.

WESTERN UTAH COPPER (Gold Hill)—Has been shipping 200 to 250 tons daily; limiting output lately to about 150 tons a day, owing to inability of smelteries to take larger tonnage.

CANADA

Ontario

GOLD DISCOVERY made in Lightning River in Northern Ontario, south of Lake Abitibi. Only one discovery reported to date consisting of a 3-ft. vein.

ONTARIO-KIRKLAND (Kirkland Lake)—Mining plant will be installed.

BURNSIDE (Kirkland Lake)—Purchased by Aladdin-Cobalt and arrangements made for development.

BEAVER (Cobalt)—Completed balance of payments on Kirkland Lake gold mines, which it is operating.

NEWRAY (Porcupine)—Under option to Crown Reserve; reported to be developing favorably. Stated that 30-ft. vein has been cut.

KERR LAKE (Cobalt)—Transferred all assets to Kerr Lake Mines, Limited, of Ontario, and shareholders will receive one share of the new stock for each share of old.

MONDEAU CLAIMS (McElroy Township)—Road completed to this property, under option to Kerr Lake. Sinking by hand will start shortly; plant to be installed as soon as possible.

PROVINCIAL (Cobalt)—New milling equipment comprising Hardinge mill, two slime tables, classifier and slime tank with a Grotch oil-flotation machine installed, with capacity of 40 tons per day. Ore on dumps, and much high-grade ore blocked out.

DOME (Porcupine)—Announced mill will be shut down because of shortage of labor and high operating costs. Stated that $6 ore on limited production will only pay operating expenses. Mine operation will continue and development at greater depths undertaken.

Quebec

GRAPHITE MINES have shipped 376,390 lb., valued at $75,776, during 1917, comparing with a value of $2461 the previous year. Shortage of labor curtailed output during present year.

MEXICO

METAL EXPORT TAXES are provided in a decree of Mexican Government, according to dispatches from Mexico City, dated Dec. 1, as follows: Gold, 93.33 pesos per kilogram; silver, 2.803 pesos per kilogram; ore concentrates, 3.924 pesos per kilogram; copper bars, 0.51 centavos per kilogram; ore concentrates, 0.621 centavos per kilogram; lead bars, 0.56 centavos per kilogram; ore concentrates, 0.75 centavos per kilogram; zinc bars, 0.73 centavos per kilogram; ore concentrates, 0.97 centavos per kilogram; tin bars, 9.12 centavos per kilogram; ore concentrates, 10.9 centavos per kilogram; mercury, 18 centavos. Export duty on mercury, it is stated, will be based on flasks on an average net weight of 34 kg., and a sample will be taken from every tenth flask for assay to determine whether it contains an amalgam of any other precious metal subject to a higher duty.

SANTA GERTRUDIS (Pachuca)—Report for year ended June 30, 1917, states profit amounts to $8738. A total of 8856 ft. was driven, raised and sunk in various levels. Development interfered with owing to frequent cessation of milling caused by shortage of supplies. Mining costs advanced on account of increased costs of labor and supplies. It was reported that reserves on June 30, 1917, are estimated at 1,125,000 dry tons containing 68,783 oz. gold and 13,756,756 oz. silver. Recoverable amount estimated at 61,904 oz. gold and 12,381,080 oz. silver. Milling operations were 53.2% of normal capacity due to shortage of cyanide, but full supply now arranged for. Milling costs increased owing to low tonnage and cost of labor and supplies. Treated 213,872 dry tons of ore, averaging $8.96 per ton. Recovery in bullion was 89.81%.

AFRICA

TRANSVAAL GOLD PRODUCTION, as reported by Transvaal Chamber of Mines for October, was 751,290 oz., being 13,059 oz. more than in September, but 41,049 oz. less than in October, 1916. For the 10 months ended Oct. 31 the total value was $159,968,211 in 1916, and $155,636,039 in 1917, a decrease of $4,332,175, or 2.7% this year. The number of negro laborers employed in October was 186,792, of whom 4620 were in the diamond mines, 11,841 in the coal mines and 170,331 in the gold mines. This shows a decrease from September of 1003 in the gold mines and of 934 in the total number. There was a decrease of 28,999 negroes as compared with October of last year.

The Market Report

SILVER AND STERLING EXCHANGE

Nov. Dec.	Sterling Exchange	Silver New York, Cents	Silver London, Pence	Dec.	Sterling Exchange	Silver New York, Cents	Silver London, Pence
29	4.7515		42¾	3	4.7515	85⅜	42¾
30	4.7515	84¼	42¾	4	4.7515	85⅜	42¾
1	4.7515	84¼	42¾	5	4.7515	85⅜	42¾

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

DAILY PRICES OF METALS IN NEW YORK

	Copper	Tin	Lead		Zinc
Nov. Dec.	Electrolytic	Spot.	N. Y.	St. L.	St. L.
29	....	..			
30	*23½	†88	6¼ @6½	6.25 @6.30	7⅝ @7¾
1	*23½	†88	6¼ @6½	6.25 @6.35	7.65 @7.70
3	*23½	†88	6¼ @6½	6.30 @6.35	7.50 @7.60
4	*23½	†88	6¼ @6½	6.30 @6.40	7½
5	*23½	†88	6¼ @6½	6.30 @6.40	7½

† Nominal

* Price fixed by agreement between American copper producers and the U. S. Government, according to official statement for publication on Friday, September 21, 1917.

The above quotations (except as to copper, the price for which has been fixed by agreement between American copper producers and the U. S. Government, wherein there is no free market) are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for the deliveries constituting the major markets, reduced to bajis of New York, cash, except where St. Louis is the normal basing point.

The quotations for electrolytic copper are for cakes, ingots and wirebars.

We quote electrolytic cathodes at 0.05 to 0.10c. below the price of wirebars, cakes and ingots.

Quotations for spelter are for ordinary Prime Western brands. We quote New York price at 17.5c. per 100 lb. above St. Louis.

Some current freight rates on metals per 100 lb. are: St. Louis-New York 17c.; St. Louis-Chicago, 6.3c.; St. Louis-Pittsburgh, 13.1 cents.

LONDON

	Copper			Tin		Lead	Zinc
	Standard		Electrolytic				
Nov. Dec.	Spot	3 Mos.		Spot	3 Mos.	Spot	Spot
29	110	110	125	290	285¾	30½	54
30	110	110	125	291	289½	30½	54
1							
3	110	110	125	293¾	291	30½	54
4	110	110	125	294	292	30½	54
5	110	110	125	295	292½	30½	54

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2,240 lb. For convenience in comparison of London prices, in pounds sterling per 2,240 lb., with American prices in cents per pound the following approximate ratios are given, reckoning exchange at $4.7515. £30½ = 6.4696c.; £54 = 11.4545c.; £120 = 25.4544c.; £137 = 29.0605c.; £240 = 50.9089c. Variations, £1 = 0.2121205c.

Metal Markets

NEW YORK—Dec. 5, 1917

All of the metal markets were dull again, insofar as events appear and may be reported. Lead was a shade stronger, but zinc was distinctly weaker.

Copper—The business in copper is now so thoroughly organized that production passes toward consumption without a ripple. The refinery production in November was larger than in October, but was very far short of the rate of a year ago. A little business was done this week with domestic consumers in contracts for delivery in February and March, 1918. This business was done at 23½c., cash, New York, without any guarantee whatever.

Copper Sheets are quoted at 33c. per lb., f.o.b. mill, for hot rolled, and 1c. higher for cold rolled. Copper wire is quoted at 28c., f.o.b. mill.

Tin—This market is quoted entirely nominally, supplies having been attached by the U. S. Government, whose survey of everything in warehouses is minute. There is probably a little business done surreptitiously in lots that have escaped attention. Anyway, there are rumors of such, but the quantities involved cannot be large. We quote Straits tin nominally at 88c., for there is no doubt that that price would be paid, or that 85½c. would be paid for Banka tin.

Lead—The volume of business was larger than in the previous week, but this was due to a few transactions in large lots, one of 1000 tons being reported. The ordinary inquiry was less than in the previous week, and therefore the market appeared to be duller. However, it was very firm and in the St. Louis market prices advanced a little on small transactions.

Zinc—On Friday some business was done at 7⅝c. and later at 7¾c., the aggregate amounting to a considerable tonnage, but on the following day some round lots were sold at concessions and thereafter the market became distinctly weak. In the aggregate the business of the week amounted to a fairly large tonnage.

Zinc Sheets—Price of zinc sheets has not been changed. Market is still at $19 per 100 lb. f.o.b. Peru, less 8% discount.

Other Metals

Aluminum—This market continues dull with small transactions taking place at 36@38c. per lb. for No. 1 ingots at New York.

Antimony—This market was distinctly stronger. We quote spot at 15½c. Consumers came into the market. It is supposed that they were covering Government orders. None of the importing houses would quote futures. They are holding off for higher prices, expecting to get 18 or 20c.

Bismuth—Unchanged at $3.50 per pound.

Cadmium—This metal is quoted at $1.50 @1.75 per pound.

Nickel—Steady at 50c. per lb., premium of 5c. per lb. for electrolytic.

Quicksilver—Stocks in this market have been greatly reduced and prices are much stronger. We quote $115. San Francisco reports, by telegraph, $110, steady.

Gold, Silver and Platinum

Gold—In the nine months ended Sept. 30, the exports of gold from the United States to Japan were $155,467,726, against $9,300,630 in the corresponding period last year. Exports to Spain were $39,337,400, and to Mexico $6,712,279 for the nine months.

Silver—This market has remained steady at 42¾d. in London, without any special feature. The conferences between the United States and the Allied Governments in reference to taking over the silver output of America in order to stabilize the price have not yet resulted in any definite conclusion, but negotiations are still pending.

Our correspondent in Washington wired on Dec. 5 that conferences with Western silver producers were still in progress and that a delegation from Salt Lake City was en route.

Complaints came from Japan of a scarcity of silver coins. The one-yen pieces (50c. in face value) have almost disappeared and subsidiary silver coins are in very short supply. The embarrassment is so great that it is proposed to issue notes of 50 sen (one-half yen) to relieve it. At present the smallest paper issue is the one-yen note

Mexican dollars at New York: Nov. 30, 64½c.; Dec. 1, 64½c.; 3, 65⅝c.; 4. 65⅝c.; 5, 65⅝c.

Platinum—Active at $103@105.

Palladium—Stronger. We quote $125@130.

Zinc and Lead Ore Markets

Joplin, Mo., Dec. 1—Blende, per ton, high, $72.65; basis 60% Zn, premium $72.50; medium to low, $65@62.50; calamine, per ton, 40% Zn, $35@38; average value, all grades of zinc, $57.89 per ton.

Lead, high, $85.75; basis 80% Pb, $75@85; average selling price, all grades of lead, $81.05 per ton.

Shipments the week: Blende 7049 tons, calamine 436 tons, lead 1730 tons. Value, all ores the week, $573,510.

One producer-smelter today characterized the local ore situation and the metal situation as intolerable. His company is having a hand-to-mouth existence because of the inability to get ore to the smeltery. Shippers can get but a part of the cars needed, and the transportation companies are endeavoring to divide them around to the best advantage, yet every buyer is "kicking" strenuously. Purchased ore aggregates hundreds of tons with no cars to move the ore. Gondolas, or coal flat cars, are being resorted to.

Platteville, Wis., Dec. 1—Blende, basis 60% Zn, $62 base for premium grade down to $57 base for second grade. Lead ore, basis, 80% Pb, $65 per ton. Shipments reported for the week are 3090 tons of zinc ore, 60 tons of lead ore, and 691 tons of sulphur ore. For the year to date the figures are: 134,819 tons of zinc ore, 6647 tons of lead ore, and 26,431 tons of sulphur ore. Shipped during the week to separating plants, 4057 tons of zinc ore.

Other Ores

Manganese Ore—Metallurgical ore continues firm at $1.20 per unit.

Molybdenum Ore—In good demand with sales reported at $2.20@2.25 per lb. of molybdenum sulphide, basis 90%.

Pyrites—Spanish lump quoted at 15c. per unit, on basis of 10s. ocean freight, buyer to pay excess freight and war risk, except that concession of 2% of war risk is allowed. Ocean rates remain at 35s. for Northern, 40s. for Southern and 42s. 6d. for Gulf ports.

Tungsten Ore—We quote this market unchanged as to prices, which range from $26 per unit for the highest grade of ore down to about $20 for ore of 60% grade.

With respect to this market, Charles Hardy, under date of Dec. 4, reports the following:

"A proclamation issued on Nov. 28, makes most of the imports subject to license and tungsten is one of those articles, especially mentioned in the proclamation. It is anticipated that the necessary delays in obtaining licenses and the nationality of several shippers of tungsten ore in South America will delay shipments and generally interfere with the regulation of imports. This fear of shortage of imports caused considerable business to be done for spot goods during the last few days. A new development, however, has since taken place and buyers are for the time being, very reluctant to buy material. The railroads have almost invariably placed an embargo on shipments leaving New York and buyers do not feel that they can afford to buy material which cannot be shipped to them, thus the week begins with a dead look and prices in tungsten are absolutely nominal."

Exports of nickel and chrome ores from New Caledonia for the five months ended May 31 are reported by the *Bulletin du Commerce* of Noumea at 20,963 metric tons of nickel ore and 17,542 tons of chrome ore. Exports of metals were 3799 tons of nickel matte.

The iron ore movement from the Lake Superior region in November was very heavy, the total shipments having been 7,331,804 tons, or 1,616,357 tons more than in November, 1916. This will bring the total for the season up to within 2,500,000 tons of those of last season In 1916 shipments ended with November, but this year an effort is being made to bring down several more cargoes

PITTSBURGH—Dec. 4

The traffic situation dominates the entire iron and steel trade in the Pittsburgh and adjacent districts. Through the continued shortage in Connellsville coke the blast furnaces have had operations still further curtailed, while coal supplies to steel mills, particularly in the Youngstown district are insufficient, though perhaps a trifle better than two or three weeks ago The coke shortage is attributed entirely to car shortage, and it is claimed that through the two wage advances recently made and the termination of much outdoor work, there could now be a much larger production of coke if the cars were available. The pooling of the roads east of Chicago, arranged by the War Industries Board, Nov 24, was promptly followed by the issuance of a number of drastic orders by the General Operating Committee, the seven railroad vice-presidents who have in charge the conduct of the pool, these orders being directed chiefly toward relieving the congestion in the Pittsburgh district. No definite results, in freer traffic movement, are to be noted thus far The Carnegie Steel Co. was operating 48 of its 59 blast furnaces at the beginning of last week, dropping to 44 on Friday, and to 41 at the beginning of this week. Merchant-furnace operations have been intermittent, there being frequent bankings. There was a partial cleanup over Sunday of coke stalled en route and receipts at some furnaces are improved this week.

Only a small volume of commercial steel business is being done in the open market The large steel producers are as a rule out of the market. They are continually receiving large orders for Government account, while they still have fairly heavy shipments against old contracts, and their production is restricted. The leading interest has between 40,000 and 50,000 tons of finished rolled steel in yards awaiting cars for loading. Demand is light, consumers being uncertain what their requirements will be, and as shipments will depend more and more upon priority orders they see no particular advantage in getting mills to accept orders at this time Cases of mills offering to sell steel at above the set prices are rare and never occur in connection with the large mills Specifications against steel contracts are at a rate far below shipments, and make a favorable comparison only with the small volume of specifications received in October The sheet market, however, is quite active, as it has been since the Government prices were announced Nov. 5. It is estimated that sales of sheets by the independent mills in November totaled about 140,000 tons, of which perhaps one-fourth was directly or indirectly for the Government All sales of sheets were at the set prices.

Pig Iron—The large steel interests, normally self-contained as to pig iron, have run still shorter, on account of their decreased production, and several hundred thousand tons of steel-making iron, chiefly basic, could be sold to near-by steel works if it were available. As the merchant furnaces have likewise had their output restricted by coke shortage there are no offerings Of foundry grades there are occasionally small sales. We quote the market largely nominal at the set prices: Bessemer, $36.30; basic and No 2 foundry, $33 malleable, $33.50; gray forge, $32, f.o.b furnaces, the freight from the valleys to Pittsburgh being 95c Messrs W P Snyder & Co report their computations of average prices obtained in market sales of valley iron in November at $36.30 for bessemer and $33 for basic, these being the set prices, and the same as obtained in October While the tonnage entering into the October computations was about 100,000 tons, the tonnage for November was extremely light

Steel—There are practically no market offerings of billets or sheet bars, and buyers without an established mill connection are having a hard time The mills are taking fairly good care of regular customers, at the set prices, $47.50 for billets and $51 for sheet bars f.o.b mill, Pittsburgh or Youngstown

Ferroalloys

Ferromanganese—The market is quiet The usual asking price for prompt or forward is $250 delivered, but this price is frequently shaded by $1 to $3 a ton

Coke

Connellsville—Production continues on a restricted scale on account of car shortage being at the rate of about 70% of the average rate in 1916 against an average of 80 to 85% during the fore part of this year The byproduct ovens however, are now operating substantially at capacity, being benefited by recent priority orders in favor of their coal

STOCK QUOTATIONS

N. Y. EXCH.†	Dec. 4
Alaska Gold M	2¼
Alaska Juneau	2⅜
Am.Sm & Ref.,com.	72¼
Am. Sm. & Ref., pf.	100
Am. Sm. Sec., pf. A	92
Am. Sm Sec., pf. B	‡96
Am. Zinc	12½
Am. Zinc, pf	42½
Anaconda	55¼
Batopilas Min	1
Bethlehem Steel	75
Bethlehem Steel, pf	80
Butte & Superior	16½
Cerro de Pasco.	30½
Chile Cop	14¼
Chino	41
Colo Fuel & Iron	33
Crucible Steel.	52½
Dome Mines	6½
Federal M. & S.	11
Federal M. & S., pf.	30½
Great Nor., ore ctf.	26
Greene Cananea	38
Gulf States Steel	84¼
Homestake	90
Inspiration Con	43
International Nickel	27
Kennecott	31
Lackawanna Steel	79½
Miami Copper	28
Nat'l Lead, com.	43½
National Lead, pf	99
Nev Consol	17
Ontario Min	4
Quicksilver	75
Quicksilver, pf.	50
Ray Con	21½
RepublicI.&S.,com.	74½
Republic I & S., pf.	94½
Sloss-Sheffield.	35
Tennessee C. & C.	12½
U. S. Steel, com	87¼
U. S. Steel, pf	107½
Utah Copper	74½
Va Iron C & C	50

N. Y. CURB†	Dec. 4
Big Ledge.	1½
Butte & N Y.	.75
Butte C. & Z.	7
Butte Detroit	.25
Caledonia	42
Calumet & Jerome.	1¼
Can Cop. Corpn	1⁹⁄₁₆
Carlisle	3½
Cashboy	04
Con. Ariz. Sm.	1⁵⁄₁₆
Con. Coppermines	7½
Con. Nev.-Utah.	³⁄₁₆
Emma Con	⅛
First Nat. Cop	2¼
Goldfield Con.	43
Goldfield Merger.	04
Greenmonster.	⁵⁄₁₆
Hecla Min	4⁵⁄₁₆
Howe Sound	4
Jerome Verde	75
Kerr Lake	4¼
Louisiana.	.50
Magma	45
Majestic	40
McKinley-Dar-Sa.	60
Milford	1¼
Mohican	‡³⁄₁₆
Mother Lode	29
N. Y. & Hond	11
Nipissing Mines.	8½
Nixon Nevada	1⁵⁄₁₆
Ohio Cop	93¼
Ray Hercules	3
Richmond	‡ 56
Rochester Mines	.38
St Joseph Lead	16¼
Standard S. L.	⁵⁄₁₆
Stewart	28½
Success	13
Tonopah	5
Tonopah Ex	1³⁄₁₆
Tribullion	½
Troy Arizona	16
United Cop	.50
United Verde Ext	32
United Zinc	1½
Utica Mines	08
Yukon Gold	1½

SAN FRAN.*	Dec. 4
Alta	03
Andes	10
Best & Belcher.	02
Bullion	01
Caledonia	08
Challenge Con	05
Confidence	10
Con Virginia	16
Gould & Curry	01
Hale & Norcross	02
Jacket-Cr Pt	03
Mexican	08
Occidental	.60
Ophir	09
Overman	01
Savage	02
Sierra Nevada	13
Union Con	12
Utah Con	01
Belmont	3 50
Jim Butler	70
MacNamara	16
Midway	06
Mont.-Tonopah	08
North Star	04
Rescue Eula	09
West End Con	62
Atlanta	1 09
Booth	04
Comb. Frac	‡ 03
D'field Daisy	‡ 02
Florence	11
Jumbo Extension	13
Kewanas	05
Nevada Hills	05
Nevada Packard	15
Round Mountain	20
Silver Pick	07
White Caps	75
Big Jim	‡ 75
United Eastern	3 05

BOSTON EXCH.*	Dec. 4
Adventure	1
Ahmeek	80
Algomah	.25
Allouez	50
Ariz. Com., ctfs	10¼
Arnold	‡.25
Bonanza	21
Butte-Balaklava.	.56
Calumet & Ariz	63
Calumet & Hecla	425
Centennial	14
Copper Range	42½
Daly West	2
Davis-Daly	4½
East Butte	10½
Franklin	4¼
Granby	65
Hancock	8½
Hedley	‡15½
Helvetia	.25
Indiana	1
Isle Royale	23
Keweenaw.	1
Lake	6
La Salle	2½
Mason Valley	5
Mass	6½
Mayflower.	1¼
Michigan	1½
Mohawk	57
New Arcadian	1¼
New Idria	13½
North Butte	13
North Lake	.50
Ojibway.	‡1½
Old Dominion	38
Osceola	56½
Quincy	63
St. Mary's M. L.	54
Santa Fe	.50
Seneca	6½
Shannon	5½
Shattuck-Ariz.	18
So. Lake	1¼
So. Utah	14
Superior	5
Superior & Bost.	3¼
Trinity	3⁵⁄₁₆
Tuolumne	1³⁄₁₆
U. S. Smelting	44½
U. S. Smelt'g, pf.	44
Utah Apex	2¼
Utah Con	12¾
Utah Metal	2¼
Victoria.	3
Winona	1
Wolverine	32
Wyandot	.50

BOSTON CURB*	Dec. 4
Alaska Mines Corp	25
Bingham Mines.	9¼
Boston Ely	.75
Boston & Mont	51
Butte & Lon'n Dev	.14
Calaveras	1¼
Calumet-Corbin.	‡ 01
Chief Con	1¼
Cortez	10
Crown Reserve.	20
Crystal Cop	55
Eagle & Blue Bell.	2
Gila Copper.	17¼
Houghton Copper	60
Intermountain	80
Iron Cap, Com	14
Iron Cap Cop., pf.	‡14½
Mexican Metals	.25
Mines of America	1¼
Mojave Tungsten	28
Nat. Zinc & Lead.	30
Nevada-Douglas	1½
New Baltic	75
New Cornelia	14½
Oneco.	25
Pacific Mines	‡ 35
Rex Cons	13

SALT LAKE*	Dec. 3
Bannack	26
Big Four.	‡ 01
Cardiff	2 50
Colorado Mining	10
Daly	1 40
Daly-Judge	7 00
Empire Copper	1 17
Gold Chain	14
Grand Central	.50
Iron Blossom	59
Lower Mammoth.	03
May Day	03
Moscow	11
Prince Con	05
Rico Wellington	18
Silver-King Coal'n	2 70
Silver King Con.	3 50
Sioux Con	‡ 03
So Hecla	85
Tintic Standard.	1 45
Uncle Sam	02
Wilbert	15
Yankee	02

TORONTO*	Dec 3
Adanac	13
Bailey	05
Beaver Con	30
Chambers Ferland	07
Coniagas	2 90
Hargraves	08
La Rose	35
Peterson Lake	12
Temiskaming	25
Wettlaufer-Lor	05
Davidson	30
Dome Exten	09
Dome Lake	13
Hollinger	4 95
McIntyre	1 31
Newray	31
Porcu. Crown.	22
Teck-Hughes	25
Vipond	20
West Dome	13

STOCK QUOTATIONS—Continued

COLO. SPRINGS	Dec. 4
Cresson Con.	4 87½
Doctor Jack Pot.	03½
Elkton Con.	03¼
El Paso	16
Gold Sovereign.	02½
Golden Cycle	1 64
Granite	40
Isabella	07½
Mary McKinney	06½
Portland	1 10
United Gold M	18½
Vindicator	33

LONDON	Nov. 16		
Alaska Tre'dwell	‡£1	0s	0d
Burma Corp	4	0	0
Cam & Motor	0	11	6
Camp Bird	0	8	0
El Oro	0	9	0
Esperanza.	0	8	3
Mexican Mines.	5	15	0
Min. Corp. Can.	0	16	6
Nechi, pfd.	0	10	0
Oroville	0	19	3
Santa Gert'dis.	0	14	3
Tomboy.	1	1	6

* Bid prices. † Closing prices ‡ Last Quotations.

MONTHLY AVERAGE PRICES OF METALS

Silver	New York			London		
	1915	1916	1917	1915	1916	1917
Jan.	48.855	56.775	75.630	22.731	26.960	36.682
Feb	48.477	56.755	77.585	22.753	26.975	37.742
Mar.	50.241	57.935	73.861	23.708	27.597	36.410
April	50.250	64.415	73.875	23.709	30.662	36.963
May	49.915	74.269	74.745	23.570	35.477	37.940
June	49.034	65.024	76.971	23.267	31.060	39.065
July	47.519	62.940	79.010	22.597	30.000	40.110
Aug	47.163	66.083	85.407	22.780	31.498	43.418
Sept.	48.680	68.515	100.740	23.591	32.584	50.920
Oct	49.385	67.855	87.332	23.925	32.361	44.324
Nov	51.714	71.604	85.891	25.094	34.192	43.584
Dec.	54.971	75.765	..	26.373	36.410	.
Year	49.684	65.661	..	23.675	31.315	.

New York quotations cents per ounce troy, fine silver. London, pence per ounce, sterling silver, 0.925 fine.

Copper	New York		London			
	Electrolytic		Standard		Electrolytic	
	1916	1917	1916	1917	1916	1917
Jan.	24.008	28.673	88.083	131.921	116.167	142.895
Feb.	26.440	31.750	102.667	137.895	133.167	148.100
Mar.	26.310	31.481	107.714	136.750	136.000	151.000
April	27.895	27.935	124.319	133.842	137.389	147.158
May	28.625	28.788	135.457	130.000	152.622	142.000
June	26.601	29.962	112.432	130.000	137.455	142.000
July	23.865	26.620	95.119	128.409	125.500	140.409
Aug	26.120	25.380	110.283	122.391	126.304	137.000
Sept.	26.855	25.073	113.905	117.500	134.071	135.250
Oct.	27.193	23.500	122.750	110.000	142.523	125.000
Nov.	30.625	23.500	134.659	110.000	155.432	125.000
Dec	31.890		145.316	. .	162.842	
Year	27.202	. .	116.059		138.281	

Tin	New York		London	
	1916	1917	1916	1917
January	41.825	44.175	175.548	185.813
February	42.717	51.420	181.107	198.974
March	50.741	54.388	193.609	207.443
April	51.230	55.910	199.736	220.171
May	49.125	63.173	196.511	245.114
June	42.231	62.053	179.466	242.083
July	38.510	62.570	168.357	242.181
August	38.565	62.681	169.870	243.978
September	38.830	61.542	171.345	244.038
October	41.241	61.851	179.307	247.467
November	44.109	74.740	186.932	274.943
December	42.635		183.368	
Av. year	43.480		182.096	

Lead	New York		St. Louis		London	
	1916	1917	1916	1917	1916	1917
January	5.921	7.626	5.826	7.530	31.167	30.500
February	6.246	8.636	6.164	8.595	31.988	30.500
March	7.136	9.199	7.375	9.120	34.440	30.500
April	7.630	9.288	7.655	9.158	34.368	30.500
May	7.463	10.207	7.332	10.202	32.967	30.500
June	6.936	11.171	6.749	11.123	31.011	30.500
July	6.352	10.710	6.185	10.644	28.137	30.500
August	6.244	10.594	6.088	10.518	29.734	30.500
September	6.810	8.680	6.699	8.611	30.786	30.500
October	7.000	6.710	6.898	6.650	30.716	30.500
November	7.042	6.249	6.945	6.187	30.500	30.500
December	7.513		7.405		30.500	.
Year	6.853		6.777		31.359	

Spelter	New York		St. Louis		London	
	1916	1917	1916	1917	1916	1917
Jan.	16.915	9.619	16.745	9.449	89.810	48.329
Feb	18.420	10.045	18.260	9.875	97.762	47.000
Mar	16.846	10.300	16.676	10.130	95.048	47.000
April	16.695	9.459	16.525	9.289	99.056	54.632
May	14.276	9.362	14.106	9.192	94.217	54.000
June	11.752	9.371	11.582	9.201	68.591	54.000
July	8.925	8.643	8.755	8.473	50.750	54.000
Aug	8.730	8.360	8.560	8.190	51.587	54.000
Sept	8.990	8.136	8.820	7.966	52.095	54.000
Oct	9.829	7.983	9.659	7.813	54.159	54.000
Nov	11.592	7.847	11.422	7.672	56.023	54.000
Dec	10.665		10.495		55.842	
Year	12.804		12.634		72.071	

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton.

Pig Iron, Pgh.	Bessemer‡		Basic‡		No. 2 Foundry	
	1916	1917	1916	1917	1916	1917
January	$21.60	$35.05	$18.78	$30.95	$19.70	$30.95
February	21.16	30.37	18.93	30.95	19.51	30.95
March	21.81	37.37	19.20	33.49	19.45	35.01
April	21.65	42.23	18.95	38.90	19.45	40.06
May	21.78	46.94	19.11	42.84	19.58	43.60
June	21.95	54.22	18.95	50.05	19.34	50.14
July	21.95	57.45	18.95	53.80	19.20	53.95
August	21.95	54.17	18.95	50.37	19.22	53.95
September	22.88	46.40	19.58	42.24	19.53	48.59
October	24.61	37.25	21.26	33.95	21.51	33.95
November	30.07	37.25	29.18	33.95	26.55	33.95
December	35.16		30.95		30.79	
Year	$23.88		$20.98		$21.15	

‡ As reported by W P Snyder & Co.

Current Prices—Materials and Supplies

IRON AND STEEL

SHEETS—Quotations are in cents per pound in various cities from warehouse, also the base quotations from mill:

Blue Annealed	Large Lots, Pittsburgh	St. Louis	Chicago	San Francisco	New York Dec. 6, 1917	New York One Yr. Ago
No. 10	4.25	5.42	5.45	8.25	5.445	4.25
No. 12	4.30	5.47	5.50	8.30	5.495	4.30
No. 14	4.35	5.52	5.55	8.35	5.545	4.35
Black						
Nos. 18 and 20	4.80	6.32	6.25	8.30	6.245	3.80
Nos. 22 and 24	4.85	6.37	6.30	8.35	6.295	3.85
No. 26	4.90	6.42	6.35	8.40	6.435	3.90
No. 28	5.00	6.52	6.45	8.50	6.445	4.00
Galvanized						
No. 10	5.25	6.97	6.80	....	6.695	....
No. 12	5.35	6.97	6.80	8.60	6.795	4.50
No. 14	5.35	6.97	6.80	8.60	6.795	4.50
Nos. 18 and 20	5.65	7.17	7.10	8.90	7.095	4.90
Nos. 22 and 24	5.80	7.32	7.25	9.05	7.245	5.30
No. 26	5.95	7.47	7.40	9.20	7.395	5.45
No. 28	6.25	7.77	7.70	9.50	7.695	5.75

STEEL RAILS—The following quotations are per 100 lb. f.o.b. Pittsburgh and Chicago for carload or larger lots. For less than carload lots 5c. per 100 lb. is charged extra:

	Pittsburgh Dec. 6, 1917	Pittsburgh One Year Ago	Chicago* Dec. 6, 1917	Chicago* One Year Ago
Standard bessemer rails	$38.00	$33.00	$38.00	$38.00
Standard openhearth rails	40.00	40.00	40.00	40.00
Light rails, 8 to 10 lb.	43.50	50.00	43.50	47.00
Light rails, 12 to 14 lb.	39.00	49.00	39.00	46.00
Light rails, 25 to 45 lb.	30.00	47.00	30.00	44.00

Note—Reported that rerolled rails are higher than new rails rolled from billets.

TRACK SUPPLIES—The following prices are base per 100 lb. f.o.b. Pittsburgh for carload lots, together with the warehouse prices at the places named:

	Pittsburgh Dec. 6, 1917	Pittsburgh One Year Ago	Chicago	St. Louis	San Francisco
Standard railroad spikes, 3/16-in. and larger	$5.00 to 5.50	$2.65	$5.00	$6.45 base	$7.25
Track bolts, square nuts	7.00 to 8.50	3.25	6.25	Premium	8.80
Standard section angle bars	3.50 to 4.00	2.00	4.50	Premium	4.65

STRUCTURAL MATERIAL—The following are the base prices f.o.b. mill, Pittsburgh, together with the quotations per 100 lb. from warehouses at the places named:

	Pittsburgh	New York Dec. 6, 1917	New York 1 Yr. Ago	St. Louis	Chicago	San Francisco	Dallas
Beams, 3 to 15 in.	$3.00	$4.195	$3.85	$4.27	$4.20	$7.75	$6.00
Channels, 3 to 15 in.	3.00	4.195	3.25	4.27	4.20	7.75	6.00
Angles, 3 to 6 in., ¼ in. thick	3.00	4.195	3.25	4.27	4.20	7.75	6.00
Tees, 3 in. and larger	3.00	4.195	3.40	4.27	4.25	7.75	6.00
Plates	3.25	4.445	4.00	4.52	4.45	7.75	9.00

RIVETS—The following quotations are per 100 lb.:

	Mill, Pittsburgh	Warehouse New York Dec. 6, 1917	Warehouse New York One Year Ago	Warehouse Chicago	Warehouse St. Louis	Warehouse San Francisco	Warehouse Dallas
STRUCTURAL							
¾ in. and larger	$5.25	$7.00	$5.25	$5.50	$5.55	$7.15	$8.40
CONE HEAD BOILER							
¾ in. and larger	5.35	7.10	5.35	5.60	5.65	7.25	8.50
⅝ and 11/16	5.50	7.25	5.50	5.75	5.80	7.40	8.65
½ and 9/16	5.85	7.60	5.85	6.10	6.15	7.75	9.00

Lengths shorter than 1 in. take an extra of 50c. Lengths between 1 in. and 2 in. take an extra of 25c.

HORSE AND MULE SHOES—Warehouse prices per 100 lb. in cities named:

	Mill, Pittsburgh	Chicago	St. Louis	Denver	Birmingham
Straight	$4.75	$6.00	$5.50	$7.50	$6.75
Assorted	4.90	6.00–6.50	5.75	7.75	7.00

STEEL SHEET PILING—The following price is base per 100 lb. f.o.b. Pittsburgh with a comparison of a month and a year ago:

Dec. 6, 1917	One Month Ago	One Year Ago
$4.00 to $5.00	$4.00 to $5.00	$2.60 to $2.70

WIRE ROPE—Discounts from list price on regular grades of bright and galvanized are as follows:

	New York	St. Louis	Chicago	San Francisco
Galvanized	10—2½%	10—2½%	10—2½%	+40%
Bright	20—2½%	20—2½%	20—2½%	15%

SWEDISH (NORWAY) IRON—This material per 100 lb. sells as follows:

	Dec. 6, 1917	One Year Ago
New York	$14.00	$6.00
Cleveland	15.00	6.30
Chicago	13.50	5.50

In coils an advance of 50c. usually is charged:
Note—Stock scarce generally.

COAL BIT STEEL—Warehouse price per pound is as follows:

New York	Chicago	Birmingham	St. Louis	Denver
$0.12	$0.09	$0.16	$0.15	$0.14

DRILL STEEL—Warehouse price per pound:

	New York	St. Louis	Chicago
Solid	12c.	14½c.	9c.
Hollow	24c.	23½c.	..

PIPE—The following discounts are for carload lots f.o.b. Pittsburgh, basing card of Nov. 6, 1917, for steel pipe and for iron pipe:

Steel Inches	Steel Black	Steel Galvanized	Iron Inches	Iron Black	Iron Galvanized
BUTT WELD					
⅛, ¼ and ⅜	44%	17%	¾ to 1½	33%	17%
½	48%	33½%			
¾ to 3	51%	37½%			
LAP WELD					
2	44%	31½%	2	26%	12%
2½ to 6	47%	34½%	2½ to 4	28%	15%
			4½ to 6	28%	15%
BUTT WELD, EXTRA STRONG PLAIN ENDS					
⅛, ¼ and ⅜	40%	22½%	¾ to 1½	33%	18%
½	45%	32½%			
¾ to 1½	49%	36½%			
LAP WELD, EXTRA STRONG PLAIN ENDS					
2	42%	30½%	2	27%	14%
2½ to 4	45%	33½%	2½ to 4	29%	17%
4½ to 6	44%	32½%	4½ to 6	28%	16%

Note—National Tube Co. quotes on basing card dated Apr. 1.

From warehouses at the places named the following discounts hold for steel pipe:

	Black New York	Black Chicago	Black St. Louis
¾ to 3 in. butt welded	38%	42.8%	40.1%
3½ to 6 in. lap welded	18%	38.8%	36.1%

	Galvanized New York	Galvanized Chicago	Galvanized St. Louis
¾ to 3 in. butt welded	22%	27.8%	25.1%
3½ to 6 in. butt welded	List	18.8%	22.1%

Malleable fittings, Class B and C, from New York stock sell at list price. Cast iron, standard sizes, 15 and 5%.

MISCELLANEOUS

FLOTATION OILS—Prices of oils for flotation, in cents per gallon, in barrels:

	New York	Chicago	Denver In Bbl. Lots	Denver In Carload Lots
Pure steam-distilled pine oil	$0.50½	$0.45	$0.30	$0.27
Pure destructively distilled pine oil	.40	.43	.30	....
Pine tar oil	.28½	.30	.24½	.19
Crude turpentine	.37	.47	.44	.38
Hardwood creosote	.19½*	.....	.34½	.31

*F.o.b. Cadillac, Mich.

SODIUM CYANIDE—New York price is 37c. per lb.; Denver, 44c.; in Chicago, 50c.

SODIUM SULPHIDE—In New York the price per pound is 4c. to 4¼c. for concentrated, 2¼c. to 2½c. for crystals. The Denver price for concentrated is quoted at 3½c. The Chicago price is 3½c. Concentrated comes in 500-lb. drums, the crystals in 400-lb. barrels.

ZINC DUST—New York price is 18c. per lb. in 1600-lb. barrel; Chicago, 18c.; in Denver, 18c.

ALUMINUM DUST—Chicago price is $1 per lb.

CALCIUM CARBIDE—Price f.o.b cars at warehouse points east of Mississippi River (except in Alabama, Georgia and Florida) is $97.50 for Cameo, $102.50 for Union miners' carbide. In territory between Mississippi River and the Rockies and in Alabama, Georgia and Florida, add $5; west of Rockies, add $10 to $15.

LINOLEUM—In 50-sq.yd. rolls in carload lots the price is 88c. per square yard, for concentrating tables.

HOSE—

Fire

	50-Ft. Lengths
Underwriters' 2½-in.	75c. per ft.
Common, 2½-in.	40%

Air

	First Grade	Second Grade	Third Grade
¾-in., per ft.	$0.60	$0.35	$0.30

Steam—Discounts from list

First grade	Second grade	Third grade
30%	30%	40%

RUBBER BELTING—The following discounts from list apply to transmission rubber and duck belting:

Competition	50%	Best grade	20%
Standard	35%		

LEATHER BELTING—Present discounts from list in the following cities are as follows for cut lengths:

	Medium Grade	Heavy Grade
New York	40%	35%
St. Louis	45%	40%
Chicago	30+10%	40+5%
Birmingham	35%	10%
Denver	40%	40%

RAWHIDE LACING—40%

MANILA ROPE—For rope smaller than ⅝-in. the price is ½ to 2c. extra, while for quantities amounting to less than 600 ft. there is an extra charge of 1c. The number of feet per pound for the various sizes is as follows: ⅝-in., 8 ft.; ¾-in., 6; ⅞-in., 4½; 1-in., 3⅓; 1¼-in., 2 ft. 10 in.; 1½-in., 2 ft. 4 in. Following is price per pound for ⅝-in. and larger, in 1200-ft. coils:

Boston	$0.35	New Orleans	$0.33
New York	.35	Los Angeles	.34
Chicago	.37½	Seattle	.33½
St. Paul	.34	Denver	.35½

PACKING—Prices per pound:

Rubber and duck for low-pressure steam	$0.77
Asbestos for high-pressure steam	1.54
Duck and rubber for piston packing	.88
Flax regular	.66
Flax waterproofed	.99
Compressed asbestos sheet	.99
Wire insertion asbestos sheet	1.21
Rubber sheet	.55
Rubber sheet, wire insertion	.88
Rubber sheet, duck insertion	.44
Rubber sheet, cloth insertion	.25
Asbestos packing, twisted or braided, and graphited, for valve stems and stuffing boxes	1.10
Asbestos wick ½- and 1-lb. balls	.65 to .70

FIRE BRICK—Quotations on the different kinds in the cities named are as follows, f.o.b. works:

	New York	Chicago
Silica brick, per 1000	$50.00 to 55.00	$55.00 to 60.00
Fire clay brick, per 1000, No. 1	45.00 to 55.00	....
Magnesite brick, per net ton	135.00 to 145.00	....
Chrome brick, per net ton	135.00	....
Deadburned magnesite brick, per net ton	85.00 to 90.00	....
Special furnace chrome brick, per net ton	60.00 to 70.00	60.00 to 80.00

Standard size fire brick 9 x 1½ x 2½ in. The second quality is $4 to $5 cheaper per 1000.

St. Louis—High grade $55 to $65. St. Louis grade, $40 to $50.

Birmingham—Fire clay $25 to $30. Denver, $23, per 1000.

RAILWAY TIES—For fair-size orders, the following prices per tie hold:

	Material	7 in. x 9 in. by 8 Ft. 6 In.	6 in. x 8 in. by 8 Ft.
New York	Yellow Pine	$1.30	$1.06 to 1.11
St. Louis	White Oak	1.00	.75
Chicago	Plain	.97	.82
Chicago	Creosoted	1.30	1.15
San Francisco	Green	1.13	.80
San Francisco	Creosoted	2.02	1.43

GREASES—Prices are as follows in the following cities in cents per pound for barrel lots:

	Chicago	St. Louis	Birmingham	Denver
Cup	5½	5.6	10½	10½
Fiber or sponge	6	5.9	15	15
Transmission	6	5.9	13	13
Axle	1	3.3	4	4
Gear	1½	6	5½	5½
Car journal	3½	3.75	5	5

COTTON WASTE—The following prices are in cents per pound:

	New York		Cleveland	Chicago
	Dec. 6, 1917	One Year Ago		
White	11.00 to 13.00	10.00 to 12.00	16.00	14.00 to 15.00
Colored mixed	8.50 to 12.00	7.00 to 9.00	14.00	10.00 to 12.00

WIPING CLOTHS—In Cleveland the jobbers' price per 1000 is as follows:

13½ x 13½ .... $35.00   13½ x 20½ $45.00

In Chicago they sell at $30 to $33 per 1000.

LINSEED OIL—These prices are per gallon:

	New York		Cleveland		Chicago	
	Dec. 6, 1917	One Year Ago	Dec. 6, 1917	One Year Ago	Dec. 6, 1917	One Year Ago
Raw in barrels	$1.22	$1.01	$1.25	$1.05	$1.22	$0.96
5-gal. cans	1.32	1.11	1.40	1.15	1.32	1.06

WHITE AND RED LEAD in 500-lb. lots sell as follows in cents per pound:

	Red				White	
	Dec. 6, 1917		1 Year Ago		Dec. 6, 1917	1 Yr. Ago
	Dry	In Oil	Dry	In Oil	Dry and In Oil	Dry and In Oil
100 lb. keg	12.25	12.50	10.50	11.00	12.00	10.50
25 and 50 lb. kegs	12.50	12.75	10.75	11.25	12.25	10.75
12½ lb. keg	12.75	13.00	11.00	11.50	12.50	11.00
1 to 5 lb. cans	14.25	14.50	12.50	12.50	14.50	12.50

NUTS—From warehouse at the places named, on fair-sized orders, the following amount is deducted from list:

	New York		Cleveland		Chicago	
	Dec. 6, 1917	One Year Ago	Dec. 6, 1917	One Year Ago	Dec. 6, 1917	One Year Ago
Hot pressed square	$1.00	$0.50	$1.40	$3.00	$2.00	$3.00
Hot pressed hexagon	1.00	.50	1.20	3.00	2.00	3.00
Cold punched square	1.00		.75	2.00	1.50	2.50
Cold punched hexagon	1.00	.50	.75	2.75	1.50	3.00

Semi-finished nuts sell at the following discounts from list price:

	Dec. 6, 1917	One Year Ago
New York	10%	10%
Cleveland	50—10%	65—10%
Chicago	50%	65—10%

MACHINE BOLTS—Warehouse discounts in the following cities:

	New York	Cleveland	Chicago
¾ by 4 in. and smaller	30%	50%	40—10%
Larger and longer up to 1 in. by 30 in.	15%	40%	30—5%

WROUGHT WASHERS—From warehouses at the places named the following amount is deducted from list price:

New York ..... $1.00   Cleveland ..... $3.50   Chicago $3.00

For cast-iron washers the base price per 100 lb. is as follows:

New York ..... $5.00   Cleveland ..... $5.50   Chicago $3.50

EXPLOSIVES—Price per pound in small lots at cities named:

	Low Freezing	Gelatin			Black
	20%	40%	60%	80%	Powder
New York	......	$0.27½	$0.34½	.....	$2.50*
Boston	......	......	.30¼	$0.43¾	
New Orleans	.....	.27½	.34½	......	....
Los Angeles	$0.24	.30	.39	......	....
Seattle	.18½	.24¾	.31¾	.41¾	....
Chicago	.19¾	.23¾	.33	.43	2.45*
St. Paul	.20	.26¼	.33¼	......	2.55*
St. Louis	.16½	.20½	.29½	.39½	2.15*
Denver	.19	.25¼	.32¼	.42¼	....
Dallas	.25	.29	.39	.49	....

*Keg.

FUEL OIL—Price variable, depending upon stock. New York quotations not available owing to this fact. In Chicago and St. Louis the following prices are quoted:

	Chicago	St. Louis
Mexican heavy, 12-14 Baumé	7c.	none
Domestic light, 22-26 Baumé	5¾c.	7½c.

Note—There is practically no fuel oil in Chicago at present time.

OIL—Price per 50-gal. bbl. is as follows:

City	Fuel	Black	Red Engine	Steam Cylinder	Gasoline
Seattle	$1.60	$6.25	$11.00	$21.00	$10.25
Denver	3.00	8.75	18.00	24.00	12.00
Boston	6.00	11.00	16.00	23.00	12.50
San Francisco	4.05	5.75	9.50	20.50	10.00
New Orleans	3.00	7.50	15.50	18.00	11.25
Cincinnati	5.04	6.00	12.50	18.00	12.00

Note—Standard prices of oil are necessarily difficult to give. Those above are for average grades.

CONSTRUCTION MATERIALS

ROOFING MATERIALS—Prices per ton f.o.b. New York or Chicago:

	Carload Lots	Less Than Carload Lots
Tar felt (14 lb. per square of 100 sq.ft.)	$61.00	$62.00
Tar pitch (in 400-lb. bbl.)	15.00	16.50
Asphalt pitch (in barrels)	29.00	30.50
Asphalt felt	60.00	62.00

PREPARED ROOFINGS—Standard grade rubbered surface complete with nails and cement costs per square as follows in New York and Chicago:

	1-Ply		2-Ply		3-Ply	
	c.l.	l.c.l.	c.l.	l.c.l.	c.l.	l.c.l.
No. 1 grade	$1.15	$1.40	$1.45	$1.60	$1.75	$1.90
No. 2 grade	1.10	1.25	1.25	1.40	1.50	1.65

Asbestos asphalt saturated felt (14 lb. per square) costs $5.35 per 100 lb.

Slate-surfaced roofing (red and green) in rolls of 108 sq.ft. costs $1.85 per roll in carload lots and $2.10 for smaller quantities.

Shingles, red and green slate finish, cost $4.75 per square in carloads, $5 in smaller quantities, in Philadelphia.

HOLLOW TILE—

	4x12x12	8x12x12	12x12x12
Boston	$0.08	$0.15	$0.20
St. Paul	.055	.138	.153
Denver	.11	.20	.30
Los Angeles	.0668	.12	.20
Seattle	.06	.10	.16

LUMBER—Price per M in carload lots:

	8 x 8-in. x 20 Ft. and Under				12 x 12-In., 20 Ft. and Under	
	Y.P.	Fir	Hemlock	Spruce	Y.P.	Fir
Boston	....	....	....	$10.00	...	..
Seattle	$23.00	$23.00	$23.00	23.00	$23.00	$23.00
Los Angeles	..	30.00	30.00	..	..	..
New Orleans	26.00	..	..	..	38.00	.
St. Paul	....	38.00	38.00	38.00	..	51.00
Denver	....	32.00	..	28.50	...	34.00
San Francisco	....	24.00	24.00	..	...	24.00

	1-In. Rough, 10 In. x 16 Ft. and Under			2 In. T and G 10 In. x 16 Ft.	
	Y.P.	Fir	Hemlock	Y.P.	Fir
Seattle	$23.00	$23.00	$23.00	$23.00	$23.00
New Orleans	26.00	..		24.00	.
San Francisco	.	24.00	24.00	...	24.00
St. Paul	..	53.00	34.00	61.00	37.50
Denver	.	30.00	30.00	...	30.00

PORTLAND CEMENT—These prices are for barrels in carload lots, including bags:

	Dec. 6, 1917	One Month Ago	One Year Ago
New York	$2.22	$2.22	$1.72
Jersey City	2.16	2.16	1.60
Boston	2.77	2.77	1.92
Chicago	2.21	2.31	1.88
Pittsburgh	2.31	2.31	1.81
Cleveland	2.41	2.41	1.94
Denver	3.10	3.20	....
Los Angeles	2.40	2.40	...

LIME—Warehouse prices:

	Hydrated per Ton		Lump per 300-Lb. Barrel	
	Finished	Common	Finished	Common
New York	$10.50	$13.25	$2.10	$1.90
Chicago	15.00	12.00	1.90	...
St. Louis	13.00	10.75	...	...
Dallas	20.00	15.00		
San Francisco	16.50			1.65

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Driving Operations of the Spiro Tunnel of the Silver King Consolidated

By MURRAY SCHICK*

A 14,000-ft. tunnel is being driven for drainage and development purposes, of which 4000 ft. has been completed at a cost of $25 per ft., including equipment. Individual machine drills have been provided for each machineman, thereby reducing repair costs per drill shift. Two and three shifts per day have been worked and an average of 308 ft. per month of timbered double-tracked tunnel has been driven.

THE Silver King Consolidated Mining Co. is driving a 14,000-ft. drainage and development tunnel at its property in Thayne's Canyon, near Park City, Utah. By September of this year 4000 ft. had been finished. The work was planned and directed by the engineering staff of the company and the bore is known as the Spiro tunnel.

Early mining operations in Thayne's Canyon, while productive of considerable good ore, were confined to the upper limestone known as "Thayne's formation," and did not extend below to the Woodside shale or the lower Park City formation. The shaft of the Silver King Consolidated was sunk to a depth of 950 ft. through the Thayne limestone, the shale and into the Park City limestone, which has proved to be mineralized under Thayne's Canyon as in the territory further east. Although the shaft was high up on a monocline dipping to the northwest, it made considerable water while sinking. The shale seemed to form an impervious stratum that held all underground water of surface origin and a deep shaft through the lower portion of the monocline was thereby rendered impracticable.

The Silver King Consolidated holdings comprise about 1000 acres, covering the entire length of the canyon. The starting point of the tunnel is 6888 ft. above sea level, the lowest elevation to be found in the vicinity, and to gain that level it was necessary to drive several thousand feet through the limestone and shale formations.

THE CALIFORNIA-COMSTOCK MILL AT THE HEAD OF THAYNE'S CANYON, PARK CITY, UTAH, WHERE THE SPIRO TUNNEL WILL TERMINATE

Clearing and grading for roads, houses and tunnel portal commenced in May, 1916. Building started the month following. A substantial blacksmith and machine shop was constructed, covered with corrugated iron. Work started in the tunnel in June. In July a plugger drill was used for drilling part of the time and during the latter part of August the regular drills were placed in service, the delay being caused by the scarcity of drill steel. A compressed-air line was extended from the mine to the tunnel, a distance of nearly two miles, and was laid on top of the ground with the necessary anchors and slip joints. At the tunnel the air passes through a receiver, 20 in. by 30 ft., under which a slow fire is maintained. This gives dry air to the machine drills, raises the temperature and promotes efficiency.

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*Room 305, Boston Bldg., Salt Lake City, Utah.

Individual Drills for Each Machineman

An individual drill was purchased for each machineman and an extra machine kept in reserve. Each machineman was required to use his own machine and no other and was held responsible for its condition. The machines were taken outside after each shift and thoroughly tested, cleaned and oiled. A record is kept of all repairs charged against each drill and a substantial reduction in repair cost as compared to the repair cost of drills used by all shifts has been made. A record of the amount of drilling by each machine, explosives used and cars of rock removed is also kept.

The size of the tunnel in the clear is 7 ft. 4 in. wide at the bottom, 6 ft. at the top and 7 ft. high. Mine cars have 20 cu.ft. capacity. A double track is used. The main track and switches have 30-lb. rails, 18-in. gage, laid upon 6 x 10-in. sills spaced at 5-ft. centers. The daily extension of the track and dump switches is made with 12-lb. rail. On the monthly change day there is no power but this time is utilized in extending the main track, air, water and ventilating pipe lines.

On the left side of the tunnel a water ditch, 3 x 4 ft., is carried below the tunnel floor. The grade is 0.3% and the course S 28° 40′ W. The tunnel has passed through several breaks and slips in the formations, with fractures filled wholly or in part with vein matter. These veins cut through the formation on nearly a vertical plane and have approximate strikes varying from east-west to north-south. At 4000 ft. the breast of the tunnel has a depth of about 800 ft. vertically below the surface. Ventilation at present is obtained by means of a suction fan operated by motor and drawing the air from near the breast through an 18-in. steel pipe exhausting at the portal. The motor is driven from a power line, which also supplies current for lighting.

Close timbering was seldom required through the Thayne limestone through which the tunnel passed for the first 2700 ft. In the Woodside shale stretches of loose and swelling ground occurred which retarded progress considerably.

Two 8-hour shifts are worked constantly and three shifts have been put into service when labor and material were available. The average rate of progress for the first 400 ft. was about 308 ft. per month.

The Spiro tunnel has had to contend with rising costs, scarcity of material and diminishing labor efficiency; nevertheless construction expense has been kept within peace-time estimates. Expenditures, including preliminary building and equipment, aggregate $98,000, or slightly over $25 per ft. of tunnel.

The tunnel survey is entirely in territory owned or controlled by the Silver King Consolidated and can be extended 1000 ft. more within the company's domain. At 14,000 ft. the tunnel level will be approximately 1800 ft. below the surface. The portal is only a few hundred yards from the Park City branch of the Denver & Rio Grande R.R. and within less than a mile of the Silver King Consolidated mill.

Hydraulic-Filling Method To Extinguish Fires in Butte Mines

Butte Correspondence

A method for extinguishing fires in Butte mines has been decided upon by the engineers of the Anaconda Copper Mining Co. after a study made of methods applied in mines all over the world. Hydraulic filling is to be used and is expected to extinguish not only present fires but also to prevent such fires in the future.

The Leonard mine will be the first of the Anaconda mines to adopt the method and preparations have already been made to install it on the various levels of this and other mines of the company. The plan adopted incidentally solves another problem that threatens to become rather serious, due to lack of dumping ground in the cramped quarters of the district. The filling material to be used will come from the present and future sand tailings of the Butte & Superior company's mill which at the present rate of production are piling up in such quantities that the available room and facilities for disposal have been nearly exhausted. The flume that brings the tailings more than a mile to the Leonard mine is already built and will be connected to the 10-in. pipe placed for that purpose down the Range shaft, as soon as the piping on the underground levels can be laid. At intervals the sands will be forced through diamond-drill holes into the fire region. The water will seep to the bottom and eventually be drawn off, after being clarified by methods the details of which are now being worked out. The fine sands will be forced by the static pressure into existing cavities in the fire zone and eventually shut off all fresh air and oxygen from the fire. The hydraulic filling will be placed on the lower fire levels first and gradually will work to the top.

As a means for preventing fires in the future, the Anaconda company has made a most successful start by fireproofing the shaft of its Tramway mine, which was the scene of a destructive conflagration some time ago. The entire 2475 ft. of this shaft has been made safe against a repetition of such a scene by covering all timbers in the shaft and stations with a ½-in. coating of cement which was made to adhere to the timbers by surrounding them with steel lathing. A few feet above and below each station the timbering was removed and replaced by solid concrete walls built against the surrounding rock. The method will be introduced with all possible speed in all of the company's shafts as well as in drifts and crosscuts especially exposed to danger. Fireproofing of the shaft was accomplished in 94 days.

Exportation of Scrap Copper, lead, zinc, iron and alloys thereof from Chile may be prohibited by the President of that country if national interests so demand, a law of Sept. 21, 1917, having given him this authority.

Utilization of Low-Grade Manganese Deposits a Metallurgical Problem*

The development of low-grade manganese deposits in America at such cost as may be necessary is regarded as a war necessity by J. E. Johnson, Jr., who holds that the consumption of ferromanganese should be limited to the manufacture of low-carbon steels. Silicon-alloy substitutions for deoxidizing steels, the production of a manganese pig iron from extensive low-grade manganiferous iron ores, and the difficulties of wet concentration are problems to be worked out by the metallurgist.

THE war has brought about a situation in regard to several minerals which is unprecedented. America has been liberally endowed by nature with most of those minerals required for the purposes of civilization, among the first of which are coal and iron ore; but in regard to others, quantitatively less important, but still vital to this country's progress, she has not been so generous. Hitherto this has made little difference, cheap and unrestricted navigation to and from all parts of the world having supplied America with those thing of which her own yield was scanty or wanting; but with a blockade existing in a large part of the world, with a huge proportion of the world's total ship tonnage sunk and most of the rest commandeered by the governments for war purposes, the supply of vessels for commercial work has become almost a vanishing quantity. In some cases it is not a matter of price but of a lack of bottoms at any price.

GROSS TON OF STEEL REQUIRES 17 LB. OF MANGANESE

Some minerals which could be imported more cheaply than they could be produced can no longer be obtained abroad except at prohibitive prices and our own supplies must now be developed, be the cost what it may. In regard to those minerals of which this country has no supply of her own, the situation is exceedingly serious.

Manganese is one of the minerals with which nature has been niggardly in her supply to America, and it has hitherto been imported, either as ore or as ferromanganese. This country's need arises from the fact that about 17 lb. of manganese, or roughly 0.75%, is required per gross ton of steel to deoxidize the steel and make it a useful product. Manufacturers are not using any more manganese per ton of steel now than formerly—rather less—but the total consumption tends to rise because of the unprecedented output of the steel industry under present conditions.

There have been in the past three principal sources of supply which are in fact the principal manganese-producing districts of the world. (1) The Caucasus Mountains of southern Russia, where there is perhaps the world's largest supply of this indispensable mineral; (2) India; (3) Brazil. This is the order of importance of the districts from a tonnage point of view in the prewar period, though Brazil was a bad third, producing roughly only about 250,000 tons as against nearly 1,000,000 tons for the Caucasus. The Russian deposits are cut off from America entirely by the closing of the Dardanelles. The Indian fields are at so great a distance that the freight under present conditions has become absolutely prohibitive. Of the three principal fields, therefore, only the Brazilian remains available.

For several years practically no manganese had been produced in the United States. Present conditions caused renewed activity in mining this mineral, but according to the Geological Survey, the total supply of manganiferous materials in this country is considerable, although much of it is low grade. Domestic ores could supply a large part of our needs if we made our metallurgy fit the conditions.

TWO STANDARD ALLOYS, SPIEGELEISEN AND FERROMANGANESE

The metallurgical side of this situation is extremely important. There has been in the past only two varieties of manganese alloy in common use—spiegeleisen, containing about 20% manganese, 5% carbon and the rest iron, and ferromanganese of standard variety, containing 80% manganese, about 6% carbon and the rest iron. In the days when the bessemer process was the only one of any importance for producing steel and when rails were the principal steel product made, the use of "spiegel" was almost universal. It was melted in cupolas and tapped as required into a ladle which was charged with the required amount for a heat, taken to the converter and poured into the bath after the completion of the blow. The ratio of carbon to manganese is about 1:4 in spiegel, whereas it is about 1:14 in "ferro." This means that 1% of manganese imparted to the steel with spiegel would raise the carbon 25 points (0.25%), whereas if imparted by ferro it would raise the carbon only about seven points (0.07%). Assuming the carbon to be blown down to 0.08 in both cases, the total carbon with 1% manganese would be 0.33 in one case and 0.15 in the other. For example, 0.33% carbon is much less than is required for rails, and the remainder of the recarbonization was accomplished by adding straight pig iron.

When the openhearth furnace came in, all this was changed. The openhearth brought about the application of steel to a multitude of purposes for which wrought iron had been used in the past, and the steel, to be suitable for these purposes, must be low in carbon. For a vast proportion of the total output, exclusive of rails, the 0.33 carbon is entirely too high. This situation brought about the use of ferromanganese, and, once introduced, its use grew. On account of its small volume, it could be charged direct into the furnace or the steel ladle, and all the bother of handling another ladle of molten material was eliminated. As rails have become a decreasing percentage of our steel output, the importance of the low-carbon steels has grown greater and greater, and in the period immediately before the war there was no sale for spiegeleisen. The New Jersey Zinc Co. had stacked up more than 30,000 tons of spiegel, which was virtually unsalable under the conditions then prevailing. The material was a byproduct and the situation was a serious one for the producer. Within a few months, the present conditions in the steel industry began to develop, and this huge accumulation was sold at a price much higher than that which the company would have been glad indeed to take a few months earlier.

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*Excerpts from a paper, "The Situation in Regard to Manganese, Sulphur, Pyrite and Some Other War Minerals," read by J. E. Johnson, Jr., before the Engineers' Society of Western Pennsylvania, Nov. 27, 1917.

Iron, Phosphorus and Silicon Detrimental to Manganese Ores

High-grade manganese ores being necessary to produce ferro, numerous enormous deposits of low-grade materials have remained undeveloped. If more than a certain limited percentage of iron, roughly one-sixth of the amount of manganese, be present, standard 80% ferro cannot be produced. Spiegel, as already shown, is normally almost unsalable. Not alone the presence of iron ruins manganese ores, but phosphorus and silica as well. Phosphorus becomes increasingly important as the content of manganese is lower because the amount of alloy to be added obviously increases as the percentage of manganese in it decreases, and a phosphorus content which might be tolerable in a 50% manganese ore may be prohibitive in a 25% ore. Silica is objectionable because of the loss of manganese that it involves.

Manganese is much more active chemically than iron. It is easily possible to run an iron blast furnace so as to keep the iron content of the slag down to 0.2% or under, but with manganese this is not the case. Each unit of silica carries away with it in the slag a proportion of manganese, this proportion depending roughly on the amount of other bases in the slag and on the temperature at which the furnace is run. If the temperature is high, the reduction of manganese is more complete than if it is low, but an attempt to make a complete recovery by raising the temperature indefinitely is not practicable, since another difficulty is encountered by so doing. Manganese is volatile, is driven off as a vapor in the hearth and passes out with the gases in a huge yellow cloud which can be seen coming out of the boiler stack at most ferromanganese furnaces. The cinder, on the other hand, always has a strong yellowish green tint, characteristic of manganiferous slags. It was formerly thought that of the total manganese charged, one-third was lost, but practice in this respect has been greatly bettered in recent years. One of the best furnacemen in the country claims to be running with a loss of 15 per cent.

Returning now to the ores, it has been customary to penalize all silica in excess of 12% for the reasons just given. The recoverable manganese in the ore is smaller as the silica rises. This condition has made worthless the low-manganese ores, even when they were approximately free from iron, because manganese could not be produced from them without a loss that was commercially prohibitive. To summarize there is, then, the following situation: (1) A small tonnage of high-grade ore in the United States. (2) A considerable tonnage of low-grade manganiferous material not suitable for ferromanufacture because of either too much iron, too much silica, or too much phosphorus, or a combination of all three. (3) A demand for a manganese alloy with a low ratio of carbon to manganese, so that low-carbon steels can be produced containing enough manganese to deoxidize them thoroughly. (4) The requirement that an ore to produce the desired alloy must be pure.

In the face of the present scarcity of ships, which has already limited severely imports of rich manganese ore and which threatens to limit it still further, what is to be done? The answer is not to be found in a sentence, but only by applying these rigid conditions to each problem and working out the best solution on its merits. The solutions broadly are to be found along three lines. (1) The absolute conservation of ferromanganese for steels, the requirements of which rigidly demand that they be low in carbon. (2) Breaking down metallurgical prejudice in favor of the exclusive use of high-grade ferro and using 70, 60, 50, 40 and 30% alloys for those purposes in which the carbon and manganese requirements of the product permit their utilization. This is a matter of psychology as much as of practice. The inertia of the steel men, which naturally prejudices them in favor of the practice to which they are accustomed, must be overcome. They must get out of the rut and learn to do something different, not only because it may be cheaper, but because the safety of the country as a whole and the outcome of the war depend upon the production of steel. (3) The specifications for steel should be rigidly revised by all steel manufacturers and steel users, perhaps under the auspices of the American Society for Testing Materials, so as to lower the manganese content in all cases where the absolute necessities of the case do not require it to be as high as at present. Some of the best steel makers are convinced that the present specifications for manganese in many classes of material are higher than they need to be, and it is possible that in the manufacture of steel manganese, like charity, may cover a multitude of sins. Steel well made can have its manganese content distinctly lowered and still be better than a badly made steel doused with a parting hypodermic of manganese to make it stagger through the tests.

Metallurgical Changes To Promote Economy

A fourth point involves changes in the metallurgy of manganese itself. The electric furnace has been used for several years in Europe in the production of ferro, and its application to this purpose has made a good start in the United States. It has distinct advantages over the blast furnace under present conditions, for the price of the product is so high that the balance in favor of coke as against electric power for its production no longer controls. The electric furnace has the great advantage that it uses little fuel in comparison with the blast furnace and therefore does not have to contend with anything like the silica, which comes from that source in the blast furnace and takes its toll of manganese when it goes out as slag. Further than this, part of the silica, a considerable part, can be reduced and combined with the manganese to form a ferrosilicon manganese, which has a distinct advantage. It prevents the loss of manganese which accompanies the silica when the latter is slagged, and, what is even more important, it forces down the carbon. In ferro containing 10 or 15% of silicon the carbon has been found to be only about two instead of 6%. This means that the carbon-manganese ratio in such a material is far lower than in straight ferro, even though its content of manganese be materially lower than that of the standard alloy, and offers possibilities which have not yet been fully realized. It is possible to use a mixture of spiegel, or low-grade ferro, with this silico-ferro, so as to obtain the required amount of manganese without permitting the carbon to rise above the desired percentage. A representative of an electric-furnace plant recently made the claim that by melting the ferromanganese before charging, a saving of about 20% in the amount required could be made. This is the statement of an interested party, but there seems to be good reasons for believing that at least some improvement could be made in this way, and, if so, there is no excuse under present conditions for not making it.

Difficulties in Beneficiation of Manganese Ores

A natural question to ask is why the lower-grade ores of manganese cannot be treated like other low-grade ores and brought up to standard metallurgical grade by washing, jigging or some other process. The answer to this question is twofold. (1) The cheapness of the imported ores until recently made such a course commercially unprofitable. (2) The nature of the manganese minerals themselves. Manganese seems to have the faculty of diffusing itself through gangue material in a condition of almost impalpable fineness, and while in many cases there is no chemical union between the two, the problem of separating them by any of the accepted methods of ore treatment has so far failed absolutely. Of course when lumpy manganese is associated with clay, the latter can be washed out, or if it is mixed with particles of rock, these can be jigged out, but there is a great deal of material containing 20 to 30% manganese and about 25% silica with a considerable amount of alumina. This material has a consistency about like that of stove polish, and no method of ore treatment so far developed has sufficed for the apparently easy task of separating this simple mechanical mixture. Experiments are under way at present looking to a solution of this problem along radically novel lines, but the investigation is as yet incomplete and is entirely unprotected by patents. Those interested are hopeful that within a few months low-grade material now worthless can be converted into extremely high-grade ferro, but it is obviously inadvisable to give further details at this time.

Silicon-Alloy Substitutes for Deoxidizing Steel

Various substitutes for manganese have been proposed. Many years ago Henry D. Hibbard tried deoxidizing a heat of steel with ferrosilicon. He killed the heat absolutely; it poured like cream, but when the ingot went through the rolls it broke up into pieces more like birdshot than billets. In other words, in spite of its higher heat of combustion, silicon has not the deoxidizing power of manganese in steel. It has been found that about 25% of the work of deoxidation could be done by silicon, but that the remainder had to be done by ferro. In the electric furnace, it is contended, this condition does not exist and a heat can be so thoroughly killed and deoxidized that good steel can be made without the addition of manganese. It is doubtful, however, if prejudice would permit an acceptance of such steel without a much longer time of trial than has been available under present conditions. It has been proposed that use be made of other metalloids or particularly combinations of these, such as calcium-silicon or calcium-silicon-aluminum in such proportions that their oxides after they had been converted to oxide in deoxidizing the bath would form a fluid slag and so free themselves from the steel in the same way that the oxide in manganese does. This is said to have been done extensively in Europe, but the practice has not been developed to any important extent in this country.

Production of a High-Manganese Pig Iron from Manganiferous Iron Ores

One of the most hopeful methods of bettering conditions is by so altering American practice as to leave the manganese in rather than to introduce it at the end of the process. While ores high enough in manganese to be considered as ores of that element are scarce, there are available enormous tonnages of manganiferous iron ore, and some of even the extremely lean-grade manganiferous material can be charged into the furnace to produce a high-manganese pig iron without causing excessive expense by increasing the slag volume. Then by starting steel manufacture with an iron containing more than 1% manganese, preferably 2%, an important amount can be left in the bath at the conclusion of the oxidizing operation, which is the essence of steel making. This manganese has two good effects: (1) By its presence it tends to prevent excessive oxidation of the heat. (2) It replaces at least a part of the manganese which must otherwise come from the scarce high-grade alloys. Somewhat similar results can be obtained by adding enough manganese ore to the slag to make it decidedly manganiferous. According to such information as is at present available by this means there occurs a considerable reduction of the manganese oxide to metallic manganese by the metalloids of the bath and the manganese content of the iron rises as the heat progresses. The information is not sufficient to permit figures as to the relative consumption of manganese by this process and by the other, but it is reasonable to assume that the efficiency of the manganese would be higher if charged into the blast furnace and almost completely reduced there than if charged into the openhearth and reduced only to a fractional extent.

The situation in regard to manganese is acute and it is a patriotic duty and a commercial necessity to conserve the supply by every possible means. A meeting of the metallurgists of all the steel plants of the country under instruction from the executives of their respective companies to thrash out all these matters to the bottom, each one to have instructions from his chief not to strive for a partisan advantage, but as a matter of patriotic duty to lay all the cards on the table and give to all the experience and knowledge of each for the benefit of the country as a whole, would promise the solution to the situation.

High Prices Necessary To Develop Manganese Resources

The thing for the steel men of this country to hope for is that the price of manganese will go higher. The shipping situation is so serious that ships are almost certain to be taken out of the manganese trade, and that will cut off a corresponding percentage of the present supply of manganese ore. It is positively known that managanese resources in this country are sufficient to last for two or three years if intelligently handled, but they will do no good unless they are developed, and they will not be developed unless it can be done at a profit to someone. The Government bureaus have been urged with the utmost emphasis to consider the absolute indispensability of a pronouncement from the highest authority in Washington that the price of manganese ore would not be regulated downward during the period of the war, and it has been pointed out that if, pursuant to this policy, the price of manganese should rise, as it probably will, the steel makers should be allowed a compensating increase in the prices fixed for their product. The bureaus of the Government are, it is believed, favorable to this idea, and if influence be brought along this line, much may be accomplished, but if the short-sighted view of holding down the price of manganese by price regulation be adopted, the steel industry as a whole and the country with it are likely to suffer. Manganese at $500 a ton is much better than manganese at a nominal price of $100 when it cannot be obtained at any figure.

Zinc Ore Prices in Joplin Nominal and Market Not Representative

Although the basis price for zinc ore in the week ended Nov. 24 ranged between $52.50 and $72.50, with an "average" basis price of $62.50, in reality the settlement price did not exceed $56.71 for at least 66% of the production from 75% of the largest mines in the Joplin district—Missouri-Kansas-Oklahoma—according to figures compiled by the Associated Zinc Ore Producers and printed in the *Joplin News-Herald* of Nov. 25, 1917. The statement issued by the association specified that a basis price of $60 for 60% ore was offered for 11½% of the production and that $65.85 a ton was the average price bid for 16% of the zinc ore produced. Those figures not only are for the week named, but for ore produced since Nov. 10. The entire statement follows:

> It was reported yesterday that there was practically no change in the price of zinc ore this week from the price which prevailed the week previous, when the basis range was from $57.50 to $72.50 per ton for 60% zinc blende in carload lots. Also that Friday, as for several weeks past, only a comparatively small tonnage was purchased at the top basis price, the greater portion of the sales being made around $65, and that this week's average settlement will likely be around the same figure.
>
> During the past 48 hours this office has received accurate and reliable information regarding prices offered for ore from 87 companies operating 133 mills in various parts of the district, which is not in harmony with the figures above quoted.
>
> Only two operators producing 400 tons a week report being offered as high as a $72.50 basis at any time since Nov. 10, and one of these is a property owned by a company also engaged in the smelting business, while the other operator who was offered this price has a production of but 40 tons per week. Twelve companies, with an aggregate weekly production of 927 tons, were offered various prices from $62.50 to $70 per ton, the average of all offerings being $65.85 a ton.
>
> Fourteen operators having a weekly production aggregating 681 tons have received bids of a $60 basis, while 37 companies having an aggregate output of 3897 tons per week were bid from $52.50 to $57.50 per ton, the average price offered being $56.71 per ton.
>
> The foregoing figures, representing nearly 6000 tons weekly production, may fairly be taken as an average for the entire district, and from these figures it is shown that but $56.71 has been offered for 66% of the zinc ore produced; that but $60 a ton has been offered for 11½% of the production and that $65.85 is the average price that has been bid for only 16% of the zinc ore produced since Nov. 10. To make the actual situation more clearly understood let it be known that the figures here quoted are over the signatures of operators themselves, on cards now filed in this office, which show that since Nov. 10 the best bids that have been made for 77½% of the ore produced have been at or under $60 per ton.
>
> The "average price," which is a much misused term, cannot be ascertained by merely taking the high price which may be paid for a few tons of ore and the low price which is paid for a large amount of ore and dividing the difference between the two prices; but can be ascertained with accuracy only by knowing all the bids that have been made for all the ore, which is the basis upon which the foregoing information has been tabulated.

It was declared also by an officer of the Associated Zinc Ore Producers that the many reports of overproduction of ore in the tri-state district were a myth. "It has been said there was as much as 60,000 tons of ore lying in the bins of mines in the Joplin district," said the officer. "On the other hand, the surplus doesn't begin to reach those figures. Indeed, the situation is becoming so complex that mines are still closing down. Several producers in the West Joplin field ceased operation last week, leaving but two mines operating there."

Data returned to the association showed that there were 7076 men employed at 87 mining companies' properties from which replies were received. The car shortage is proving an overwhelming barrier in the district, in that railroads are able to furnish but a small proportion of the cars needed in moving the weekly production. This is not causing the ore to pile up, but is bringing about a curtailment and shutdowns.

Standardized Crushing on Marquette Range, Michigan

MARQUETTE CORRESPONDENCE

The Cleveland-Cliffs Iron Co. has standardized another ore-producing operation on the Marquette range, namely crushing. All lump ore requiring crushing before shipment, as well as incoming lump coal, is sent to a central crushing plant situated at the Maas mine. The plant was completed in July and has been operating on coal and ore continuously since. The Maas plant crushes the Jackson ore (Negaunee), Holmes lump (Ishpeming) and Lake lump (Ishpeming). A similar plant is in operation in the Gwinn district, crushing all the company's lump ore in that district.

The ore is brought to the plant in 45-ton, quick-dumping, standard railroad cars and spotted above a receiving bin on a slight grade. As needed, a car is dropped down to the bin, dumped and run down to the loading pocket, where it receives the same ore it brought to the crusher. The receiving bin is of concrete, steel lined, with nearly vertical sides. The bin holds one car of ore and discharges automatically upon a pan conveyor, with 7½-ft. pans having a capacity of approximately one car of ore. The conveyor discharges upon a 3-in. grizzly over which the oversize slides to a No. 7½ McCully gyratory crusher. The crusher product and the grizzly undersize fall upon a long inclined, 36-in., troughed belt conveyor which discharges into a framed-timber loading pocket, beside the track, 200 ft. below the lump-ore pocket.

The pan conveyor is driven by a 50-hp. motor, the crusher, by a 100-hp. motor and the belt conveyor by 50-hp. motor. The average monthly output is 30,000 tons of run-of-mine ore, reduced to three inch.

Mining Men in National Service

LIEUT. M. ROBERT GUGGENHEIM
Machine Gun Co., 165th U. S. Infantry, 42d Division, A. E. F.

LIEUT. HARRY F. GUGGENHEIM
With U. S. Naval Aviation Forces in France

CAPT. ERLE P. DUDLEY
20th Regiment, U. S. Engineers, Washington, D. C.

CAPT. JOHN G. WORTH
Commanding Auxiliary Remount Depot, Macon, Ga.

Cyaniding a Small Gold-Tailings Dump

By A. W. Allen*

An account of the erection and operation of a small leaching plant. This is usually a "one-man" proposition, and the notes published are mainly for the benefit of the non-technical operator whose only chance of success lies in economy in construction and simplicity in method.

TAILINGS dumps are found wherever gold is mined. They often carry appreciable amounts of the precious metal, but operations on a company scale are seldom justified on account of small tonnage and low possible yield. Opportunities for the small operator are numerous, but he is often handicapped by scarcity of capital and lack of technical experience. Avoidance of unnecessary equipment and simplification of operations will materially increase his prospect of success.

The general arrangement of the simplest type of plant for the purpose is shown in Fig. 1. The leaching vats suggested are 15 ft. in diameter, 4 ft. deep, and made of galvanized iron. The bottom pieces should be of No. 20 and the side pieces of No. 22 or 24 gage. The accompanying tables of data relating to galvanized sheet iron, plain and corrugated, have been prepared to aid in the selection of construction material. A stiffening ring around the top of each vat is optional. The sheets should be double-riveted and soldered inside and out. On the outside and bottom they should be painted with tar, and on the inside with P. & B. cyanide paint. Galvanized iron is practically indispensable for constructing small plants of this description.

A platform of lumber may be used if finances permit; otherwise a carefully leveled bottom, with sand spreading, is usually adopted. Care should be taken to see that the vats are absolutely water-tight when finished. As soon as this is demonstrated, the spaces between them and against one side may be filled in with earth or tailings to carry a track to facilitate filling. On the opposite side a track for discharging may run on a level with the bottom of the vats. An overhead track above the vats for filling purposes is not justified by the size of the plant.

Use of Storage Sump Avoids Frequent Pumping

The capacity of these vats will be about 25 tons of dry tailings. The plant calls for three sumps of twice this volume. One of these, placed above the level of the leaching vats for storage of solution, will be found especially useful. It will obviate the necessity for frequent pumping and enable continuous leaching to be carried on during the night without personal attention. A separate service of 1½-in. piping is connected with the bottom of each leaching vat by double flanges, and delivers to a distributor (see Fig. 3) placed above the level of the zinc boxes. Each pipe is fitted with a piece of canvas hose and a cast-iron plug cock as shown. The distributor has three compartments through which delivery may be made to No. 2 sump, or No. 1 zinc box, or to No. 2 zinc box; and the discharge from any of the leaching vats may be diverted into any one of these compartments.

To avoid the cost of filter bottoms, the leaching vats may be arranged as shown in Fig. 2. The upward filling of the vat with strong solution is made possible by the use of a piece of 3-in. piping, flanged and perforated near the bottom, standing at the side of the vat and close to the solution-supply pipe. The filter bottom consists of pebbles, gravel, and sand, in the order named,—a combination which has often proved thoroughly satisfactory as a cheap filtering medium. The top layer of sand may be renewed occasionally when there is a tendency toward delay in leaching.

The arrangement of piping around the sump is shown in the general arrangement plan. If only a centrifugal pump is available it should preferably be placed on a level with the bottom of the sumps, so that it will be always under a head of water. Much priming trouble will thus be avoided. If a plunger pump is used it can be placed above the sumps. A 2-in. pump and service will be found sufficient.

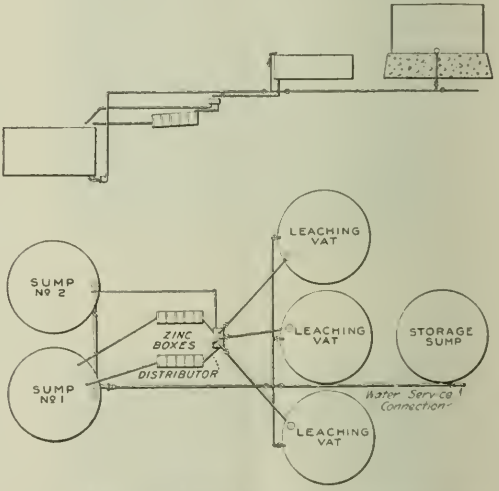

FIG. 1. LAYOUT OF SIMPLEST TYPE OF LEACHING PLANT

Disadvantages of Discharging Leaching Solution from Several Vats Through One Pipe

An idea of pipe economy sometimes prompts operators to connect all the discharge pipes of the leaching vats underneath the vats with a single solution main leading to the extractor house. Or, as an alternative, two mains are sometimes used, each vat having a separate valve connection with each main. Both systems are to be avoided. The principal disadvantages are: (*a*) Valves are needed underneath the vats and at points usually difficult of access, where it is equally impossible to see the discharge or effectively to regulate the leaching rate; (*b*) the piping and valves are exposed, thus increasing the danger of freezing and bursting in winter; (*c*) there is a danger of the loss of valuable solution by the inadvertent connection of two vats, one of which is discharging, or the passage of rich solution from a vat with a fresh charge to one in which treatment is almost concluded, leading often to an inexplicable rise in residue value; (*d*) there is no easy method of sampling the effluent of any particular vat; nor is it always possible to discharge it directly to the sump, or to hasten percolation in case rapid drainage is desired. In more than one instance I have come across plants so equipped and constant trouble and difficulty have resulted. The arrangement suggested as an alternative, and now usually adopted, is far preferable and will result in more efficient operation.

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DETAILS OF ZINC-BOX CONSTRUCTION

The zinc boxes needed can be made cheaply of 20-gage flat galvanized iron, riveted, soldered and painted with P. & B. paint, and may be mounted on wooden trestles. A convenient size for small leaching plants, such as the type under description, is made of two 3 x 7-ft. sheets, which, when riveted together along their lengths, form the sides and bottom of the box. One inch should be allowed for overlap. The end pieces are 25 x 25 in., with a square inch cut from each corner. On three sides the extra inch is bent at right angles for riveting to the body of the box. The surplus on the top side, in conjunction with the extra inch at the sides of the box, is for covering a stiffening ring made of $\frac{3}{8}$-in. round iron. The box, when completed, is therefore 7 ft. long by 23 in. wide by 23 in. deep.

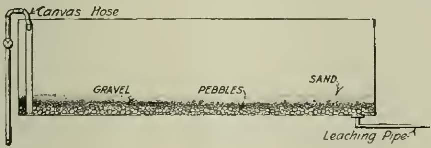


FIG. 2. LEACHING TANK, SHOWING FILTER BOTTOM

Four division plates are cut 20 in. deep and 25 in. wide. These are bent for an inch on each side at right angles, and the first plate is then riveted in place 3 in. from the head end of the box and 1 in. from the top. These plates then alternate with others, to be described later, and carry a piece of 1-in. angle iron riveted along the bottom, the bottom edge of the angle being flush with the bottom of the plate. The projection comes inside the compartment and is for the purpose of supporting the screen or screen frame. No division plate should be placed flush with the top of the box as there is then no provision against chokage in any particular compartment, and overflow is likely to result. The secondary division plates are riveted to the bottom as well as to the sides of the box and are placed 18 in. from the other plates and 2 in. below the top level of the box. The sheets are therefore cut 25 x 25 in., with a square inch taken from the two lower corners, and the sheet bent for an inch on the sides and bottom. These plates also carry a strip of 1 x 1-in. angle iron 3 in. from the bottom to support the other side of the screen frame. A channel space of 2 in. is left between each compartment. Riveting of the division plates to the body of the box is all done inside the compartments and not in the space between the compartments. When completed every joint and every rivet should be soldered and tested before being painted. Leakage from one compartment to another is almost as great a detriment as leakage from the box.

SCREENS SHOULD BE EASILY REMOVABLE

Four-mesh iron-wire screening is a convenient size to use, although a finer mesh is preferable in the first compartment, where there is usually more fine zinc. If heavy screening is obtainable there is no need of a screen frame, but two bent iron handles should be fixed to the screen to allow its easy removal. These handles need only come a few inches above the screen and should not be carried above the surface of the solution, as the latter plan often leads to short-circuiting.

There are four compartments in each box and three boxes are generally necessary. These will have a total zinc-shaving capacity of about 18 cu.ft. each. The boxes are conveniently supported on 3 in. x 2 in. wood trestles in the manner shown in Fig. 4. These are bolted to the box in the channel between the compartments at the middle, and also at the ends of the box.

STANDARD GAGE NUMBERS AND DIMENSIONS OF GALVANIZED PLAIN-IRON SHEETS *

Standard Gage No.	Thickness In.	Standard Widths	Standard Lengths
10	0.141	24 in.	72 in.
12	0.109	26 in.	84 in.
14	0.078	28 in.	96 in.
16	0.062	30 in.	120 in.
18	0.050	36 in.	1.83 m.
20	0.0375	61 cm.	2.13 m.
22	0.0312	66 cm.	2.44 m.
24	0.0250	71 cm.	3.05 m.
26	0.0188	91 cm.	....
27	0.0172	....	.....
28	0.0156	......	.....
29	0.0141	......	...
30	0.0125	....	.....

* Standard widths and lengths are made in all thicknesses mentioned.

GAGE NUMBERS, DIMENSIONS, NUMBER OF CORRUGATIONS, ETC., OF GALVANIZED CORRUGATED-IRON SHEETS

Thickness In.	Gage No.	Corrugations 3-Inch	Number of Sheets per Ton of 2240 Lb. Lengths 6 ft.	7 ft.	8 ft.	9 ft.	10 ft
0.05	18	8	72	62	54	48	43
		10	62	53	46	41	37
0.0375	20	8	85	81	71	63	57
		10	79	68	59	53	47
0.0322	22	8	116	99	87	77	69
		10	97	83	73	65	58
0.0250	24	8	140	120	105	93	84
		10	117	100	88	78	40
0.0188	26	8	186	159	139	124	111
		10	155	133	116	103	93
0.0172	27	8	193	165	144	128	115
		10	161	138	120	107	96
0.0156	28	8	200	172	150	133	120
		10	167	143	125	111	100
0.0141	29	8	220	189	165	146	132
0.0125	30	8	240	206	180	160	144

Precipitate discharge arrangements may be provided by means of cast-iron plug cocks connected by short nipples to bored and threaded squares of $\frac{3}{16}$-in. iron plate, which in turn are attached to the bottom of each compartment by means of galvanized-iron roofing bolts. Plates and bolts are then soldered to the bottom of the box. If larger boxes are required, much thicker iron must be used to ensure rigidity and prevent bulging of the sides and division plates and channeling of the solution.

SLIME IN DUMP MUST BE DRIED AND BROKEN UP

Seams of slime in the dump must be exposed and thoroughly dried. All slime must then be broken up and intimately mixed with the sand so that no lumps of any appreciable size are allowed to go to the leaching vats. The best way to insure this is to screen the material roughly and pass it through a set of hard-wood rolls. These can be operated by a small gasoline engine, the initial cost of which will soon be repaid in improved extraction results. A mixture containing up to 50% of slime may thus be treated in a shallow vat and uniform percolation insured.

As soon as the vat is filled with tailings the leaching-pipe cock at the distributor in the extractor house should be closed. Then solution is pumped from the sump through the hose into a wire tray containing the cyanide and into the top of the pipe (with the perforated lower end) standing in the vat. This allows it to percolate upward and evenly through the charge without channeling. It is usually advisable to leave the solution in contact with the ore overnight. In the morning the canvas hose, connected at the distributor with the leaching pipe from this vat, should be put into the distributor compartment, which is connected directly with No. 2 sump. The cock is then opened cautiously and the solution allowed to run directly to the sump until it is clear of slime. A few minutes generally suffices. The hose is then placed in the distributor compartment leading to one of the zinc boxes and the solution passed slowly through the zinc. When the level of the solution in the leaching vat sinks below the top of the sand, it is advisable to pump more solution directly on the charge; or, if found advantageous to extraction, the vat may be allowed to drain partly before the next charge.

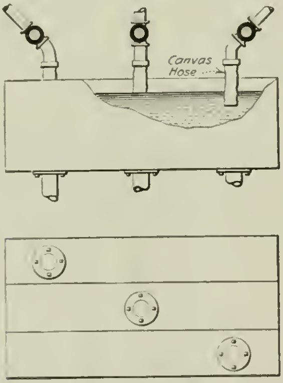


FIG. 3. SKETCH OF THREE-COMPARTMENT DISTRIBUTOR

Operations of Leaching Cycle

On the basis of three days for treatment, the preferable method of leaching is as follows:

First night—Soaking with strong solution made up from sump No. 2. No leaching
First day—Leaching with solution from No. 2 sump.
Second day—Leaching with solution from No. 1 sump
Third day—Leaching with solution from No. 1 sump
Third night—Drain.
Fourth day—Discharge

A water wash may be added late on the third day. The water service may be conveniently connected to the cyanide main beyond the storage sump, and should be arranged so that no back-flow is possible.

The treatment of dried tailings offers unusual advantages in the matter of water-washing without involving an undesirable accumulation of low-grade solution. The ground ore enters the plant at probably 8 to 10% moisture and leaves at from 18 to 25%, according to the percentage of slime present. The evaporation from large areas of vat surface is also considerable in most places. The result is that there is ample scope for washing with water. Normal water-washes are, however, usually inefficient and, unless large quantities are used and much time is spent, it is common to find an appreciable amount of cyanide associated with the residue. Provided final leaching has been carried out with barren solution, this fact is not without an advantage, for the loss of cyanide is accompanied by a loss of dissolved zinc, which, if allowed to accumulate in the solution, would result in sundry complications involving the need of a continuously increasing cyanide strength in the circuit to maintain effective precipitation, with correspondingly high zinc and cyanide consumption.

Modifications in the matter of solution destination may be necessary to keep the balance. The point to be remembered is that final washes should be as free as possible from contained gold and should consist of precipitated solution or water. The effluents from the leaching vats may be distributed as follows to insure maximum efficiency and minimum precipitation cost:

First day—Run solution through zinc boxes.
First half of second day—Run solution through zinc boxes.
Second half of second day—Run solution direct to sump No. 2
Third day—Run solution direct to sump No. 2.
Third night—Run solution direct to sump No. 2

Uniform Solution Best for Precipitation

Solution from leaching vats should be mixed to produce a uniform grade. There is seldom advantage in keeping strong and weak solutions separate and running them to different zinc boxes, although the practice may be followed in exceptional cases. In most instances the adoption of the single-solution idea has resulted in large economies in cyanide consumption, with no variation in extraction. If a solution is so strong that cyanide is in excess of precipitation requirements, the inevitable result of segregating the solutions will be an unnecessary consumption of zinc and a loss of cyanide. If the operator has any doubt as to the solubility of zinc in strong solution, let him watch the effect of a small lump of cyanide placed on the shavings in a zinc box filled with solution.

If a solution is too weak for effective precipitation it should not be run through the box. By combining all the leaching-vat effluents a solution can be obtained of uniform cyanide strength, the actual percentage present being controlled by the amount of the salt added to each fresh charge. With a dump material of fairly uniform composition it is usually feasible to restrict cyanide addition entirely to the fresh charge. The aim should be to produce a precipitated solution that is as nearly barren as possible; otherwise dissolved gold losses in the residue will be unnecessarily high. In the attainment of this end it will be found that uniformity in the matter of cyanide content is the chief desideratum.

Chemical Control of Operations

It is assumed that preliminary small-scale tests have demonstrated the practicability of cyanidation under normal conditions, and that no especial precautions need be taken in practice. Lime is generally necessary and cyanide, of course, essential. It is usually advisable at first to mix about 40 lb. of slaked lime with the contents of the vat by adding a small amount to each car of tailings. The first solution is allowed to dissolve about 40 lb. of sodium cyanide gradually as it enters the leaching vat. This amount will probably be necessary for each of the first three charges, after which the quantity may be reduced to 18 lb., or less, per charge.

Solution testing, even if carried out in a rough way, is valuable in the control of operations, and the following system of obtaining an estimate of the principal constituents of the solution in circuit is recommended. The reagents used are made as follows:

Silver-nitrate solution—Dissolve 6.5 grams of pure silver nitrate ($AgNO_3$) in 1000 c.c. of distilled water, and keep in a stoppered bottle covered with opaque paper.

Iodide indicator solution—Dissolve 4 grams of caustic soda ($NaOH$) and 1 gram of potassium iodide (KI) in 100 c.c. of distilled water.

Acid solution—Dissolve 1.123 grams of crystallized oxalic acid ($C_2H_2O_4$, $2H_2O$) in 1000 c.c. of distilled water.

Ferrocyanide solution—Make up a 10% solution of potassium ferrocyanide ($K_4FeC_6N_6$) with distilled water.

Phenolphthalein indicator—Dissolve 1 gram of phenolphthalein in 25 c.c. of alcohol and add 25 c.c. of distilled water.

Cyanide check solution—Dissolve 2 grams of potassium cyanide (KCN) in 1000 c.c. of distilled water.

Alkali check solution—Dissolve 2 grams of potassium hydrate (KOH) in 1000 c.c. of distilled water.

All the reagents must be chemically pure. The cyanide and caustic solutions are for checking the results whenever there is doubt about the strength of the standard solutions or the correctness of the factors. The cyanide solution must be freshly prepared, as it decomposes. Titrating flasks may be kept clean and free from deposit by washing in acidified water, followed by rinsing in distilled water. Float indicators are a help in reading burettes, which should be covered with a loose cap of lead foil to exclude dust where stoppered burettes are not available.

TESTING FOR CYANIDE AND ALKALI

To test for cyanide, filter the solution from the sumps if it is not clear. Take 50 c.c. of this and add 5 c.c. of the iodide-indicator solution. Use a narrow-neck titrating flask. Then run the silver-nitrate solution slowly and cautiously from a burette until a yellow coloration persists after shaking and standing for a while. Find out how many cubic centimeters of the silver-nitrate solution have been taken, and multiply by 0.01. This will give what is termed the "total cyanide percentage in terms of potassium cyanide." The latter is generally taken as the unit in such estimations.

It is impossible to be dogmatic about the strength of solution necessary or advisable, but as a general rule in small leaching plants the total cyanide percentage content is kept between 0.05 and 0.10 (1 to 2 lb. per ton). If the stock solution circulating through the plant drops below the minimum, more cyanide may be added to the next fresh charge. If it rises above the maximum, less cyanide is probably required.

To test for alkali (lime, etc.), take another 50 c.c. of the filtered solution, add 5 c.c. of the ferrocyanide solution, and then a little more silver-nitrate solution than was found necessary in the total cyanide test. Then add a few drops of phenolphthalein indicator, taking care that it does not touch the sides of the beaker, the hands, or anything but the solution. The latter should turn crimson or pink. Next run in the acid solution slowly from the burette, with occasional shakings of the beaker, until the color disappears. Read off the number of cubic centimeters used and multiply by 0.002, which will give the "percentage protective alkalinity in terms of caustic potash" (which is taken as a convenient standard).

If the solution does not turn pink or becomes only slightly so when the indicator is added, more lime must be used in the plant. As with the cyanide, it is inadvisable to dogmatize without knowledge of conditions, but it may be taken as a rule that when the protective alkalinity of the sump solutions rises above 0.05% (1 lb. per ton of solution), in terms of caustic potash, the amount of lime added to the tailings should be reduced.

CONSUMPTION OF LIME, CYANIDE AND ZINC

The quantity of lime required varies widely. Sometimes none is necessary and in other cases 10 to 15 lb. per ton of tailings is required. In the latter event a preliminary wash with a weak solution or water to dissolve the lime and neutralize the acid may prove advantageous. On a clean oxidized ore which has previously been milled in alkaline water and contains little or no partly decomposed pyrite the cyanide consumption should be low. If the solution is protected with sufficient alkali, the amount used will vary upward from ½ lb. of cyanide per ton of tailings. The solvent used is generally sodium cyanide, which contains about 30% more available cyanogen than the potassium salt and is therefore often referred to as "130% cyanide." Copper, of course, will cause a marked increase in cyanide consumption if the metal is present in soluble form. Zinc consumption will depend largely on the care taken to use a solution of the minimum alkali and cyanide strength consistent with satisfactory extraction and precipitation. The amount required is also influenced by the method of dressing the zinc boxes and the avoidance of an unnecessary production of "short" zinc, which has to be destroyed at clean-up times. In small plants a consumption of 1 lb. of zinc shavings per ton of tailings treated is normal, but even this amount is largely in excess of theoretical estimates. The reason for the loss is that the solutions are generally low grade and often contain only a minute percentage of metal to be precipitated. The zinc is always in continual contact with other solvents, such as cyanide and caustic alkali, and this accounts for the bulk of the loss. It is therefore advisable to keep the grade of the solution going to the boxes as high as possible, which may be achieved by slow percolation and by precipitating only the richest solutions coming from the vats. There is no material disadvantage in returning solutions containing gold, as the previous milling of the ore in alkaline water has usually left the tailings in a clean condition for the cyaniding operation.

TROUBLES EXPERIENCED IN EXTRACTING

When the residue assays are not as low as might reasonably be expected, it is advisable to investigate. The next residue sample should be divided in two. One part should be assayed directly after drying and the other half should be thoroughly washed with water, and the water decanted off after settlement, before being dried and assayed. If the washed sample gives an appreciably lower result than the unwashed one, the amount of gold in the residue may probably be reduced by increasing the amount of water used for final displacement or by improving the precipitation in the zinc boxes to decrease if possible the amount of gold in the tails solutions. The extraction may be further investigated by grading the sample through screens of different mesh and assaying the resulting products. Reasons for low extraction may often be deduced from the results. High assays of the coarser sizes may indicate that the ore has not been ground finely enough for satisfactory leaching or that the time of contact with the percolating solution has been too short. High assays in the slime may indicate poor mixing of it with the sand before charging into the vat. Faulty extraction may be detected by sampling the residue of the vat *in situ* before discharge, the samples to represent horizontal sections of the charge. Assays of these may reveal higher gold content in the bottom layers than at the top of the charge. I remember one instance in which the bottom quarter of the charge assayed higher than the original sample, and this after an extensive leaching treatment. Such variations are often due to re-precipitation of the gold and usually occur only where high-grade material is being handled. Sometimes they may be due to the inefficient displacement of dissolved gold by barren solution or wash. Slow percolation rate with high moisture percentage in the residue after drainage indicates an excess of slime. A properly proportioned mixture should leach at the rate of from 1 to 1½ in. per hour.

Complex compounds often form beneath the filter bottom. Solution with matter in suspension should be run directly to the sump and returned to the top of the charge until a clear effluent is obtained. This phenomenon seldom occurs after regular leaching has begun. "White precipitate" is a name given to a deposit often found on the zinc, particularly when semi-oxidized pyrites forms a proportion of the material being cyanided. Sometimes the deposit causes no particular trouble and does not adversely affect precipitation results, but in other instances active steps must be taken to reduce the amount. The usual method of doing this is to raise the free cyanide content in the solution by means of a drip of strong cyanide at the head of the zinc box.

Method of Avoiding Poor Precipitation

Bad precipitation is frequently caused by paying too little attention to the boxes or by poor packing of the zinc. In either case it results in channeling of the solution, which can easily be detected by adding a few drops of phenolphthalein to the solution entering the compartment under suspicion, and seeing whether the coloration spreads evenly through the mass of zinc. The appearance of hydrogen bubbles is a usual sign, though not an invariable indication, that precipitation is going on satisfactorily. The action is largely electrical and is sometimes stimulated to advantage by bringing some dissimilar metal into contact with the zinc. Lead is generally used for this purpose in the form of a saturated solution of lead acetate into which the shavings are dipped before being packed in the zinc box. The lead-coated zinc is then placed preferably in shallow horizontal layers, in the compartments, alternating with layers of ordinary zinc. Improved precipitation often results, but the method has the disadvantage, in addition to that of first cost, that the lead ultimately finds its way into the bullion unless special refining methods are adopted.

The final phase, constituting a monthly or semi-monthly operation, is usually the bugbear of the process and is always greeted with mixed feelings—pleasure at the prospect of a return and disgust at the labor and worry involved. This is often due to lack of experience in the intricacies of the process and to the impossibility of installing the facilities and conveniences adopted in normal-scale operations. In order to reduce cleanup troubles as much as possible, start early in the month by paying careful attention to the dressing of the zinc boxes, so that, when cleanup time comes, the gold will be associated with the minimum amount of zinc. In dressing the boxes it is always advisable to move up the partly plated zinc from compartment to compartment and never to put fresh zinc at the head of the box. If there is a tendency toward choking in the first compartment, followed by channeling of the solution, dress more frequently and reduce the depth of shavings. By adding fresh zinc to the head of the box the final grade of precipitate is invariably lowered. Every effort should be made to take advantage of the solvent-precipitant action of the incoming solution, which is at a maximum at first contact with the zinc shavings.

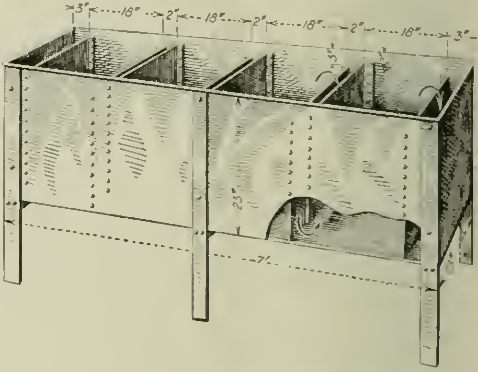


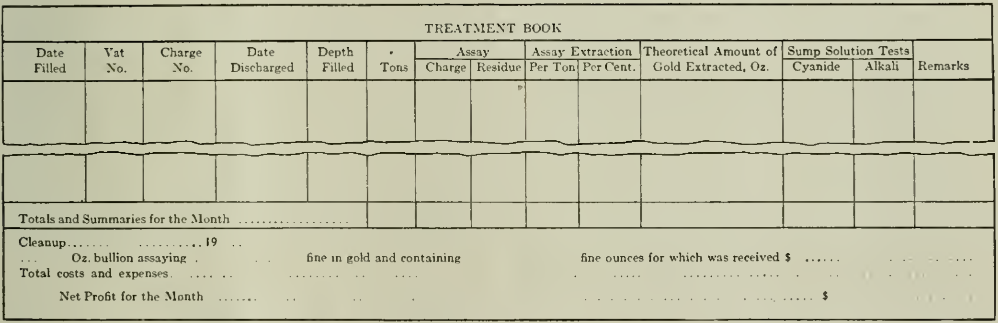
FIG. 4. A FOUR-COMPARTMENT ZINC BOX

Separating Zinc from Sludge

Two methods are available for the removal of the zinc from the sludge in small plants. In one the zinc is roasted, after having been wetted with a brine of niter, and the mixture of gold, zinc oxide, and other impurities, is smelted. The method is fairly efficient, although losses are unavoidable, but these may be reduced far more than is generally supposed. The greatest disadvantage is in the large amount of low-grade precipitate formed, all of which has to be smelted after admixture with a considerable proportion of expensive flux. The smelting operation in small plants is one in which labor should be reduced to a minimum, and acid treatment of the zinc sludge should therefore be practiced wherever possible. Too much emphasis cannot be laid on the advice that this operation, if attempted, should be carried out thoroughly. Plenty of hot water should be used, and acid and hot water should be added, with continuous stirring, until there is positively no further action.

Where the silver content of the ore is negligible, and also where copper is present, it is often advisable to follow the sulphuric-acid treatment by an additional treatment with nitric acid. In one instance within my recollection the plant was so far removed from civilization that it did not pay to ship even silver. Moreover, the cost and labor of smelting were so great that it was found an economy of money and energy to reduce the zinc-box product with double-acid treatment, so that the dried material had the appearance of retorted gold, and was smelted with the minimum of trouble and with only a little borax as flux.

Smelting precipitate requires much experience, coupled with a fairly extensive theoretical knowledge of the process. Where large amounts of low-grade material are being smelted by inexperienced operators, the results obtained are often disappointing. In small plants every effort should be made to reduce the product to be smelted to as clean and concentrated a form as possible and to place little reliance on the effectiveness of refining in the crucible. This fact is not generally realized in the experimental stages of operations, and sometimes not until the appearance of the bar of bullion, whose dwarfed dimensions suggest the immediate resmelting of the slag in an endeavor to find the missing metal. Clean precipitate means clean bullion and no dispute over the assays. Production of base bullion inevitably leads to conflicting assay results in which the small operator has no hope of holding his own. Small parcels of precipitate can easily be treated to carry from 70 to 80% of bullion, and the slag from the smelting of this is so small in amount and should be so clean that retreatment will not be necessary and one of the most frequent causes of loss thus obviated.



TREATMENT BOOK

Date Filled	Vat No.	Charge No.	Date Discharged	Depth Filled	Tons	Assay		Assay Extraction		Theoretical Amount of Gold Extracted, Oz.	Sump Solution Tests		Remarks
						Charge	Residue	Per Ton	Per Cent.		Cyanide	Alkali	
Totals and Summaries for the Month													

Cleanup....... ....19 ..
... Oz. bullion assaying . . . fine in gold and containing fine ounces for which was received $ ......
Total costs and expenses. ....
Net Profit for the Month .... $

FIG. 5. SPECIMEN PAGE OF TREATMENT BOOK, SHOWING EFFICIENT WAY OF KEEPING RECORD OF OPERATIONS

SAMPLING AND THE CALCULATION OF EXTRACTION

Sampling in a small leaching plant is a phase of operations which is often neglected, to the detriment of progressive results. Heads samples should be taken from the cars going to the vats by means of a tubular galvanized iron sampler about 4 ft. long and 1.5 in. in diameter, and with a $\frac{3}{8}$-in. slit from the point to within 6 in. of the end forming the handle, something after the fashion of a cheese taster. This is driven diagonally into the tailings, twisted to smooth the bore hole, and removed. A separate sampler should be kept for the residues (tailings after leaching) and the receptacles used should be distinctly marked to prevent accidental interchange. The samples obtained should be thoroughly mixed and reduced in bulk before final drying for assay. The residue dump should also be sampled around the tipping face at intervals of a week or more and the result used to check the assays of the samples taken from the cars. The facility for checking and rechecking the gold content in the residue is a factor which makes this computation of greater reliability than the head assay and favors what is generally known as the "bullion plus tailings" method of calculating the actual recovery. In this case the assay of the head sample is not considered and actual recovery percentage is calculated as follows: B equals fine gold in bullion in oz.; R equals fine gold in oz. in residue from which the bullion was recovered. Then $\frac{100[(B + R) - R]}{B + R}$ equals actual discovery[1].

KEEPING ACCURATE RECORDS NECESSARY

No plant is so small that the keeping of records is not imperatively necessary, for by such means only is it possible to increase efficient working and obtain the best results. Tonnage figures should be based on a definite decision as to intervals and should preferably refer to the actual tailings charged to the vats during the period. It is impossible absolutely to reconcile yield with theoretical estimates in a leaching plant, but the method of calculating tonnage should be inflexible. The record book should show the numbers of the vats, when they were filled and discharged, their assay value before and after treatment, and other useful data. From these figures may be estimated the total tonnage handled in the period and the average assay of charge and residue, from which an estimate can be made of the extraction according to the assay or theoretical figures. For various reasons this will not agree with the actual results for the first month's operation, but subsequent comparisons will form a basis for an intelligent control of the operations. It will be invaluable for estimating the probable yield at any particular date and will invariably indicate where improvements in the process can be effected. In Fig. 5, a type of ruling for this purpose is shown.

Irregularities between practice and theory usually adjust themselves as the work proceeds, and an excess in one month over theoretical estimates should be followed by a corresponding discrepancy in the returns of the month following. Such variations are usually explainable by the assays and should occur only where considerable variation in value is encountered in the tailings from day to day. A discrepancy in yield is naturally more common than an excess over theoretical estimates. Assaying and sampling are often responsible. Old gold dumps from an amalgamation process usually contain amalgam, and this makes the accurate sampling and assaying a difficult matter. Overheating the sample before the assay is also a frequent cause of erroneous result. Granted correct assaying and estimation of tonnage, a discrepancy may be caused if the method of sampling favors the inclusion of an excess of a part of the product having different physical properties and a higher gold content than the remainder. Seams of high-grade slime often cause trouble in this respect, and the best way to check the result is to screen both charge and residue sample to determine whether the percentage of slime is the same in each case. Solution leaks and drips around the plant often appear unimportant but seldom fail to swell the loss discovered at the end of the month.

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[1] This could be more simply expressed by $\frac{100 B}{B + R}$. It is, of course, based on the assumption of honesty of employees and that the total gold as calculated, or B + R, is equal to the gold actually present in the heads.—Editor.]

Effect of Copper in the Solution

The majority of copper ores are affected by cyanide solutions, and gold ore entirely free from copper is the exception rather than the rule. Small amounts, often only a minute fraction of 1% are sufficient to increase the cyanide consumption; and even though the metal may not be detected in the ore, its presence in the solution is very quickly demonstrated by the immediate plating of the zinc shavings with a copper coating. There is no method of excluding the copper, if in soluble form, and dissolving only the gold by cyanide. Once in the solution it should not be allowed to accumulate, as this tends to lower the efficiency of the solvent with reference to the gold. Copper may easily be precipitated from solutions of low cyanide strength, and the copper-plated zinc will then serve to precipitate the gold, although not so effectively as with clean zinc. As long as the cyanide consumption is not excessive, or above the economic limit set by the grade of the tailings and the necessary operating expenses, there is usually no marked trouble to be expected in cyaniding ore having a small amount of copper; and it is customary to obtain an undiminished extraction of the gold when copper is present and is being dissolved and precipitated in the zinc boxes with the gold.

Extraction of Gold and Silver

Silver occurs almost invariably in combination with gold. In most cases the amount is insufficient to warrant special consideration in treating a gold tailings dump. Cyanide leaching of silver ore is impracticable if efficient extraction is the aim as the silver occurs in comparatively large masses and usually as a somewhat refractory sulphide. Hence, in treating gold-silver tailings, a high extraction of the gold may be obtained by leaching, together with a poor extraction of the silver. Further expense in improving the latter is usually inhibited by the low value of the metal under consideration. Extraction of silver is usually not taken into account in theoretical estimates of progress unless the metal occurs in sufficient quantity to make the operation pay. If silver does occur to an extent warranting recovery, the question of efficient treatment by an alternative process involving fine grinding or sliming should be considered. When tailings carry only a few dollars' worth of silver per ton, an extraction of from 50 to 60% is all that may usually be expected when leaching 20-mesh material. If the gold occurs free and the ore has already been efficiently amalgamated, a much higher extraction of the more valuable metal can be obtained by the simple leaching methods outlined. Actual percentage of extraction will, of course, depend on the amount of gold in the tailings—the richer the tailings the higher the percentage of recovery. For this reason comparative figures dealing with percentage of extraction are often misleading and it is better to consider the amount of gold left in the tails. With average amalgamation tailings carrying between $2 and $3 in free gold, it is usually possible to recover all but 30 to 50c. per ton. Such an extraction may not seem high, considered by itself, but when added to the actual recovery made by previous amalgamation it denotes satisfactory work.

Leaching of Pyritic Dumps

Old dumps of pyritic concentrates, often carrying comparatively high gold content, are sometimes encountered. Where the material has previously been treated by plate amalgamation, there is not much likelihood of a satisfactory result with simple leaching. If the dump has oxidized to a considerable extent the gold is exposed to a degree permitting a fairly satisfactory recovery, but the residue is invariably high. Under normal circumstances, the treatment of such a dump will result in complications in the extractor boxes. In isolated districts, however, it may be the only feasible method of recovering a fair proportion of the gold. High cyanide and alkali consumptions are usual, and it is sometimes preferable to amalgamate the gold in a small grinding pan of the Berdan type and trust to comminution to free the precious metal from encasing pyrite.

Monthly Costs Should Be Compared

Monthly costs for each important item, such as cyanide, zinc, lime, etc., should be compiled and calculated per ton of tailings handled. Comparison of monthly estimates will invariably show where opportunities to effect economies lie, and, if used in conjunction with the treatment records, such figures are useful to determine the net economic results of a change in method or a modification in some detail of practice. A form suitable for cost records is shown.

COST BOOK

Month ending	19			
Tonnage				
Supplies				
Cyanide	lb	$	$	per ton
Lime	lb			per ton
Zinc	lb			per ton
Acid	lb			per ton
Lubricants	lb			per ton
Fuel	lb			per ton
Lighting	lb			per ton
	lb			per ton
	lb			per ton
	lb			per ton
Sundries	lb			per ton
Labor				
Filling and discharging.				per ton
Sundry				per ton
Sundry expenses				
Assaying				per ton
Bullion expenses				per ton
Repayment of cost of plant *				per ton
Totals and averages		$	$	per ton

* (1) If plant will be valueless at the completion of operations, this will be the total cost of materials and erection divided by the life of the dump in months (2) If the plant or parts of it can be sold or used elsewhere, calculate an appropriate proportion of (1)

Some persons are immune from any ill effects through contact with cyanide solution. I have known Mexicans who could handle cyanide and strong solution until the epidermis of the hands was completely dissolved, and, too, without apparent discomfort. I speak from experiences that have left very vivid recollections when I say that others are not so fortunate. If there is any real remedy for cyanide rash I have failed to discover it. Persons susceptible to the action of cyanide should avoid contact with the solution whenever possible. In case contact is unavoidable, the operator will do well to reserve a bucket of slightly acid water, in which the hands should be dipped after exposure to the poisonous solution. Rubber gauntlet-gloves should be worn in dressing the zinc boxes, the requisite amount of fresh zinc being teased out by the bare hands before being wetted. For the consolation of the beginner, let me say that where susceptibility is obvious, he should give up hope from the start of eventually overcoming the tendency by continued exposure to the poison. I have seen many attempts of this kind, but never a result which tended to prove that familiarity breeds immunity.

Colorado School of Mines Men in National Service

Colorado School of Mines is well represented in almost every branch of the military service of the United States. Those of last year's graduating class now with the colors are:

Kenneth S. Ferguson, U. S. Marine Corps, Cuba; Charles M. Knepper, captain U. S. N., Government inspector for the Navy, Bethlehem, Penn.; Sydney A. Mewhirter, first lieutenant, Engineers, Fort Riley; Sydney S. Small, first lieutenant, Coast Artillery, Fortress Monroe, Va.; Robert A. Thurstin, Reserve Officers' Training Camp; Lisle R. Van Burgh, first lieutenant, Engineers, Linda Vista, California.

Graduates of former years in various branches of the service are:

Louis R. Ball, captain and military instructor, Colorado Agricultural College, Fort Collins, Colo.; W. S. Beck, 1914, Camp Kearney, Calif.; Gary E. Block, 1908, captain 314th Engineers, Camp Funston, Kan.; A. C. Bigley, 1913, Camp Lewis, American Lake, Wash.; R. G. Bowman, 1911, first lieutenant Co. 3, E. O. R. C., Fort Leavenworth, Kan.; Irving A. Chapman, 1913, coxswain, U. S. S. S. P. 41; David C. Dodge, 1915, second lieutenant, Officers' Reserve Corps; Frank A. Downs, Co. C, 346th Machine Gun Battalion, Camp Lewis, American Lake, Wash.; Carl E. Frey, 1913, Second Officers' Training Camp, Calif.; R. M. Fullaway, Co. B, 4th Engineers, U. S. A., Vancouver, Wash.; Charles W. Hammen, 1914, Aviation Corps, Chicago, Ill.; Wayne A. Harrod, 1916, 25th Co., 7th Battalion, 166th Depot Brigade, Camp Lewis, American Lake, Wash.; Dale D. Hinman, 1915, first lieutenant, Coast Artillery Corps, Fortress Monroe, Va.; Van Dyne Howbert, 1916, Training Camp, Fort Riley, Kan.; E. F. Jones, 1910, Camp Funston, Kan.; Percy Jones, Jr., 1908, U. S. A.; Wallace Lee, 1904, First Battery, Fort Sheridan Training Camp, Fort Sheridan, Ill.; Milton M. Levy, 1916, second lieutenant, 315th Engineers, Camp Travis, Fort Sam Houston, Tex.; Victor A. Light, 1913, U. S. A., Fort Riley, Kan.; Neil M. MacNeill, 1914, corporal, Co. C, 115th Engineers, U. S. A., Camp Kearney, Linda Vista, Calif.; Emory M. Marshall, 1911, Ordnance Department, Camp Kearney, Calif.; Roy H. Miller, 1916, Co. D, 316th Supply Train, Camp Lewis, American Lake, Wash.; William J. Murphy, 1917, Sergeant Co. A, 115th Engineers, U. S. A., Camp Kearney, Linda Vista, Calif.; James W. Pearce, 1914, Co. C, 115th Engineers, U. S. A., Camp Kearney, Linda Vista, Calif.; Harold C. Price, 1913, Co. 2, C. A. C., Fort Winfield Scott, Calif.; Charles E. Prior, 1913, first lieutenant, infantry, detailed with motor transportation unit, now in Washington, D. C.; John V. Richards, 1902, Officers' Training Corps, Spokane, Wash.; Ernest J. Ristedt, 1909, first lieutenant, E. O. R. C.; Donald O. Russell, 1909, with the English army in France; W. W. Simon, 1915, U. S. Naval Radio Co. 19, Cambridge, Mass.; Eugene G. Snedaker, 1914, first lieutenant, Engineer Corps, U. S. A., Vancouver Barracks, Wash.; Irwin R. Solomon, 1913, first lieutenant, O. R. C., Chicago, Ill.; Otis W. Swainson, 1910, first lieutenant, Coast Artillery Corps, Fortress Monroe, Va.; G. H. Van Dorp, 1915, second lieutenant, O. R. C., Fort Leavenworth, Kan.; Charles R. Vorck, 1916, corporal, Co. A, 115th Engineers, Camp Kearney, Linda Vista, California.

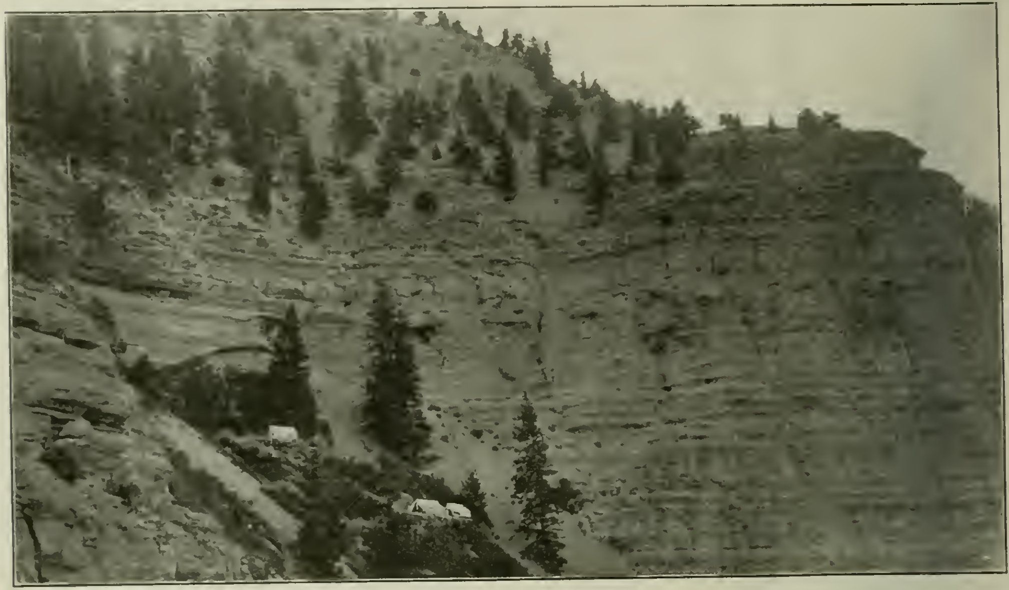
The following men have left school to enter the military service:

Charles N. Beyrle, sergeant, Co. A, 115th Engineers, Camp Kearney, Linda Vista, Calif.; E. L. Bilheimer, Officers' Training Camp; Walter E. Bilisoly, second lieutenant U. S. M. C., Quantico, Va.; L. W. Bird, U. S. A.; Max Boehmer, Camp Lewis, American Lake, Wash.; L. D. Breckenridge, second lieutenant, Marine Corps, U. S. R.; F. A. Brown, corporal, Co. A, 115th Engineers, U. S. A., Camp Kearney, Linda Vista, Calif.; Routt A. Bryant, U. S. Aviation Corps, in training near Boston, Mass.; Luther J. Buck, second lieutenant, Coast Artillery Reserve Corps, Fortress Monroe, Va.; I. M. Charles, 37th Co., 7th Reg., U. S. M. C., Camagüey, Cuba; S. D. Cunningham, Co. A, 115th Engineers, U. S. A., Camp Kearney, Linda Vista, Calif., will probably receive commission in Aviation Corps; George W. Cutting, second lieutenant, 342nd Field Artillery, Camp Funston, Kan.; Leo H. Dawson, Aviation Corps, France; H. H. De Laittre, second lieutenant, Infantry, France; Joseph B. Fast, Aviation Corps, Ratoul, Ill.; Walter Finney, Marine Barracks, Mare Island, Vallejo, Calif.; C. W. Fleming, U. S. A., Fort Riley, Kan.; Jesse J. Fushey, first lieutenant, Co. A, 115th Engineers, U. S. A., Camp Kearney, Linda Vista, Calif.; James V. Galloway, quartermaster sergeant, Co. 8, 65th Depot Brigade, Camp Kearney, Calif.; A. O. Gates, Naval Reserve Station, San Pedro, Calif.; John W. Jeuck, U. S. A., Camp Funston, Kan.; David L. Jones, second lieutenant, Artillery, O. R. C.; Arthur C. Kinsley, first lieutenant, Co. A, 115th Engineers, U. S. A., Camp Kearney, Linda Vista, Calif.; E. J. Krier, U. S. A.; D. R. Locke, Second Officers' Training Camp, Camp Funston, Kan.; John B. Maynard, lieutenant, Coast Artillery, Galveston, Tex.; J. G. Menke, sergeant, Co. C, 115th Engineers, U. S. A., Camp Kearney, Linda Vista, Calif.; John J. O'Malley, second lieutenant, Aviation Corps, in Canada or France; Frank E. O'Neill, second lieutenant, C. A. C., U. S. A., Fort Howard, Md.; Walter T. O'Reilly, West Point Military Academy; L. V. Phillips, sergeant, Co. A, 115th Engineers, U. S. A., Camp Kearney Linda Vista, Calif.; John A. Poulin, Aviation Corps; John H. Rabb, sergeant, Co. A, 115th Engineers, U. S. A., Camp Kearney, Linda Vista, Calif.; K. W. Reynolds, U. S. A., Fort Riley, Kan.; Carleton E. Richardson, Co. A, 115th Engineers, U. S. A., Camp Kearney, Linda Vista, Calif.; Fitch Robertson, Co. A, 115th Engineers, U. S. A., Camp Kearney, Linda Vista, Calif.; H. A. Robinson, lieutenant, O. R. C.; Roger M. Schade, sergeant, Co. C, 115th Engineers, U. S. A., Camp Kearney, Linda Vista, Calif.; A. D. Schoensiegel, Marine Barracks, Mare Island, Vallejo, Calif.; Leslie C. Skeen, U. S. A.; A. W. Stedman, first lieutenant, 6th Reg. Infantry, Fort Oglethorpe, Ga.; C. C. Taylor, first lieutenant, C. A. C., Fortress Monroe, Va.; C. C. Tolman, Aviation Corps; Walter B. Tongue, second lieutenant, Aviation Corps, in Canada or France; Albert E. Townsend, sergeant, Co. A, 115th Engineers, U. S. A., Camp Kearney, Linda Vista, Calif.; Henry D. Trounce, lieutenant in English Army; W. H. Williams, second lieutenant, O. R. C., Fort Riley, Kansas.

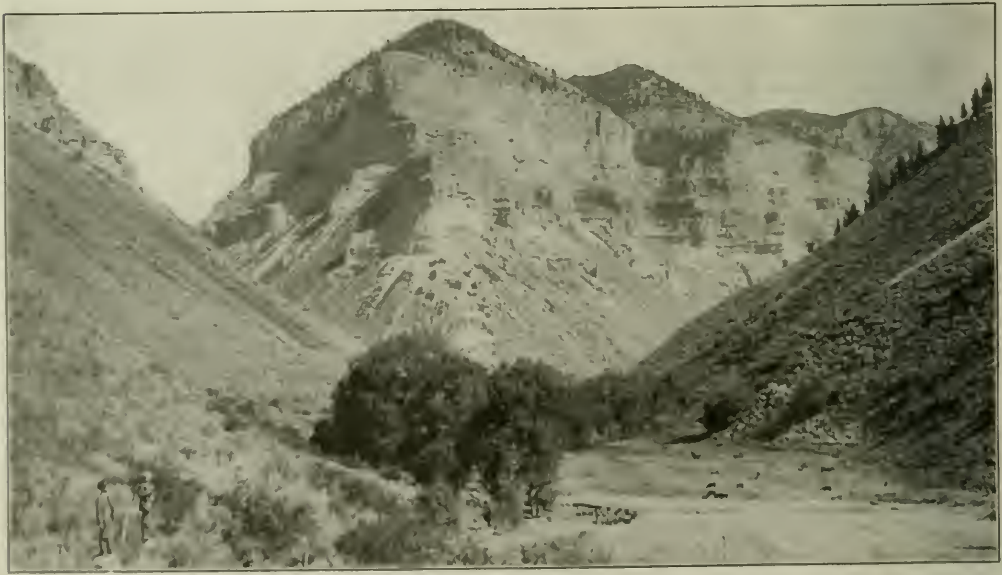
Former professor Carrol George Dolman is captain of Co. C, 115th Engineers, U. S. A., Camp Kearney, Linda Vista, Calif. Former Y. M. C. A. secretary Burdette S. Graham is in the U. S. Aviation School. Former coach and athletic director Erle O. Kistler is major, O. R. C. Former Y. M. C. A. secretary Merrill J. Parker is at Marine Barracks, Mare Island, Vallejo, Calif. Former professor Ilo I. Taylor is in charge of Engineering Depot at Fort Lee, Petersburg, Va. From the above list it will be apparent that the Colorado School of Mines is doing its bit.

Sai-nei Iron Mines in Chosen produced in 1916 a total of 73,000 tons of iron ore, all of which was shipped to the Government blast furnace at Wakamatsu in Japan. The Mitsubishi Co., of Tokyo, Japan, has acquired ore lands near this mine and is preparing to open them and to build a blast furnace at Hengho, near the mines.

Photographs from the Field

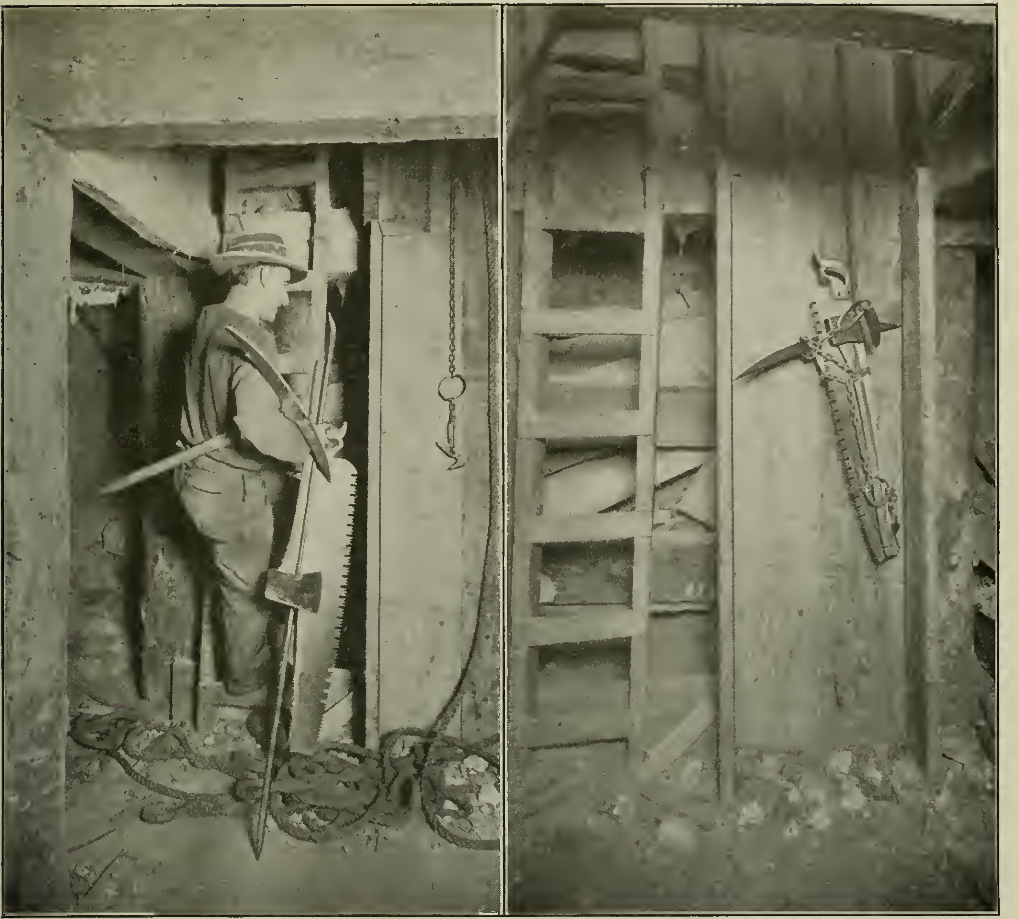


WALL OF OIL-BEARING SHALE ON THE REED-DOYLE PROPERTY NEAR GRAND VALLEY, COLO.

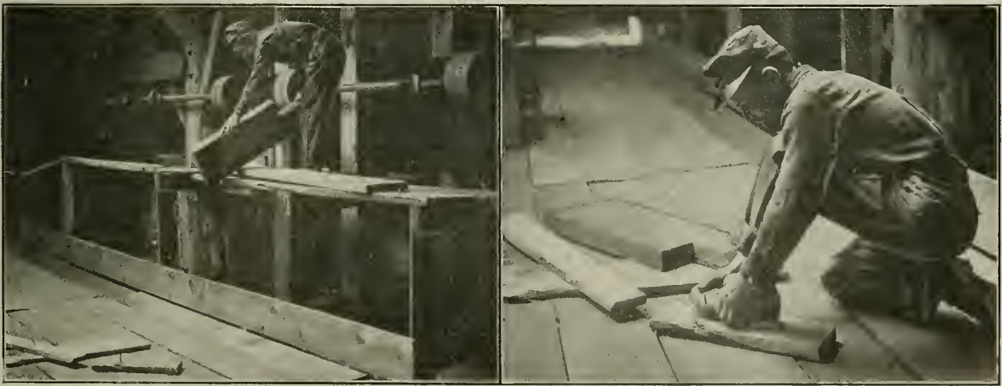


MOUNTAIN OF OIL SHALE ON PARACHUTE CREEK, NEAR GRAND VALLEY, ON DENVER & RIO GRANDE R R

Oil-shale deposits of northwest Colorado, southwest Wyoming and northeast Utah have recently been the object of exploitation and experimentation. Near De Beque, Colo., the American Shale Refining Co. is trying out a new extraction process by which it expects eventually to produce 6000 bbl. of crude oil per day.



A miner attempted to carry the load, shown at the left, up a manway. He lost his hold on the ladder and fell, cutting himself on the saw and sustaining other injuries. He should have used a rope to raise and lower tools to and from working places, as shown at the right



Millman working on platform jumps down from same and lands on a nail that has been left sticking up in a board. The "Anode," the "safety" paper of the Anaconda Copper Mining Co., is endeavoring to educate the men in safe practices by the publication of bulletins, two of which are reproduced herewith, showing the causes of accidents

PROMOTING "SAFETY FIRST" IN MONTANA MINES

Memorandum on War Excess Profits Tax

Memorandum on the war excess-tax provisions of the Revenue Act of Oct. 3, 1917, filed on behalf of
Utah Copper Co.
Nevada Consolidated Copper Co.
Chino Copper Co.
Kay Consolidated Copper Co.
Chile Exploration Co., and
Braden Copper Co.

By O'Brien, Boardman, Harper & Fox,
120 Broadway, New York.
Kernal R. Babbitt,
25 Broad St., New York.
Root, Clark, Buckner & Howland,
31 Nassau St., New York,
COUNSEL.

Nov. 24, 1917

The companies on whose behalf this memorandum is filed are all engaged in the mining of copper. They are substantial, prosperous companies. Their aggregate production for the year 1916 was upwards of 509,000,000 lb. of copper, and their production for the year 1917 will be considerably in excess of this figure. The stocks of these companies have not been exploited on the market. They are widely held by large and small investors who have purchased them because of the substantial values in the properties which the companies own. No one of these companies is a war-inspired enterprise. Each of them was organized, acquired its properties and commenced business before the commencement of the war; in fact, with two exceptions, all of these companies were engaged in business for many years prior to 1914.

Present Wording of Law Imposes Unjust Taxes

These companies have accepted the opportunity of submitting this memorandum to the Treasury Department and its advisers not because the application of the War Excess Profits Tax Law to copper companies as such presents any unique problems, but because these particular companies are so circumstanced as regards their capitalization that a strict or technical interpretation of the provisions of the law defining "invested capital" might impose upon them grossly unjust and inequitable taxes. By this is meant that in comparison with other companies engaged in the same or in other businesses whose organizers have been less conservative in the matter of capitalization, these companies would suffer heavily. The copper companies presenting this memorandum are in hearty accord with the Government's fiscal policy. They believe in raising currently as large a portion of the Government's expenses as can be obtained without seriously disturbing business enterprises. They believe, however, that there is a very clear duty imposed upon the taxing authorities so to apportion this burden of taxation that it will rest as evenly as may be practicable upon each and every business in the country; and they have every confidence that the Treasury Department and its advisers will adopt such regulations (or if necessary recommend such legislation) as will remove or minimize injustice and inequality in the apportionment of this tax.

In this memorandum these companies purpose to point out the injustice which would be done their stockholders if an interpretation should be placed upon the definition of "invested capital" which would limit the value of their mining properties to the par value of the stock issued therefor and preclude them from showing the actual value of their properties on Jan. 1, 1914. The bankers who directed the formation of all of these companies and determined the amount of stock to be issued in exchange for the mining properties were substantial and conservative bankers. They were dealing with properties which at the time had been explored only to an extent sufficient to satisfy the bankers that they contained enormous deposits of low-grade copper ore capable of being extracted and put upon the market at a cost which would result in a substantial profit.

The precise extent of the orebodies had not been determined. A large body of ore was assured, a further body of ore was probable and a still further body of ore was possible. The situation at the time these companies were organized and their properties acquired by the issuance of stock was one in which the amount in par value of stock to be issued for the properties depended almost entirely upon the attitude of the bankers engaged in their organization. If these properties had been in the hands of persons who proposed to exploit them on the market, stock could have been issued to a par value representing the utmost expectations of the engineers who had examined the properties, and in every case, as the outcome has proved, such stock would have been fully supported by the actual value of the properties, because in every instance the extent of the orebody has surpassed every estimate made at the time the properties were acquired.

The bankers who formed these companies, however, were not desirous of exploiting them, and they chose the conservative and commendable course of capitalizing their companies at amounts which they felt were well within the limits of the assured values of the properties. The result in every case has been that the stocks issued to acquire these properties are worth many times their par value.

Market Value Much Above Par Value

By Jan. 1, 1914 (the date as of which the amount of the invested capital of a business is to be determined under the War Excess Profits Tax Law), the value of the stocks of Utah Copper Co., Nevada Consolidated Copper Co., Chino Copper Co., and Ray Consolidated Copper Co., as represented by market quotations, was in the aggregate almost four times their par value. The stock of Utah Copper Co., of a par value of a little more than $16,000,000, was worth at market quotations upward of $81,000,000. The stock of Nevada Consolidated Copper Co., of a par value of a little less than $10,000,000, was worth at market quotations approximately $30,000,000. The stock of the Chino Copper Co., of a par value of about $4,300,000, was worth at market quotations a little less than $33,500,000. The stock of Ray Consolidated Copper Co., of a par value of about $15,750,000, was worth at market quotations upward of $28,500,000. The Utah Copper Co. stock and the Ray Consolidated Copper Co. stock each has a par value of $10 per share, while the stock of the Nevada Consolidated Copper Co. and Chino Copper Co. each has a par value of $5 per share. All of these stocks are listed on the New York and Boston Stock Exchanges. In the aggregate these stocks of a par value of about $46,000,000 were worth at market quotations upward of $173,500,000.

This demonstrated value of these stocks was due entirely to the fact that the mineral deposits owned by these companies on further exploration were discovered to be more extensive than had been assumed at the time they were organized, so that the value thus set upon the stock in January, 1914, was an appraisal by the public of the mining properties. It represented in effect the price at which the owners could have sold them, and, to some extent, did sell interests in them. It therefore affords the best data available from which to calculate the invested capital of these companies.

The injustice to which these companies and their shareholders would be subjected if the value of these properties as of Jan. 1, 1914, should be limited to the par value of the stock originally issued therefor, and if these companies should be denied the opportunity of showing the actual value of their properties as of that date, is apparent. It is also apparent that if such a limitation should be imposed upon these companies the loss ensuing would be the direct consequence of the honest conservatism of the bankers who organized them. It is entirely obvious, to take a single illustration from the foregoing, that if the Utah Copper Co. had issued stock to the extent of $81,000,000 for its properties, instead of adopting the conservative course which its organizers chose, the company under any construction of the law would be permitted to count its mining properties as worth on Jan. 1, 1914, the sum of $81,000,000.

STOCK WATERING CONDEMNED IN EARLIER STATUTES

Stock watering and the issuance of inflated stock have been condemned alike by state statutes, economic writers and publicists generally. A conservative course in the issuance of stock against properties not fully developed has been universally commended. If these companies and their shareholders are forbidden the right to value their mining properties at their fair value on Jan. 1, 1914, merely because a comparatively small amount of stock was issued against these properties in the first instance, then a direct and severe penalty is imposed because of conduct that has heretofore been commended, and by the same token a premium is put on practices that have heretofore been condemned. We have made mention of the value of these stocks as of Jan. 1, 1914, because that is the date fixed in the law for the ascertainment of the invested capital of a corporation whose properties were acquired prior to that date. It is not a date selected by us with a view to obtaining thereby a high valuation for these stocks and thus adding force to our argument. On the contrary, the price of copper at that date had not felt the effect of the enormous demand induced by the war, nor does that date fall within a period of high prices on the stock market. The average price of copper for the month of January, 1914, was 14.45c. per lb., as against an average price for the year 1916 of 28.46c. These stocks which on that date had an aggregate value of $173,500,000 have reached much higher value since that date. In the discussion of this particular point we have made no mention of the Chile Exploration Co. or of Braden Copper Co., for the reason that these two companies seem to call for separate treatment.

ACTUAL VALUE OF PROPERTY SHOULD BE CONSIDERED

We have no doubt that the hardship and injustice which would result from forbidding these companies to show the actual value of their properties as of Jan. 1, 1914, would fall equally upon any company whose organizers have seen fit to capitalize it at a figure which they thought was conservative or low and which in fact has proved to be much less than the actual value of the properties acquired by the company in exchange for its stock. It must be, therefore, that facts similar to those which we have presented have been brought to your attention by corporations similarly circumstanced. We shall not presume to suggest the precise method of working out a result whereby a corporation shall be permitted to show the fair value of its properties as of Jan. 1, 1914, without regard to the accident of how much in par value of stock was originally issued for these properties. It may be that regulations following in principle those promulgated under the Federal Capital Stock Tax Law of 1916 would afford the necessary relief. It may be that relief might be had through regulations issued under the provisions of the War Excess Profits Tax Law which permit corporations to include in invested capital the paid in or earned surplus used or employed in the business. For example, a regulation which permitted a corporation to revalue its properties as of Jan. 1, 1914 (either by reference to the market value of its stock outstanding or on some other basis which safeguards the Government but is fair to the corporation) might afford relief. If legislation should be necessary, the relief would be readily obtained by striking out from the definition of invested capital the phrase "but in no case to exceed the par value of the original stock or shares specifically issued therefor."

The precise manner by which justice is to be done to undercapitalized corporations is necessarily to be determined by the Treasury Department and its advisers. There should, of course, be all proper safeguards to the Government, but we submit that justice and fair dealing in the distribution of the burdens of Government expense require the discovery of some method which with such safeguards will permit every corporation to demonstrate to the Internal Revenue Department the fair value of its property as of Jan. 1, 1914.

EFFECT ON HOLDING COMPANIES

We have heretofore discussed the injustice which would be done four of these companies if in ascertaining their invested capital as of Jan. 1, 1914. they should be limited as regards their mining properties to the par value of the stock issued therefor. We purpose now to discuss the effect of such limitation upon the other two companies, Chile Exploration Co. and Braden Copper Co. Both of these companies own mining properties situated in the Republic of Chile. Because of the provision of the Chilean law which in effect makes it impracticable to mortgage mining properties, the bankers who undertook the financing and development of these properties found it necessary to form in each case two companies, one to own and operate the mines and the other to hold the stock of the operating company.

With this corporate structure it became possible for the holding company to issue its bonds and pledge as collateral security therefor stock of the operating company, and thereby confer upon the bondholders an indirect lien upon the property in Chile. Inasmuch as all of the stock of the operating company was to be held by another corporation, the amount in par value of such stock was a matter of entire indifference. The stock of the holding company in each case was to be held publicly, and the only thought given by the bankers to the question of capitalization concerned the relation between the value of the mining properties and the stock of the holding company. The bankers engaged in the formation of these companies were conservative and substantial people, and in respect to the capitalization of the holding company they adopted the conservative policy of an undervaluation rather than an overvaluation of the mining properties which furnished the support for this stock. On this particular point, however, it is unnecessary to add anything to what we have already said with respect to the other companies.

The situation in which these two operating companies find themselves differs in one important respect from the situation of the four other companies. These operating companies own the mines and receive, in the first instance, the income which is subject to tax under the War Excess Profits Tax Law. They are the companies which must make the returns and include therein a statement of their "invested capital." If a technical construction were placed upon the definition "invested capital," a construction which considered the form rather than the substance of this corporate situation and which by so doing limited the invested capital of these two operating companies to the par value of the stock issued by them, a result most inequitable and unfair to these two businesses would be reached.

HOLDING COMPANY CAPITALIZATION NOT BASED ON PROPERTY VALUE

The amount at par of the stock issued by these two operating but subsidiary companies bore no relation whatsoever, and was not thought by any one to bear any relation whatsoever, to the value of the mineral properties. In the case of Chile Exploration Co., the par value of its stock was $1,000,000—while the par value of the stock of its holding company (Chile Copper Co.), the amount of which was thought to represent conservatively the value of the properties, was $95,000,000. In the case of the Braden Copper Co. the amount of its stock was $2,332,030 par value, while the par value of the stock of its holding company (Braden Copper Mines Co.) was $12,953,530.

The stock of Chile Copper Co. (par value $25) was first listed on the exchange in April, 1915, on which day it sold at $21.25, making a total value at market prices for the stock of Chile Copper Co. of upward of $80,000,000. For the year 1915 the market prices of Chile Copper Co.'s stock ranged from $17¼ to $26¾. For the year 1916 from $19½ to $39¼, and from Jan. 1 to June 1, 1917, from $20 to $27½. The stock of Braden Copper Mines Co. (par value, $5) was listed on the exchange prior to January, 1914. On Jan. 2, 1914, the lowest sale was $7 per share, making a total value for the stock at that date of upward of $18,000,000. The value of the stock steadily increased. In November, 1915, the Kennecott Copper Corporation, having already acquired a substantial interest in the stock, offered to pay in cash $15 for each share of stock in Braden Copper Mines Company.

THE CASE OF THE CHILE AND BRADEN COMPANIES

In the case of Chile Copper Co. and Braden Copper Mines Co., their stock represents solely the indirect proprietorship of the mining properties owned by their respective operating companies, and the values placed upon the stocks of the holding companies as indicated above furnish a true appraisal of the actual values of these mining properties. In other words, the mineral properties which Chile Exploration Co. holds against its $1,000,000 par value of its stock were appraised by the public in 1915 at upward of $80,000,000. Similarly the properties against which the Braden Copper Co. issued slightly over $2,300,000 of its stock were appraised by the public in January, 1914, at upward of $18,000,000 and were appraised by Kennecott Copper Corporation in 1915 (through its purchase of shares of the holding company at $15 each) at almost $39,000,000

Enough has been said on this subject to show the tremendous injustice which would be done these companies and their stockholders by adopting an interpretation of the law so literal and technical as to limit the valuation of the mineral properties of Chile Exploration Co. and Braden Copper Co. to the par value of the capital stock which these two companies issued against the mineral properties. It is submitted that in situations such as these, involving a holding company whose stock is publicly dealt in and an operating company whose stock is all held by the holding company, an equitable administration of the law imperatively requires the disregarding of the form of corporate structure and calls for regulations which will permit such an operating company to regard the stock of the holding company issued and dealt in publicly as virtually the stock of the operating company.

It is not conceived that any argument that we could make would add to the impression that must already have been made by these two actual and definite and not hypothetical situations. In neither of these instances has the par value of the operating company any relation whatsoever to the value of its assets. It seems to us that it is incumbent upon the Treasury Department to treat the holding company and the operating company as a single company and that if the amount of the issued stock is to be a factor in determining invested capital, the stock issue of the holding company is to be looked to.

CONSERVATIVE CAPITALIZATION PENALIZED

With respect to both of the foregoing suggestions, we earnestly desire to call to the attention of the Treasury Department and its advisers what we belive to be the situation of a great number of corporations throughout the United States. It is true undoubtedly that the public has often been gulled into the purchase of stock issued on a vastly inflated basis, and so there has arisen an entirely justifiable prejudice against the evil of watered stock. It is right for the Internal Revenue authorities to protect itself in the matter of invested capital by such regulations as will not permit watered stock to constitute a basis of value. The fact is, however, that the issue of watered stock is confined to those corporations whose promoters purposed, following the organization of the corporation, to sell out to a more or less gullible public. A great number of corporations, however, for the purpose of economy in formation, economy in operation, and because of the conservatism of the men who formed them, even when it was expected that the stock would be sold on the market, have been conservatively capitalized or greatly undercapitalized.

Admitting the evils of stock watering, and even if it were admitted that it has been more prevalent than it has been, what is to be thought of that construction of law which makes the course of a corporation whose stock has been watered so easy, and the course of that corporation whose stock has been conservatively issued, or purposely issued to an inadequate amount, considering its assets, so difficult, not to say hopeless?

It seems to us that it would not be putting an undue burden on the Treasury Department to make the stock issue only *prima facie* evidence of property value, giving to the department full authority and complete machinery for easily overcoming this *prima facie* presumption as against the corporation whose stock is watered, but providing machinery also which will accord justice to corporations which can show by unquestioned and unquestionable evidence a value of their property—whether held by themselves directly, or held by them through some subsidiary company—in excess of what happens to be the par value of their own or their subsidiary's stock.

Government Lease of Potash Lands

From the Department of the Interior comes the statement that on Dec. 5, 1917, Secretary Lane issued regulations under which permits may be obtained to prospect for potash on public lands of the United States. Heretofore, for some years all lands known to contain potash have been withdrawn from public acquisition.

Hereafter known potash lands may be acquired only by lease from the Government. This is the first time the United States has leased its lands, excepting the coal lands of Alaska, which two years ago came under a leasing bill passed by Congress. The other mineral lands which Secretary Lane has asked Congress to place on a leasing basis are those bearing coal, oil and phosphate, of which there are now many millions of acres under withdrawal. Bills to permit the leasing of these lands have twice passed the House, but have not been passed by the Senate.

Permits may be issued to citizens, associations and corporations of the United States for the exploration of not exceeding 2560 acres each of land in compact form, the permits to be for a period of two years. If the permittee discovers potash in commercial quantity and quality he will be entitled to a patent for one-fourth (640 acres) of the area of his permit, the remainder to be subject to lease by the Government. Applications for permits must be filed in local United States Land Offices. In a few days Secretary Lane will issue the regulations to govern the leasing of public lands containing potash deposits. The prevailing high market and the great demand for soluble potash salts should be an incentive to explorations.

Report of Copper Production

This table is compiled from reports received from the respective companies (except in the cases noted by asterisk as estimated), together with the reports of the United States Department of Commerce as to imported material, and in the main represents the crude-copper content of blister copper, in pounds.

AUGUST, SEPTEMBER, OCTOBER AND NOVEMBER COPPER PRODUCTION, 1917

	Aug.	Sept	Oct.	Nov.
Alaska shipments	3,891,621	8,501,806	10,763,500	
Arizona:				
Arizona Copper	nil	nil	1,568,000	
Cons. Ariz. Smelting	1,450,000	1,450,000	1,930,000	1,800,000
Inspiration	nil	2,250,000	2,400,000	2,500,000
Miami	260,000	1,900,000	2,673,775	3,361,426
New Cornelia	1,996,587	1,460,936	2,278,000	2,106,000
Old Dominion	875,000	1,225,000	2,623,000	2,844,000
Ray	7,749,509	7,413,881	7,700,000	7,600,000
Shannon	nil	nil	nil	
Other Arizona	22,829,806	24,085,753	25,223,854	28,163,233
California:				
Mammoth	1,725,000	1,280,000	1,590,000	1,500,000
Michigan:				
Calumet & Hecla	12,338,735	11,556,438	12,265,380	
Other Lake Superior *	8,000,000	7,000,000	7,000,000	
Montana:				
Anaconda	11,175,000	2,800,000	22,336,460	21,660,000
East Butte	1,676,360	2,203,300	1,691,008	2,033,000
Nevada:				
Mason Valley	1,417,717	1,267,532	1,469,631	
Nevada Cons.	6,439,984	6,524,352	7,000,000	6,900,000
New Mexico:				
Chino	6,824,127	7,719,496	6,333,000	6,313,272
Utah:				
Utah Copper	18,796,012	17,839,378	18,100,000	16,300,000
Eastern smelters *	2,000,000	2,000,000	2,000,000	2,000,000
Total reported	109,445,458	108,477,872	136,945,608	
Others, estimated	20,000,000	20,000,000	20,000,000	
Total United States	129,445,458	128,477,872	156,945,608	
Imports, ore and concentrates, etc.	13,447,348	16,892,867		
Imports in blister, etc.	34,546,504	22,030,450		
Grand total	177,439,310	167,401,189		
British Columbia:				
Canada Copper Corpn.	212,772	537,229	724,961	
Granby Cons	3,836,770	3,321,754	3,259,974	
Mexico:				
Boleo	1,433,040	1,454,880		
Cananea	nil	nil	nil	nil
Other Foreign:				
Braden	4,512,000	5,348,000	5,414,000	5,756,000
Cerro de Pasco	6,036,000	7,041,000	7,325,032	6,440,000
Chile	8,036,000	3,294,000	9,050,000	8,872,000
Cape Copper	178,573	nil	246,400	
Kyshtim	902,700	582,400		
Katanga	5,445,360	4,960,350	5,092,625	

* Estimated.

The total production of the United States for the first nine months of 1917 was as follows:

January	174,658,603
February	183,859,588
March	192,211,648
April	188,685,898
May	187,750,810
June	173,341,047
July	129,810,739
August	129,445,458
September	128,477,872
October	156,945,608
Total	1,645,187,271

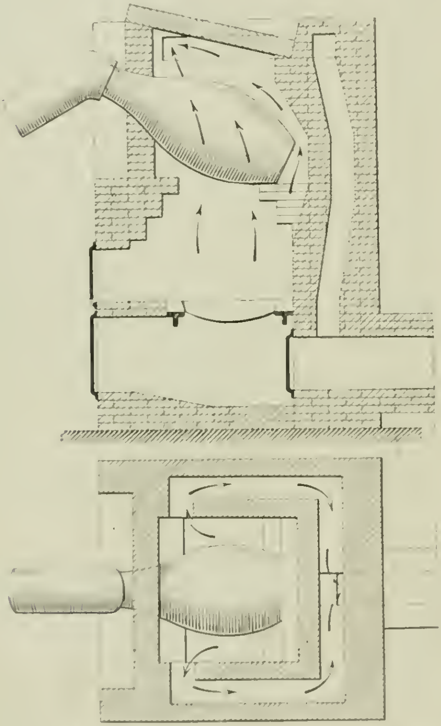
The grand total, which in the case of August was 177,439,310 lb., includes, under "Imports in ore and blister copper" the production of such companies as Canada Copper, Granby, Cananea, Braden, Cerro de Pasco and Chile. As a matter of record, however, the individual figures are given after the total. We also report the production of the Boleo, Cape Copper, Kyshtim and Katanga companies, whose copper does not come here.

The item "Alaska shipments" gives the official figure of the United States Department of Commerce. Kennecott production August to November was 7 018,000; 7,100,000, 7 116,000 and 7,142,000 lb., respectively.

Details of Milling and Smelting

Cherry Distillation Furnace

A type of furnace used in Trenton, N. J., for the redistillation of copper is shown in the sketches presented herewith, which are sufficiently explanatory of the design and construction. The furnace is covered by U. S. Pat. 1,231,239, June 26, 1917, and was designed by Edward E. Cherry, of Trenton, New Jersey.



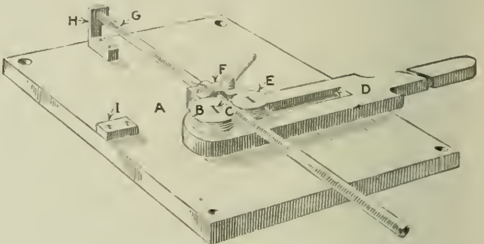
PLAN AND SECTIONAL ELEVATION OF CHERRY FURNACE

Pipe-Bending Device

A device that has been used with success for bending pipe and boiler tubes and that may have other applications is shown in the accompanying sketch, described in the *American Machinist* by Stephen Jaross.

The iron base *A* carries a pilot roller *B* the size of the required bend minus spring-back of the work. The pin *C*, which acts as a fulcrum for *B*, is also the fulcrum for the lever *D*, which carries at *E* a similar roller to *B*. The roller *E* is adjustable to and from *C* to permit various sizes of pilot rollers *B* to be used. At *F* is a clamp for the tube *G*, and at *H* a stop for the end of the tube. At *I* is an adjustable stop, as the tube will spring back slightly. If a different-size circle is desired, the roller *B* must be changed accordingly.

The grooves in the rollers *B* and *E* should be turned about 0.010 in. deeper than the radius of the pipe. As the pipe is only $\frac{1}{16}$ in., it should be filled with fine, dry sand plugged tight on the ends, and heated on the portion that is to be bent. The sand will help to retain the shape of the pipe and to hold the heat longer for the operation. The bend often can be made in one operation,



PIPE-BENDING FIXTURE

Cost of United Eastern Equipment at Oatman, Ariz.*

After the development of its new mine, the United Eastern Mining Co., decided to install a reduction plant. The tonnage to be treated at the start was fixed at 200 tons, but, in view of the favorable condition of the mine, it was considered advisable to arrange facilities for increasing the capacity to 400 tons. While it is best in some cases to adopt a distinct independent unit system where future enlargement is contemplated. in this instance the plans worked out differently.

A comprehensive idea of the total cost of the installation as well as of the individual departments can be had from the attached cost distribution. Taking, for the purpose of comparison with the cost of other cyanide plants, what is generally understood to be part of a milling plant, such as crushing plant, mill proper, and refinery, shops, offices, storehouses, assay office, and inclined railroad for distributing purposes, and allowing liberally for extending the cyanide plant to 400 tons capacity, the cost of the plant per ton of ore treated daily amounts to $520. This is a very low figure in view of the fact that the mine is situated 28 miles from the nearest railroad station and all the material had to be transported by motor truck or wagon, and that the purchasing orders were placed at a time when the various machines and materials were averaging at least 15% above normal.

The compactness of the plant, including the principal departments, such as crushing, milling and refining, is shown by comparison with two other cyanide plants recently designed by myself; one 500-ton plant occupies 112 sq.ft. and one 350-ton plant, 110 sq.ft. per ton of ore treated, while the United Eastern installation on a basis of 400 tons covers an area of only 70 sq.ft. per ton of ore capacity. The cost per ton treated of the 500-ton mill, with the main mill being constructed of steel, was $930, while the 350-ton plant of identical construction as the United Eastern cost $681 per ton of ore treated. Both of these mills are situated on branch line railroads and were built at a time when prices of material were normal.

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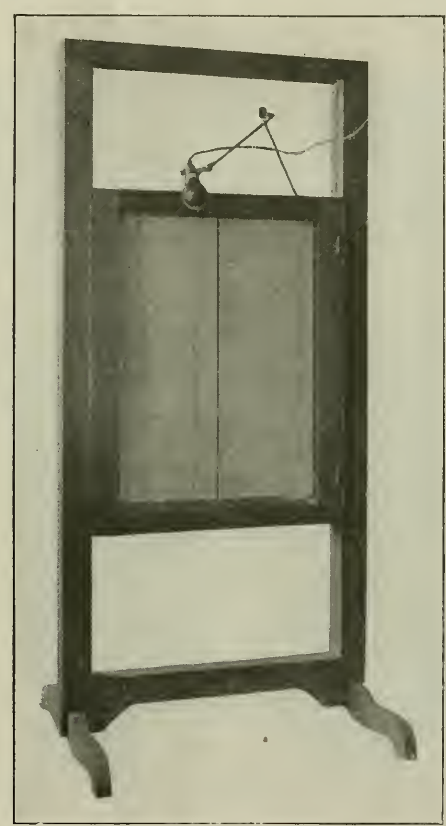
*Excerpt from a paper, entitled "The United Eastern Mining and Milling Plant" by Otto Wartenweiler, to be presented at the February meeting of the American Institute of Mining Engineers, at New York

SUMMARY OF CONSTRUCTION COSTS AS AT JAN 31, 1917. UNITED EASTERN PLANT

Account Title	Labor	Material	Power	Miscellaneous	Total
Mine:					
Headframe.	$1,687 35	$2,480 00		$33 75	$4,201 10
Compressor and hoist house..	3,904 24	19,730 42			23,634 66
Timber framing shed ..	340 39	835 80			1,176 19
Blacksmith shop. .	211 57	1,644 89			1,856 46
Change house....	699 42	1,090.84		1 00	1,791 26
Foreman's office..	88 88	142.75			231 64
Timber yard ...	408 84	428 59			837 43
Change room, No. 1 shaft	79 00	118 98			197 98
Blacksmith shop, No. 1 shaft .	12 00	14 12		77 19	103 31
Hoist house and equipment, No. 1 shaft	351.86	4,300 40			4,652 26
Powder magazine.	269 62	250 80			520.42
Mill:					
Mill proper	32,211 08	90,328 04	$135 81	10,864 16	133,539 09
Crushing plant.	2,456.50	9,504 81		14 06	11,975 37
Coarse ore bins...	953 97	962 30			1,916 27
Refinery.	2,093 52	3,695 61			5,789 13
Lime house...	146 32	126 22			272 54
Miscellaneous:					
Machine shop.	815 02	7,407 92			8,222 94
Storehouse........	824 74	2,266 60			3,091 34
Transformer house	517 64	4,109 53			4,627 17
Assay office.....	457 90	1,711 77			2,169 67
Oil house.	35 50	101 61			137 11
Inclined tramway..	224 02	880 84			1,104 86
Garage, No. 1 shaft	38 00	2 35		97 25	137 60
General office..	1,215 11	5,122 99		120 00	6,458 10
Cottages ...	712 05	2,477 05			3,189 10
Blueprint house.	28 00	59 58			87 58
Water system....	2,197 34	18,780.23		3,321 31	24,298 88
Power lines....	610 99	432.72		6 94	1,050 65
Local telephone system....	87 69	226 74			314 43
New roads......	840.40	43 38			883 78
Total mining and milling plant..	$54,516 96	$179,277 89	$135 81	$14,535 66	$248,468 32

Perpetual Stock-Inventory Board

A visible inventory board that can be kept in the warehouse to show at a glance whatever supply parts should be replaced has been designed by G. G. Porter, who describes the board in *American Machinist*, of Oct. 25, 1917. Time is lost in continually looking over cards to see that parts which have dropped below the maximum quantity are reordered to meet requirements. The accompanying illustration shows the visible stock board, which, since its installation, has proved a time-saver. To economize room both sides of the board are made alike. The uprights of the frame are made hollow and carry counterweights. This allows the board, which is 36 in. wide by 42 in. high, to be raised or lowered for the convenience of the person in charge of it. The center of the board is made of soft wood and is covered on each side with hard felt about 1¼ in. thick. The felt is covered with cross-section paper 10 to 1 in., on which the records are made. Black and red pins are used to indicate the number of parts on hand, the position of a pin opposite a part indicating the number of those parts in finished stock, each vertical line from the left next to the part representing a single piece up to 100 lines. To the right, each vertical line represents 100 finished parts in stock. The vertical lines representing 50, 100, 500, 1000, etc., are made heavier than the others. The operation of the device is as follows: All parts that go into the manufacture of products, whether made in the shop or purchased elsewhere, are numbered and listed on the board under the proper headings, which also correspond to the perpetual-inventory cards. When the parts drop below minimum, the stock keeper starts through a requisition for another order and inserts a green pin over, or to the left of, the part name. When the stock is out and the job started through the shop, the green pin is moved to the right between the part name and number, where it remains until the job is completed. A list is kept each day of finished parts received into or delivered from the finished-stock room, and from this list the next morning the finished-stock clerk posts the cards and changes the location of the pins. Glass doors fitted with lock and key protect board and protect the pins.


A TIME-SAVING PERPETUAL STOCK-INVENTORY BOARD

Pebbles for Regrinding Mills at Plymouth, Calif., are obtained from the tailings piles of the Natomas dredges in Sacramento County. Men are employed to sort the proper sizes and hardnesses, giving attention to the symmetry of the stones—chiefly dolomite. Grinding pebbles of fine quality are also found on the ocean beach in Santa Barbara County and are used by the Riverside Portland Cement Company.

Mining and Metallurgical Machinery

Progress in Steel-Pipe Manufacture

During the last 30 years the improvement in steel pipe has reflected the advance in metallurgical methods and fabricating practice. Steel pipe was first made in 1887, although the tonnage was practically negligible, but today the production approaches 3,000,000 tons per year. The many uses to which steel pipe has been put demand that it meet the most rigid requirements. That the product has met this test is proved by the many instances where it has been successfully subjected to unusual strains and conditions.

It is interesting to note some of the peculiar experiences in the various uses of steel pipe, which, while unusual and without duplication, demonstrate the advance of present-day manufacture. The illustrations are shown by the National Tube Co. as examples of the inherent qualities of "punishability" of its steel pipe.

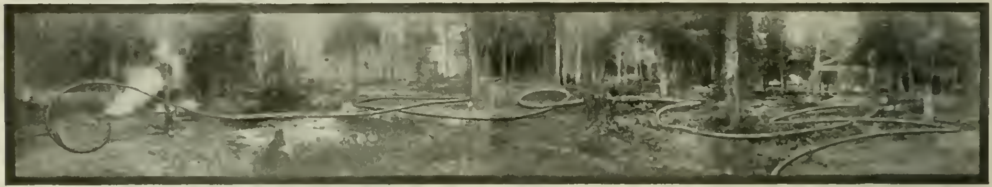


Fig. 1—Not a break was shown on any of the 26 lengths of this 4-in. casing, completely blown from a Texas oil well

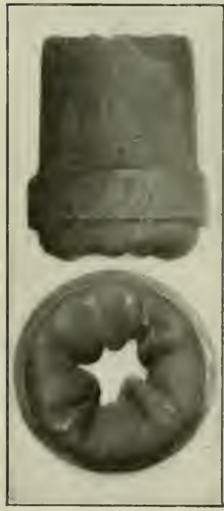


Fig. 2

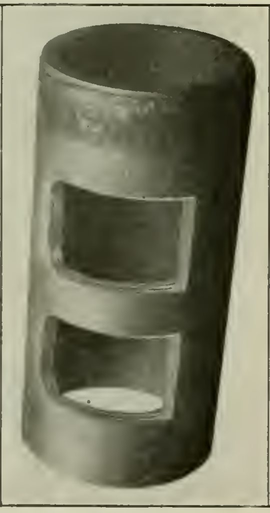


Fig. 3

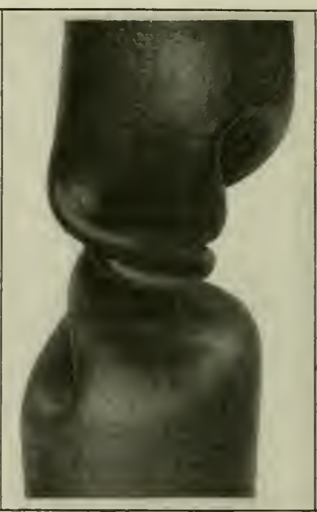


Fig. 1

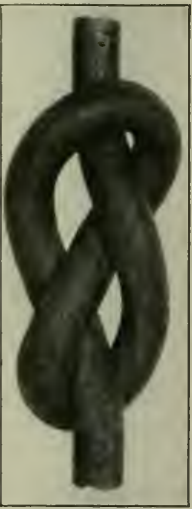


Fig. 5

Fig. —Two views of the bottom length of a 10-in. casing, 340 ft long, after falling 236 ft. in a well. Fig. 3—Telescoped tube resulting when 1440 ft of 5¼-in. steel casing fell 200 ft. in a well. Fig. 1—A section of 8-in. pipe subjected to a twisting strain of 713,000 in.-lb. Fig. 5—A bow-knot made from pipe

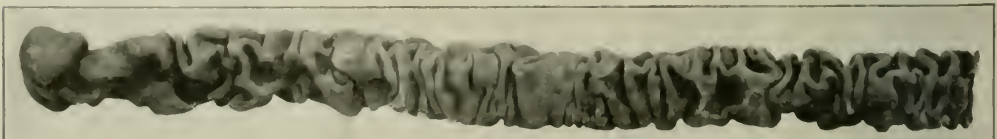


Fig. 6—Originally this casing was 18 ft long but it was reduced to one-third of its length and greatly distorted when subjected to an explosion of 170 quarts of nitroglycerine

EXAMPLES SHOWING REMARKABLE QUALITIES OF "PUNISHABILITY" OF MODERN STEEL PIPE

Fig. 1 shows an occurrence at one of the Texas oil wells. The well was about 2000 ft. deep and the 4-in. casing was being removed when gas began to show. The remaining casing—26 lengths, or about 500 ft.—was completely blown from the well, without showing a sign of a break on any of the 26 lengths. Fig. 2 shows two views of the bottom lengths of a 10-in. casing, in an Oklahoma oil well, after the casing had fallen 236 ft. The entire casing, 340 ft. in length and weighing 32.5 lb. per ft., was being hoisted when the elevator holding the casing let go and the casing hit the bottom of the well. The thread protector was forced over the threads and up over the pipe 12 or 13 in. and the pipe was bent backward and inward, but no fracture was developed.

The section of pipe shown in Fig. 3 was machined to show three sections of casing telescoped together when a string of casing fell to the bottom of a well in Ohio. A string of 1440 ft. of 8¼-in. steel casing, weighing over 34,000 lb., was being hoisted, when the entire string fell 200 ft. to a bottom of limestone. The three bottom sections were telescoped, one inside and one outside, but with no sign of a break or crack, and the exterior apparently shows a straight length of uninjured casing.

Fig. 4 shows a piece of 8-in. line pipe subjected to a twisting strain of 713,000 in.-lb. This pipe has a thickness of about ⅓ in. and weighs 29 lb. per ft. Fig. 5 shows a bow-knot made from pipe. Both of these are laboratory experiments, but demonstrate the remarkable endurance of steel pipe.

Fig. 6 shows a piece of $5\frac{3}{16}$-in. steel casing originally 18 ft. long, which has been reduced to one-third of its length, twisted and distorted, but shows no sign of fracture. The casing was stuck in an oil well in Ohio, and in attempting to remove it, at the same time "shooting" the well, 170 quarts of nitroglycerine were placed in the well and shot off. The effect of the explosion on the casing is shown, the pipe having been extracted from the hole with great difficulty.

Process for Electro-Plating Aluminum

The United Smelting and Aluminum Co., Inc., New Haven, Conn, announces that it has a patented process for electro-plating aluminum, which follows closely the standard process of electro-plating other metals, and from which the same uniform results are obtainable as with other metals. As far as is known to the company, this is the only successful method whereby aluminum may be plated with nickel, silver, copper, etc. The process is equally applicable to pure aluminum in sheets, rods, wire, tubing, etc., and to aluminum alloyed with other metals, as in molded or die castings.

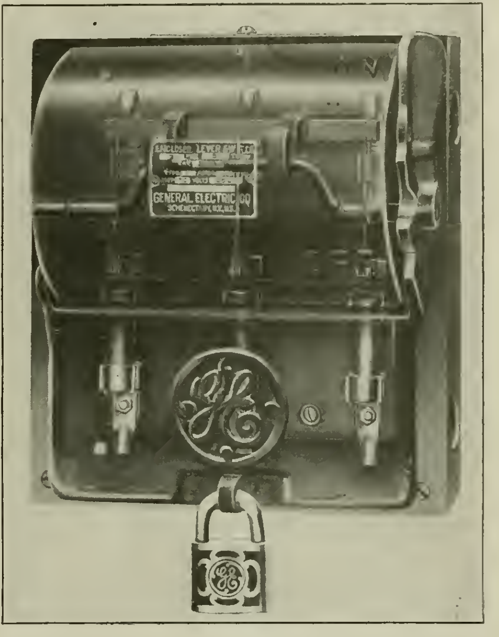
Nickel-plated aluminum is strengthened by the nickel, which is desirable in fragile work; also the article may be firmly soldered, by the ordinary method of soldering. The process, it is claimed, will be of great advantage to many companies now making brass and copper products.

Saltpeter Price Fixing is being studied by the Chilean Government with a view to centralizing sales to the Allies and munition manufacturers. It is urged by producers that regulation will not be possible unless prices of supplies to the mines are also brought under government control.

General Electric Safety Switch

The General Electric Co. of Schenectady, N. Y., first marketed lever switches enclosed in safety-first iron casings a year ago. The protective advantage offered by the new type met approval, but the designing engineers did not neglect experimentation which might better both the performance and purpose of the switches, and have now put on the market still another type, which is considered foolproof.

The illustration of the new switch here reproduced shows not only the exterior protective casing, which is of sheet metal, but also, in phantom, the working parts and the slate base. The padlock at the bottom prevents tampering with the fuses in the lower part of the switchbox and the switching lever at the upper right hand side cannot be closed while the covering over the fuses is open, and vice versa.



GENERAL ELECTRIC ENCLOSED SAFETY LEVER SWITCH

It was assumed that this interlocking arrangement would give sufficient protection, but new conditions necessitated further changes. It was observed that although one of two or three operators may throw on the switch with perfect safety, he may at the same time endanger another operator working on a machine the motor of which gets its current through that switch. To meet this condition provision has been made for three locks, each controlled by a different individual, and all operators may thus be kept thoroughly in touch with what is going on. If required, these switches will also be provided with spring catches which must be pressed down while the switching lever is moved. Both hands must thus be used to switch the electricity on or off and further safety is achieved. Modern practice makes the use of this new switch of advantage wherever "front-connected" knife switches are required.

Events and Economics of the War

On Dec. 7 Congress declared that a state of war exists between the United States and Austria-Hungary. Government control of railroads or operation of the roads as a unit under centralized management has been recommended by the Interstate Commerce Commission; the President is said to favor the former, with actual operation by the Railroads' War Board. The War Trade Board has published a list of firms in foreign countries trading with which is forbidden except under license. A reorganization of the Council of National Defense has taken place; the coöperative committees have been dissolved, one member of each remaining in an advisory capacity and as a Government employee. The U. S. destroyer "Jacob Jones" was torpedoed in European waters, about 65 lives being lost. Steps are being taken by the Government and by Great Britain to protect the Tampico oil fields in Mexico.

The blowing up of the French Line steamship "Mont Blanc," on Dec. 6 at Halifax, caused the death of about 2500 persons, 3000 more being injured and many thousands left destitute, through the wrecking of two square miles of the city by the concussion and the fires which followed.

In France, by a surprise counter attack in the Cambrai salient, the Germans took 8000 British prisoners and recovered part of the territory previously lost. In Italy, in a renewed offensive on the Asiago Plateau, the Teutons won several strong positions and took 15,000 prisoners; the main lines of the Italians still hold. A revolt headed by Kaledines and Korniloff has begun in Russia against the Bolsheviki who have brought about an armistice with the Germans on the Russian and Rumanian fronts. Japanese troops are reported to be in Vladivostok guarding the large quantities of supplies stored at that port. Bulgarians have renewed the fighting in Macedonia. Jerusalem has been captured by the British troops under General Allenby in Palestine. Ecuador has severed relations with Germany.

War To Cost Thirty-Six Billions for First Two Years

The cost of the war to the American people, including loans to the Allies, for the two years ending June 30, 1919, will be at least 36 billions, according to the figures placed before Congress by Secretary McAdoo upon the opening of the second session. Estimated receipts for the current fiscal year are $12,580,732,800, which, with a balance in the Treasury on June 30 last of $1,066,983,361, makes a total of $13,647,716,161. Most of the receipts, or $8,686,000,000, are from sale of bonds and war-savings certificates; ordinary receipts are $3,886,000,000, largely from war taxes; and the Panama Canal income is $7,000,000.

Ordinary disbursements are estimated at $12,316,295,223; loans to Allies in the year at $6,115,000,000; public debt disbursements at $321,031,732, and Panama Canal expenses, $23,593,000; making total estimated disbursements, $18,775,919,955.

In order to allow for a balance in the general fund of about $500,000,000 on June 30 next, Congress must authorize the raising of about $5,640,000,000 additional funds. This figure, with the $3,666,000,000 of authorized but unissued Liberty bonds, and $663,000,000 estimated receipts from war savings, makes the $9,969,000,000 which Mr. McAdoo believes Americans must loan the Government between now and June 30, 1918.

For the next fiscal year, ending June 30, 1919, the Secretary estimated receipts at $5,176,000,000, and disbursements at $12,804,034,440, exclusive of Allied loans. This makes a $7,627,000,000 excess of disbursements. If the present rate of loans to Allies is continued in the 1918-19 fiscal year, $6,000,000,000 additional would be required. Estimated interest on bonds to be issued that year is $385,000,000, and estimated expense of floating the bond issues $28,000,000. Thus, if the deficit is to be met by bonds, $14,040,000,000 worth must be floated between July 1, 1918, and June 30, 1919, in addition to receipts from war savings.

Eastern Roads To Control Traffic in Iron and Steel Exports

Control over the entire export traffic of the Eastern railroads of the United States in the unmanufactured forms of iron and steel was on Dec. 4, as a war emergency measure, placed in the hands of a newly appointed committee of seven railroad officers, representing the Atlantic ports from Boston, Mass., to Norfolk, Va. George D. Ogden, freight traffic manager of the Pennsylvania R.R., is chairman of the committee. In exercising control of overseas traffic the committee will coöperate fully with the agents of the Allies and the U. S. Government in the effort to secure the best possible practical results in the rail transportation, from the interior to the seaboard, of export freight. Similar control was extended to all export freight, except Government freight, on Dec. 12. The committee will issue permits for freight shipments of embargoed articles only when ocean engagements with steamship agents have been perfected.

Up to Dec. 12, the committee's work was limited to administering the general embargo on export iron and steel billets, bars, plates, scrap and pig iron (except for the U. S. Government) ordered in effect on Eastern roads by the general operating committee at Pittsburgh. The necessity for such an embargo resulted from the great accumulation of the products specified, which the roads have delivered at the North Atlantic ports, and which are now stored on the ground or in cars and are immediately available for export.

The general operating committee has also decided to pool immediately all coal-carrying cars upon the roads it represents, and formally asked the special committee on national defense of the American Railway Association that immediate authority "be secured from the proper Government representative to pool the coal-car equipment of private owners at home on the lines of the railroads represented by this committee, and establish a rate of compensation therefor." This action was based on the fact that about 80% of the coal mined in the country originates on roads represented by the committee, and that an enormous amount of shifting can be eliminated by pooling coal cars and using them interchangeably. The new organization is to be known as the Eastern Railroads Coal-Car Pool, with headquarters in Pittsburgh. F. G. Minnick will direct the traffic.

Steel and Copper Men Meet To Review Prices

Representatives of the steel and copper industries were invited to hold conferences with the War Industries Board, according to an announcement by the Council of National Defense, the steel men on Monday, Dec. 10, and the copper men on Friday, Dec. 14, to review the prices for their products agreed upon through previous conferences between the board and the industries. At the time the agreement on the prices now prevailing was made, it was understood that in the case of copper the price determined upon would be subject to possible revision at the expiration of four months, and in the case of steel that prices would be reconsidered for possible revision prior to Jan. 1. The conferences are to be for the purpose of carrying out this understanding.

Has Hoover Popular Support?

"Don't shoot the performer; he's doing the best he can." That venerable jest summarizes fairly well the popular attitude toward Mr. Hoover and his assistants in the gigantic task of regulating and conserving the food supply. What criticism of him does appear would seem to be, for the most part, due to a misconception of the purposes of food control and misunderstanding as to the powers and authority given by Congress, observes the *New York Tribune*. In a review of newspaper criticism throughout the country on the subject of food control, in an attempt to summarize the popular attitude toward Food Administrator Herbert C. Hoover, the *Tribune* further says:

"It seems obvious that prices must be high because of great actual shortage of supplies and because of abnormal war demand which neither Mr. Hoover nor any one else can control. The approval of his efforts far outweighs any dissatisfaction. As to sugar, for example, the *Boston Transcript* pertinently asked what the situation would have been, as to prices and supply, if food control had not existed. There is a very general disposition to credit Mr. Hoover with a fair measure of success, and to realize the tremendous difficulties of his job. It is patiently pointed out that the purpose of the food administration is not primarily to reduce prices, but to conserve the supply and to make the best possible distribution of it, both for export and for home consumption. Moreover, the powers given by Congress fall very far short of creating a food dictatorship. Mr. Hoover cannot directly reach the profiteering retailer, still less can he restrain the careless or extravagant individual consumer. Nor can he adequately control all the transportation systems—and that would seen to be the vitally weak spot in the whole situation. The *New York Herald* expressed this point succinctly when it said: 'One sometimes wonders why it is that complainants against high food prices always take a fling at the Food Administrator and pay no attention to Senator "Jim" Reed and his fellow statesmen who prevented Congress giving to the Food Administrator the power which the critics take him to task for not exercising.'

"It is a large contract. Mr. Hoover himself is reported to have said that no food controller 'could last six months,' but judging from the general support of the press, he still seems to have almost unanimous support, in so far as his plans are really understood. The pinch of actual want, it is promised, will eventually convince every one. Meanwhile, Mr. Hoover is trying to make people realize the facts in time to minimize the coming shortage in foodstuffs."

War Trade Board Issues Blacklist of Latin-American Firms

By order of the War Trade Board American merchants are now barred from trading with over 1600 firms in Central and South America except by special license. This blacklist, by more than 50%, duplicates the names of Latin-American firms given in the British blacklist. The entire British list, for all countries, now includes 6000 or more names. Unlike the American list, it prohibits absolutely trading with enemy firms, whereas the American list is a warning against these firms, the Trading-with-the-Enemy Law of the United States not empowering prohibition. The first American list, however, constitutes evidence, it is asserted, that firms mentioned are enemy houses or have enemy connections. There are said to be few, if any, mistakes in the list.

Central and South America were dealt with first because, the board announced, a large number of firms in the southern republics have been actively aiding Germany's cause and financing German propaganda in the United States. All those named are charged with secretly or openly assisting America's enemies. The board is now preparing a classification of non-enemy firms in Latin-America to serve American merchants who are now cut off from trade with the blacklisted firms. The board in preparing this list will minimize as far as possible inconvenience to American merchants. Care will be taken to determine that those named are not acting as agents for firms blacklisted.

Austrian Subjects Must Now Register as Enemy Aliens

Before the declaration that a state of war exists between the United States and Austria-Hungary the Department of Justice began to plan the arrest throughout the country of scores of Austro-Hungarian subjects suspected of being enemy agents. Many of these men have been under surveillance for months, but lack of definite evidence prevented their internment. With the adoption of the war resolution, many Austrian subjects in the United States automatically became enemy aliens, amenable to the President's order requiring registration of aliens and restricting their activities.

The Department of Justice expects to put alien registration into effect within a few days, and apply it at first only to Eastern cities, where the police will conduct registration. The task will be three times greater than when planned for Germans alone. The Department realizes that many Austrian subjects, particularly Bohemians and the Slavic elements, are actually pro-Ally. According to statistics of 1910 the population of the Dual Monarchy consisted of eight distinct racial groups in the following proportion: Germans, 12,000,000; Magyars, 10,000,000; Czechoslovaks, 8,500,000; South Slavs, 5,000,000; Poles, 5,000,000; Little Russians, 4,000,000; Rumanians, 3,250,000; Italians, 800,000. Only two of these groups, the Germans and the Magyars, are said to be in sympathy with the Central Powers. The 1910 census in the United States showed 1,670,502 Austrians and Hungarians in the country. Census officials estimate that there are now 2,000,000 here.

The Alien Property Custodian, A. Mitchell Palmer, has announced that property of nationals of Austria-Hungary will be safe from seizure. In his statement Mr. Palmer said: "Under the Trading with the Enemy Act the test of enemy character is one of residence and not nationality. The Alien Property Custodian will take into his possession only the property in this country held for, or on account of, or for the benefit of persons who are actually resident within the enemy territory."

Federal Operation of Railroads if They May Not Consolidate

Government operation of railroads for the duration of the war if unification of the transportation systems is not permitted by Congress has been recommended by the Interstate Commerce Commission. As an alternative to this, the commission recommended an increase in rates, Government loans and the suspension of the anti-trust and anti-pooling laws, as far as the railroads are concerned, for the duration of the war, to enable them to effect a unification in a lawful way. After reviewing the extraordinary demand on the railroads during the past year and the increases in labor and material costs, the commission's special report says:

> The act to regulate commerce was not enacted to meet such a situation. The carriers have the right to demand at our hands, and it is our duty to approve, just and reasonable rates sufficient to yield fair returns upon the value of the property devoted to public use after necessary expenditures. Measured in dollars, the gross revenues of the carriers during the past and current fiscal years exceeded any in their history. But what the dollar will buy in labor, material and supplies is substantially less.
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> We are sensible of the vital and imperative need of the hour that our railroads shall not be permitted to become less efficient or less sufficient. We realize the gravity of a serious breakdown of our transportation facilities. It is unthinkable that this breakdown would be permitted if it could be prevented. Increased charges for carriage, if found necessary to take care of unavoidable increases in operating expenses, would not at this time bring new capital on reasonable terms in important sums.
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> In our opinion, the situation does not permit of temporizing. All energies must be devoted to bringing the war to a successful conclusion, and to that end it is necessary that our transportation systems be placed and kept on the plane of highest efficiency. This can only be secured through unification of their operation during the period of the war.
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> If the unification is to be effected by the carriers, they should be enabled to effect it in a lawful way. To that end, in our judgment, the operation of the anti-trust laws, except in respect of consolidations or mergers of parallel and competing lines, as applied to rail and water carriers subject to the act to regulate commerce and of the anti-pooling provision of Sec. 5 of that act, should be suspended during the period of the war and until further action by Congress.
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> In addition they should be provided from the Government treasury with financial assistance in the form of loans or advances for capital purposes in such amounts, on such considerations and under such provision of expenditure as may be determined by appropriate authority.
>
> As a necessary concomitant, the regulation of security issues of common carriers engaged in interstate commerce should be vested in some appropriate body, as has been recommended in our annual reports. The rights of shippers for reasonable rates and nondiscriminatory service under the present jurisdiction of the commission need not be seriously interfered with by such unified control. Some elastic provision for establishment of new routes would probably be needed.
>
> If the other alternative be adopted and the President operates the railroads as a unit during the period of the war, there should be, in our opinion, suitable guarantee to each carrier of an adequate annual return for use of the property as well as of its upkeep and maintenance during operation, with provision for fair terms on which improvements and betterments made by the President during the period of his operation could be paid for by the carrier upon return to it of the property after expiration of that period.

Billion Dollar Budget for Engineering in 1919 Fiscal Year

Engineer operations, including the equipment of the corps, and railroad and other construction for the expeditionary force in France will cost nearly a billion dollars in 1919. The exact estimate, made public on Dec. 4 in the annual report of Major Gen. William Black, Chief of Engineers, is $892,000,000, and is based on providing 1,500,000 men for engineer operations.

Equipment of the engineers is estimated at $135,000,000. For this work this year Congress appropriated $1,174,000 but a deficiency of $12,100,000 was incurred in outfitting the 10 special railway regiments alone. Congress provided $94,500,000 for engineer operations this year, but deficiency items totaling $186,000,000 have been submitted, the report says, "for construction work to be accomplished by the force in France." The report shows that equipment for 70 divisions, or approximately 1,000,000 men, was purchased within 350 hours after the declaration of war, including 8,700,000 articles, among them four miles of pontoon bridges. Every unit sent to France took its full engineer equipment with it.

Arthur Koppel First German Company To Be Licensed

The first license allowing a German-owned concern to continue business under the supervision of the Alien Property Custodian was granted on Dec. 6 by the War Trade Board to the Orenstein-Arthur Koppel Co., Koppel, Penn. A. Mitchell Palmer, Alien Property Custodian, appointed T. Hart Given, president of the Farmers' Deposit National Bank of Pittsburgh, as his representative to direct the company's operations. The company, which is owned by German capital, is engaged in the manufacture of industrial-transportation equipment.

Coal Production of French Mines was 2,800,000 tons in October, according to a statement attributed to the French Minister of Armaments and Mines by *Courier des Etats Unis*. Coal is also being imported from England in large quantities, so that a total of 3,700,000 tons will be available for distribution. Beginning with December the supply for home consumption will be increased by 100,000 tons a month, according to expectations.

Industrial News from Washington

By Paul Wooton, Special Correspondent

Ask Higher Freights on Minerals

Application has been made to the Interstate Commerce Commission by carriers to increase rates on sulphur from Sulphur, La., to various points in the North and East as well as to certain Canadian points. Revision of rates on ferromanganese, ferrosilicon, spiegel iron and on chrome, magnesite and manganese ores has been asked by Southern carriers.

No Platinum in Adirondacks

Efforts are being made to interest investors in the "platinum" sands of the Adirondack Mountains. Dr. J. M. Clarke, state geologist of New York, has advised the National Research Council that the platinum story is a "chestnut, which has grown exceedingly unpalatable with the years." While it is true that traces of platinum have been found in the sands of northern New York, sufficient evidence has been collected to lead to the conviction that there is not the slighest possibility of working these sands commercially. Dr. Clarke said further, "Philadelphia has been the hotbed of some of the worst propaganda regarding gold and silver in New York that this country has known, and I am speaking within limitations in saying that millions of dollars have been wasted upon investment projects in New York, floated by crooked companies claiming to carry on their demonstrations right under the eye of the intending investor. The story of these 'gold crazes,—one after another, first on the east side of the Adirondacks, then on the west side; at present in Herkimer and St. Lawrence Counties, while the Lewis County craze is not even yet dead—is a perfectly wicked one . . . . I have on my files the whole history of the transactions—sworn affidavits and confessions of copartners in these gold and platinum propaganda—and I have been going through this thing for the last 30 years, so I am speaking with some knowledge."

Commissions in Mining Regiment Sought by Many

Requests in large numbers are reaching the War Department for officers' commissions in the special mining regiment. It is stated officially that no commissions will be granted in this manner. Maj. O. B. Perry, who is directing the formation of the regiment, already has a list of more than 40 mining engineers who have secured commissions after their merit was thoroughly demonstrated in the regular officers' training camps. Many other names probably will be added to this list, which is expected to be more than adequate to furnish officers for the units to be formed before there is an opportunity to select those best qualified from the ranks. As enlistments in the mining regiment may be made at any recruiting station, there is no way of obtaining promptly information as to just how many men have enlisted. Recruits for the regiment, however, are reaching Camp Meade at the rate of 20 a day. At present acquisitions to the regiment of quarrymen are greater than those to the mining regiment, which is attributed to the fact, that many quarries close down in winter.

Work of Administering Explosives Act Now Well Under Way

Operators from the Pittsburgh district decided upon a magazine basis for issuing explosives, after several conferences with officials of the U. S. Bureau of Mines with regard to the interpretation of the Explosives Act. In this way all explosives will be issued to Austrian and other workmen through licensed foremen.

Nearly 2500 persons have been vested with the power to issue licenses. Such appointments have been made in all of the important mining districts. The number in each county ranges from one to 20, according to local needs and may be greatly increased if necessary.

The preliminary organization for supervising the work was effected by L. E. Young, of the University of Illinois, one of the Bureau's consulting engineers. This having been done, Francis S. Peabody, the assistant charged with the administration of the act, placed D. D. Bush in direct charge of the permanent organization. Mr. Peabody has called in several volunteers to assist him. They are D. S. Boynton, of the By-Products Coke Corporation, of Chicago; W. H. Glasgow, of the H. C. Frick Coke Co.; Daniel Baker, Jr., of the Standard Lime and Stone Co., and E. A. Orem, of the DuPont Company.

Inspectors to enforce the Explosives Act have been appointed in 43 states. The appointments were approved by the President on Nov. 26. The selections were made largely upon the endorsement of each state's senators. The following appointees have been instructed to report to Van. H. Manning, director of the U. S. Bureau of Mines:

Edward L. Shaw, Phoenix, Ariz.; D. C. Sargent, Cordova, Alaska; Edwin T. Reaves, Little Rock, Ark.; Walter K. McAdory, Birmingham, Ala.; John M. Griffin, Madera, Calif.; Thomas S. Price, Longmont, Colo.; James E. McGann, New Haven, Conn.; Clarence E. Woods, Eustis, Fla.; Carlos H. Mason, Atlanta, Ga.; Lemuel T. Osborn, Mount Vernon, Ind.; John J. Hughes, Council Bluffs, Iowa; Edgar S. Elder, St. Maries, Idaho; William A. Compton, McComb, Ill.; Thomas S. Rhea, Russellville, Ky.; Isaac A. Broussard, Breaux, La.; Madison C. Bowler, Minneapolis, Minn.; Daniel F. O'Connell, Fitchburg, Mass.; Ellis S. Middleton, Pocahontas, Miss.; Albert E. Stevenson, Port Huron, Mich.; Walter L. Lampkin, Kansas City, Mo.; Jeremiah W. Farrell, Joliet, Mont.; Leon O. Tebbetts, Waterville, Maine; Edward D. Jackson, Buffalo, N. Y.; Nicholas Hughes, Paterson, N. J.; Andrew W. Bingham, Littleton, N. H.; William P. Porterfield, Fargo, N. D.; Charles F. Clark, David City, Neb.; Daniel A. McDonald, Carthage, N. C.; William N. Campbell, Medford, Ore.; Jasper S. Kinslow, Columbus, Ohio; Fred Rains, Muskogee, Okla.; John W. Rittenhouse, Scranton, Penn.; Francis E. Sullivan, Providence, R. I.; Charles B. Watters, San Antonio, Tex.; Albert M. Leach, Clarksville, Tenn.; David C. Dunbar, Salt Lake City, Utah; Park H. Pollard, Proctorsville, Vt.; Martin Williams, Pearisburg, Va.; Walter G. Ronald, Seattle, Wash.; E. M. Gilkeson, Parkersburg, W. Va.; James A. Berry, Basin, Wyo.; and William Banks, Columbia, S. C.

Editorials

The Taxation Question Again

CONGRESS has reassembled in a different frame of mind. Its members have been among their constituents and have learned that they had no high opinion of the Congressional efforts, during weary months, in drawing a war-tax measure. This is putting it mildly. It would not be stretching the truth to say that the members of Congress found their constituents disgusted with them. Nor was this a futile Wall Street disgust, but rather the ire of the mountains, the prairies and the forests. The West was vociferous and its howl was heard. Therefore Congress returns chastened in spirit and pathetically making excuses for itself.

One leader says apologetically that this was a piece of pioneering legislation, wherefore mistakes were bound to be made, but of course would be corrected. He overlooked that intelligent citizens would tell him that there was no need to do pioneering in fields that Great Britain had already explored, concerning which economists, financiers and the press gave clear advice during the debates. Senator Simmons preposterously says that Congress was guided by the Treasury Department, wherefore the faults of the law ought not to be charged to Congress, although how he can say such a thing with a straight face we do not know, unless politicians lack the common sense of humor.

Everybody knows, as Professor Taussig, of the Tariff Board, says, that after Congress had discussed the revenue bill for six months it was redrawn in a fortnight by "a group of eight men, already wearied by a trying session and now compelled to work under high pressure," and their draft was enacted by Congress after a day or two of perfunctory debate. The conference committee had tried to compromise between two antagonistic and irreconcilable principles—one being the simple taxation of war profits as proposed by the Senate and the other the taxation of the profits of capital in excess of a given percentage—and naturally produced a hodgepodge. Senator Smoot is now outspoken in saying:

> What the country needs and is going to demand is a revenue law that will clearly define precisely what taxes are to be exacted. Nothing more grotesque has ever been passed by Congress than the excess-profits tax in the War Revenue Law. Not one corporation in the country is exactly sure how the tax is to be applied. And the Treasury is unable to give any interpretation that helps them.
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> Congress ought not hesitate under this situation to repeal the entire law, and, along with it, the revenue law of 1916, which puts surtaxes on incomes of individuals and corporations beyond those already existing. The whole problem of taxing corporations and individuals has been hopelessly muddled, and Congress might as well get down to facts and pass legislation that will remedy the difficulty.
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> We need a revenue law written in the simplest language and in half the words used in the War Revenue Law. We want a law that will show individuals and corporations exactly what they have to pay. It is not that corporations kick against paying a war tax, but that they do not know what they are required to pay that has made the War Revenue Law useless.
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> Out of the chaos that now prevails over the War Revenue Law, Congress can, with little delay, frame a bill that will meet all the requirements, yielding as much revenue, putting a heavy tax on excess war profits, and maintaining, as far as is desirable, all the virtues of the present measure.

We agree fully with Senator Smoot in principle, but we are not sure that an absolute repeal of the present law will be advisable, lest we might get something worse. If there were a scientific reframing of this great revenue measure there should be as heavy taxation of war profits as was contemplated in the present measure, but no heavier; an easing of the present burden on capital that is not realizing war profits; and the raising of more money by consumption taxes, allowing for the checking of consumption of those things that it is desirable to check. But Congress has heretofore exhibited a great aversion to consumption taxes. Recognizing that and not hoping for a change of mind, the present law has many good features that might best not be exposed to further tinkering, and the repeal may well be confined to the war-profits section.

In that there ought certainly to be a removal of the iniquitous 8% additional tax on earned incomes of individuals and partnerships, a sweeping away of the second-class postal rate atrocity, and an explicit provision of how the war profits of corporations are to be taxed.

With respect to the last matter, mining companies were badly hit by the present law, and many of them inequitably and unjustly. The American Mining Congress recently filed an interesting brief on this subject with the Bureau of Internal Revenue, and the porphyry copper companies have also filed a brief, very illuminating, that we are publishing in this issue. Both of these briefs introduce some novel points for discussion and suggest proper amendments of the present law. However, the return of Congress in its present frame of mind has rather taken the wind out of the sails of this movement. If it were to be merely a matter of correcting the present law, suggestions would be in order. But if there develop a strong movement to repeal the whole thing and substitute a different principle, such as that of the original Senate bill, the definitions of capital and earned surplus might cease to be matters of interest. As to this we must wait and see.

Curtailment of Lead Consumption

THE report of the U. S. Geological Survey showing that the production of white lead in 1916 was only 129,000 tons, compared with 156,000 tons in 1915, illustrates the remarkable extent to which the consumption of lead pigment was curtailed by the higher price for pig lead.

In 1916 pig lead averaged 6.858c. per lb. at New York, against 4.628c. in 1915. In 1915 dry white lead opened at 5c., advanced to 7¼c. about the middle of the year, and closed at 6½c. In 1916 the price advanced steadily up to Mar. 17, when it was fixed at 8½c., where it remained during the rest of the year. In June, 1917, it rose to 11¾c., but subsequently was reduced to 9c.

The statistics for 1917, when they are available, will probably show that there was a further contraction in the consumption of lead for painting. That this contraction has not been due to the headway gained by other white pigments at the expense of lead is shown from the fact that the combined production of sublimed lead, zinc oxide and leaded zinc oxide was 135,606 tons in 1916, against 141,383 tons in 1915. Lithopone, which is used for special purposes, was the only white pigment to show an increase in 1916; the output of this having been 51,291 short tons, as compared with 46,494 in the previous year.

Verily, the law of supply and demand does operate, even under the conditions of world-wide war.

The Federal Trade Commission

THE Federal Trade Commission is still studying the cost of production of metals and minerals. It does not matter to it that it was publicly discredited respecting its diagnosis of the cost of producing coal, or that it was privately recognized that its opinions respecting the cost of producing copper exhibited pitiable misunderstanding. Its "experts" still haunt the offices of metallurgical companies, without bothering anybody except the accountants, who throw up their hands in despair. They might as well explain things to the sparrows that chatter outside the windows. After one flock of "experts" has disappeared another one comes.

About the time they are ready to report, conditions will have changed so that cost of production may be very different from what it was previously. This will give the "experts" an opportunity to begin all over again. For the endless job that so satisfies the soul of the bureaucrat these have found the ideal way of keeping busy.

But how about winning the war? We have heard that in the Army and Navy and other working departments there is a dearth of clerks and typists. Why do not they commandeer them from the Federal Trade Commission? Moreover, if the offices of this commission were vacated there would thus become available a good many rooms that also are much needed in Washington.

The Institution of Mining and Metallurgy

THE Institution of Mining and Metallurgy has just issued what is at the same time a glorious and a sorrowful bulletin. It is devoted to a list of the members serving with His Majesty's forces, according to information up to Oct. 20, 1917; but the names of members who have served and who have been invalided out of the forces are not included in the list. Even with such exclusion, it appears that out of members, associates and students numbering 2374, according to the Institution's list of March, 1916, there are enrolled 682 as being now in service. This is the glorious part of the record. It is something wherein the Institution of Mining and Metallurgy, and Great Britain and the Colonies may feel the deepest pride. To have nearly one-third of the membership of such an organization in military service! The sorrowful part is that since the beginning of the war, 78 of its members, associates and students have been killed or have died of wounds. The honor roll of the Institution of Mining and Metallurgy is a bright one.

The members of the Institution are giving a remarkably good account of themselves in high-explosive factory production and management, in aëroplane work, in the conservation and increasing of mineral supplies, including petroleum; in defeating the submarine menace, in artillery service, and in tunneling operations at the front. It is said that the Institution has supplied upward of 200 officers to the corps of sappers and miners.

Will America Learn To Be Thrifty?

"I SUPPOSE not many fortunate by-products can come of a war," said President Wilson, Nov. 16, "but if this country can learn something about saving out of the war, it will be worth the cost of the war; I mean the literal cost of it in money and resources."

American people have been notoriously the most wasteful of all civilized peoples. For many years thrift has been preached but it has not been practiced. Necessity may now effect what advice would not. We believe that the President is correct; that we can save enough in a relatively few years to pay the cost of the war, enormous though it be, and after that the nation may become richer than ever.

Interesting reports come from certain of the coal and iron regions, especially in the vicinity of Pittsburgh, operators stating that they observe a better performance of work per man than was recently the case. The improvement is attributed largely to the men having bought Liberty bonds on the installment plan. Men who formerly worked only enough to meet their living requirements have been stimulated to earn more money in order to meet what is due on the bonds for which they have subscribed. If such a stimulus should become general among workers in all parts of the country, the results would be marvelous.

Copper After the War

NORMAN HAPGOOD, whose letters from London and Paris, have been a feature in the *Evening Post*, refers in a recent communication to discussions among French experts respecting industrial regeneration after the war. They put the greatest emphasis upon the development of French iron-ore and water-power resources. Mr. Hapgood wrote as follows:

> Germany, thus troubled by the future, looks critically at the resources of France, whose strength she had planned to shatter. A German expert estimates that France contains three and a third times as much iron as Germany, although the great beds of Normandy are not yet fully developed. The German seizure of the iron manufacturing region of northern France would have ended the war and allowed Germany to annex that whole region had not England sent to France the steel that enabled her to hold out; and it has been freely admitted in Germany that she could not have long continued the war without the seizure of this region.
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> Germany, weak in iron, contains on the other hand far more coal than France, and there is a German proverb that says "iron runs toward coal." In other words, great metal works tend to be developed less in iron districts than in coal districts. Hence part of the bitterness of the fighting about the Franco-Germany boundary, with its immense coal implications. Thus here again we come around to the hero of this article, water power. If France is rich in iron and poor in real coal, we see still more clearly how her industrial future depends on the development of her white coal.

That there will be a greatly increased use of hydroelectric power immediately after the war, not only in

France but also in every civilized country that possesses water falls, is a plausible forecast. The shortage of labor wherefrom we now suffer is bound to continue and the deficiency must be offset by increased mechanicalization. Electrification, taking the place of thousands of coal miners and of railway cars, is one of the major ways in which that may be done. Therefore we may reasonably expect that it will be done. But electrification means the use of copper, which is of interest to the producer of copper.

BY THE WAY

The *Journal* acknowledges receipt of a copy of the house organ of Arthur D. Little, Inc., chemical engineers and managers, of Cambridge, Mass. It is felicitously named *The Little Journal* and discusses in an interesting manner many subjects of importance to chemical engineers, the mining industry and the public.

The following comes from Bisbee: A big raw-boned Texas cowpuncher applied for work at the C. & H. and was given a job as mucker on the 1800 level at the Junction mine. During his first morning out he came across a long black spit-fuse in the muck pile. After carefully sizing it up, he was heard to remark, "My Gawd, I never 'spected to find roots so deep in the earth as this."

Robert Safford Towne, who died on Aug. 3, 1916, left an estate that has just been appraised at $2,419,991. Mr. Towne was in later years mainly engaged in mining in Mexico. Besides his numerous mining enterprises, such as Cia. Metalurgica Mexicana, Teziutlan Copper, Fresnillo Mines, and the San Luis Potosi smeltery, he was president of the Mexican Northern Ry.

The concluding remarks of H. W. Garrod, of the British special labor mission, in summing up his observations of labor conditions in this country, are very much to the point if we are going to bring this war to a successful close. He said: "I will just add one other word, if I may, which I hope won't be taken as being anything in the nature of advice or criticism. Since we have been in this country, a period now of nearly 10 weeks, we have been witnesses from a distance of a very considerable number of trade disputes which have been, so far as we could judge, serious, and in some cases, prolonged. But what I want to say is that if one-eighth—I think that is no exaggeration—of the industrial troubles which we have witnessed in this country in the last two months had taken place in England, over the whole period of the last two years, we should long ago have been compelled in England to sue for disgraceful peace. That, I think, gentlemen, is a serious and solemnizing reflection, and I want to leave it to you without comment."

The identification tag worn by every man on Uncle Sam's warships is made of monel metal, an alloy into which nickel and copper both enter. "Monel metal," continues the *Unscientific American*, "is obtained in Colorado and is furnished to the United States by several firms." As a matter of fact, it may be mentioned that monel metal is the natural alloy obtained in the reduction of the Sudbury, Ont., copper-nickel ore and is produced at the Orford Copper Co.'s (International Nickel) works on Constable Hook in New York Harbor. Aside from these facts, what our contemporary has to say may be true and is interesting. "The distinguishing characteristics of monel metal, as far as its use in these identification tags is concerned, are its high melting point—3840° F.—and the fact that it is unaffected by the corrosive action of sea water. The metal tags are small, measuring in oval shape 1¼ by 1½ in. They are perforated at one end, so that they can be suspended from the neck by a wire braid, also of monel metal, which, in turn, is incased in a cotton covering. On one side of these tags, when finished, appear the name and initials of the owner, the month, day and year of enlistment and month, day and year of birth. 'U. S. N.' is added, and when the owner is an officer his rank and date of appointment. On the other side appears his 'natural signature'—that is, a print from his right index finger. These marks and letters are in raised metal, and are indestructible, except by such means as a file or hammering."

America's war aim is now "disclosed" by the *Vossische Zeitung* of Berlin. It is alleged to be the acquisition of Alsace-Lorraine's potash deposits. The correspondent to the *New York Times* at the Hague on Nov. 25 cabled the substance of an editorial in the Berlin paper which "admits that the iron-ore districts of Diedenhofen, with that of Briey-Longwy-Nancy-Calvados, would make France the richest iron country in Europe, but insists that the potash deposits between Mülhausen and Zinheim are the question of the hour." It is unnecessary, says the paper, to cite Germany's unwillingness to give up one square yard of the German Lorraine iron-ore districts, as these are imperative for Germany, industrially and agriculturally. The Alsace potash deposits, it proceeds to say, represent another economic phase of the situation, and many persons are ignorant of the fact that whereas coal and iron are the basis for industrial development potash is the "third trump" after the war. The paper asserts that, while the American troops are now on a 'quiet part of the front,' it is to be expected that they will soon be moved to Sundgau, on the Rhine-Rhone canal, in order to claim the potash deposits at present in German hands. It is alleged that Americans are even capitalizing a scheme for enlarging the canal from Mülhausen to Marseilles in order to facilitate the transportation of potash to that port, and that immediately after the conclusion of peace some German potash deposits are to be claimed as natural compensation owing to the fact that the French works have been destroyed by fire. But, it says, "Nothing must be given away, and only step by step shall we deliver potash to neutrals and, after the war, to enemies. But neutrals and enemies will need increasing quantities of potash at the conclusion of peace, as the soil becomes poor. Grain crops have almost disappeared, Australia excepted, and cotton crops have greatly decreased. If they refuse us raw materials we will revenge ourselves on the enemy's agriculture." The paper concludes with a warning that, to achieve this aim, Germany's potash monopoly must remain intact.

U. S. Mineral Production in 1915 and 1916

Production of minerals in the United States for 1915 and 1916 has been tabulated by the U. S. Geological Survey as shown herewith, the figures being subject to final revision. The value of the production in 1916 was $3,515,339,409, comparing with $2,397,335,050 in 1915. This, of course, may not represent so great an increase in actual quantity, owing to the fluctuation and generally advancing price of many of the minerals, and attention is directed to the fact that a complete record of mineral production of 1916 has not been possible. The value of the nonmetallic products reported in 1916 was $1,878,507,232 and of the metallic products $1,621,832,177, the remaining $15,000,000 being unspecified.

U. S. MINERAL OUTPUT, 1915 AND 1916

Product	1915 Quantity	1916 Quantity
Metallic:		
Aluminum, (dollars)	16,280,000	33,900,000
Antimonial lead, short tons	23,224	24,038
Antimony, short tons (2,000 pounds)	5,364	(a)
Bauxite, long tons (2,240 pounds)	297,041	425,100
Cadmium, pounds	91,415	135,212
Chromic iron ore, long tons	3,281	47,035
Copper, pounds	1,388,009,527	1,927,850,548
Ferroalloys, long tons	388,644	589,738
Gold, troy ounces	4,887,604	4,479,056
Iron:		
Ore, long tons	55,493,100	77,870,553
Pig, long tons	30,384,486	39,126,324
Lead (refined), short tons	507,026	552,228
Manganese ore, long tons	8,708	26,997
Manganiferous ore, long tons	196,640	548,803
Nickel, short tons	822	918
Platinum and allied metals, troy ounces	8,665	28,088
Quicksilver, flasks (75 pounds net)	21,033	29,932
Silver, troy ounces	74,961,075	74,414,802
Tin (metallic equivalent), pounds	204,000	278,000
Titanium ore (rutile), short tons	250	(b)
Tungsten ore (60 per cent. concentrates), short tons	2,332	5,200
Uranium and vanadium minerals (dollars)	693,750	(d)
Zinc, short tons	458,135	563,451
Nonmetallic:		
Arsenious oxide, short tons	5,498	5,986
Asbestos, short tons	1,731	1,479
Asphalt, short tons	740,254	786,811
Barytes (crude), short tons	108,547	221,952
Borax (crude), short tons	67,003	103,525
Bromine, pounds	855,857	688,260
Calcium chloride, short tons	20,535	26,062
Cement, barrels (380 pounds net)	87,685,222	95,394,433
Clay:		
Products (dollars)	163,120,232	207,260,091
Raw, short tons	2,362,954	2,932,590
Coal:		
Bituminous, short tons	442,624,426	502,519,682
Pennsylvania anthracite, long tons	79,459,876	78,195,083
Coke, short tons	41,581,150	54,533,585
Diatomaceous (infusorial) earth and tripoli (dollars)	167,474	241,553
Emery, short tons	3,063	15,282
Feldspar, short tons	105,118	132,681
Fluospar, short tons	136,941	155,735
Fuller's earth, short tons	47,901	67,822
Garnet for abrasive purposes, short tons	4,301	6,171
Gems and precious stones (dollars)	170,431	217,793
Graphite:		
Amorphous, short tons	1,181	2,622
Crystalline, pounds	7,074,370	10,931,989
Grindstones and pulpstones (dollars)	648,479	766,140
Gypsum, short tons	2,447,611	2,757,730
Lime, short tons	3,622,810	4,083,803
Magnesite (crude), short tons	30,499	154,974
Mica:		
Scrap, short tons	3,959	4,433
Sheet, pounds	553,821	865,863
Millstones (dollars)	52,480	44,559
Mineral paints:		
Natural pigments, short tons	57,442	(c)
Zinc and lead pigments, short tons	141,383	135,606
Mineral waters, gallons sold	52,113,503	55,928,461
Natural gas (dollars)	101,312,381	120,227,468
Natural-gas gasoline, gallons	65,364,665	103,492,689
Oilstones, etc. (dollars)	115,175	154,573
Peat (dollars)	288,537	369,104
Petroleum, barrels (42 gallons)	281,104,104	300,767,158
Phosphate rock, long tons	1,835,667	1,982,385
Potash (K_2O), short tons	(d)	9,720
Pumice, short tons	27,708	33,320
Pyrite, long tons	394,124	423,556
Salt, short tons	5,352,409	6,362,906
Sand:		
Glass, short tons	1,884,044	2,018,317
Molding, building, etc., and gravel, short tons	74,719,259	87,073,415
Sand-lime brick (dollars)	1,135,104	1,474,073
Silica (quartz), short tons	112,575	88,514
Slate (dollars)	4,958,915	5,338,837
Stone (dollars)	74,595,352	79,041,699
Sulphur, long tons	(e)	(e)
Sulphuric acid (60° Baume) from copper and zinc smelters, short tons	(f) 904,653	(f) 1,069,589
Talc and soapstone (exclusive of fibrous talc), short tons	98,677	119,725
Talc, fibrous, short tons	88,214	93,236
Thorium minerals (monazite), pounds	36,000	37,872

[a] Figures not yet available. Estimate of value included under "Unspecified."
[b] Figures not yet available.
[c] Canvass discontinued.
[d] Not available.
[e] Not specified.
[f] Includes 59,189 tons in 1915 and 92,802 tons in 1916 of stronger acid, reported as oleum, etc., not converted to 60° Baume.

Budget Increased for Next Fiscal Year for Government Mining Bureaus

An increase of $100,000 for mineral mining investigations is asked of Congress. This would bring the total appropriation for this purpose to $200,000 for the coming fiscal year. This money is to be expended for the following purposes:

> For inquiries and scientific and technologic investigations concerning the mining, preparation, treatment and utilization of ores and other mineral substances, with a view to improving health conditions and increasing safety, efficiency, economic development and conserving resources through the prevention of waste in the mining, quarrying, metallurgical and other mineral industries; to inquire into the economic conditions affecting these industries; and including all equipment, supplies, expenses of travel and subsistence. No part of the appropriation may be used for investigation in behalf of any private party.

The increase is needed largely to cover salaries for mining and metallurgical engineers and technologists, who have been added to the staff of the U. S. Bureau of Mines to handle war work. Expenses of conducting mining-experiment stations are increased $75,000, due to the establishment of three additional stations, $225,000 being the total to be expended during the next fiscal year. The total appropriation asked for the Bureau for the next fiscal year is $1,984,377, that for the current year being $1,071,820. A much greater sum, however, is being expended by it, due to the war work it is conducting for other departments, which furnish the necessary funds from their own appropriations.

Estimates of the amount needed to maintain the U. S. Geological Survey during the coming fiscal year are $1,720,520, which is $170,000 greater than for the current year. An additional $20,000 is asked for research to determine geological conditions favorable to the presence of potash, bringing the total for this work to $60,000. The remainder of the increase includes $50,000 for geological surveys, $50,000 for mineral resource work and $50,000 for land classification.

Engineers To Raise New Regiment

The American Society of Mechanical Engineers will recruit a regiment of 2000 engineers for service with the American expeditionary forces in France, according to an announcement by Calvin W. Rice, secretary, at the Society's 38th Annual Convention held in New York last week. Mr. Rice said that the regiment which the society recruited at the beginning of the war, 1160 strong, and sent to Europe had more than taken its share in the honors which American engineers were receiving abroad. He said that in the present crisis it was felt that the mechanical engineers should not be backward in coming to the aid of the Government, and he asked for a $10,000 fund from the society to meet the expenses of enlisting the regiment. It would cost

$5 a man, he said, to recruit the regiment. This would pay for clerical work, offices, and advertising. Recruiting offices will be opened soon in the Engineering Societies Bldg., 29 W. 39th St. Liberal responses were made to the appeal for funds.

Gano Dunn, chairman of the engineering committee of the Council of National Defense, described how more than 30,000 engineers, members of the technical societies of the nation, were already serving the Government in many branches. The engineers were told by Major B. C. Detchow, of the Ordnance Department of the U. S. Army, that they must help the Government immediately to supply a thousand trained workmen for employment behind the lines in France. He described the need and importance of quick action. These men, he said, must be outside the draft age, or else in the third and fourth classes of the draft. They would be utilized in machine shops, in repair work on "tanks" and tractors and on the mechanism of the giant guns. This was the first time, he said, that the Government had issued such a call, and he asserted there must be no delay; that unless skilled civilians were obtained the Government would be forced to recall some of its fighting men.

Bill for International Action on Silver

WASHINGTON CORRESPONDENCE

Senator Shafroth has introduced the following joint resolution, which has been referred to the Committee on Banking and Currency:

> Whereas, The settlement of balances of trade with silver-using countries threatens the depletion of our stock of gold, although such countries prefer that such balances should be paid in silver; and
>
> Whereas, To relieve such condition it is necessary that the production of silver be increased; and
>
> Whereas, The enormous expansion in world credits during the past three years necessitates the enlargement of the base upon which such credits are founded; therefore, be it
>
> Resolved, That the President be authorized to appoint a commission of three members to visit our allied and the neutral nations of the world, with a view of making an international agreement as to the coinage of silver, subject to approval by Congress; and that the sum of $100,000, or so much thereof as may be necessary, be and the same is hereby appropriated out of any money in the Treasury not otherwise appropriated, to pay the expenses and compensation of such commission.

Supreme Court Upholds "Open Shop"

On Dec. 10 the Supreme Court of the United States rendered a decision defining in general terms the rights of labor and of employers. In the case of the Hitchman Coal and Coke Co. vs. the United Mine Workers of America the company was upheld in an injunction restraining the union from enlisting members from its employees The company was working under the "open-shop" system and had entered into an agreement with its employees that no union men should be employed. The Supreme Court upheld the right of the company to enjoy the resulting status of conditions and confirmed the injunction of Judge A. G. Dayton against the conspiracy for recognition of the union.

Copper Sulphate or blue vitriol is largely used in Italy for treatment of grape vines, says *Commerce Reports*. Although produced in Italy, some quantities are also imported, the United States having supplied 123 tons and Great Britain 25 tons during the first quarter of this year.

Comfort Fund for 27th Engineers

If the rush to subscribe to the Comfort Fund for the 27th Engineers equals that to enlist in the regiment itself, there will be no lack of smokes and other life-savers for the men between here and the Rhine. From Washington we are told that requests for commissions are being received in large numbers and that a steady stream of recruits is pouring into Camp Meade from points all over the country. About 200 letters a day showing keen interest in the movement are being received by Maj. O. B. Perry, who is directing the formation of the regiment. Many are from men over the age limit, asking that exceptions be made in their cases to permit their enlistment. The following from William P. Daniels, of the Big Five Mining Co., of Denver, Colo., is characteristic of many:

> I have your letter asking for volunteers for a mining regiment. I will promptly call the request to the attention of our own employees and of those working under leases on our property. We employ but few men, but some of our former employees now are somewhere in France and others are in training camps.
>
> The writer on previous occasions has offered himself for anything for which he is competent. Age and a mutilated hand preclude active army service, but I am ready to answer a call in any capacity where I can be of use. I should like to have an opportunity to maintain, as best I can, the record of a family which gave five members to the Civil War, three of whom died on the battlefield.

It is in such a spirit as this that the 27th Engineers is being formed and it was to keep the men of this regiment happy that the Comfort Fund was started. The following subscriptions have been received to date:

"Engineering and Mining Journal"	$1000.00
New York Engineering Co.	1000.00
A Friend, Nov. 23	5.00
H. H.	5.00
D. E. Charlton	5.00
H. W. Hardinge	1000.00
Frank N. Spencer	5.00
W. L. Coursen	5.00
J. H. Polhemus	5.00
J. H. Janeway	10.00
Albert D. Beers	10.00
J. E. Hayes	10.00
J. A. Van Mater	25.00
L. Vogelstein & Co.	100.00
"Cuprite"	10.00
R. H. Bassett (Hanna Ore Mining Co.)	10.00
A Friend, Dec. 10	10.00
P. A. Mosman	10.00
American Zinc, Lead and Smelting Co.	100.00
J. G. H.	5.00
Total	$3330.00

Mining companies need not be apprehensive about subscribing to this fund as companies lest any stockholder should consider it as an illegal disbursement. It is true, of course, that a board of directors that votes such a contribution is personally liable for it should the stockholders object, but the possibility of such an objection being made is exceedingly remote. There will be various ties to bind the men in France to home and country but we want to go further than this and link the regiment closely to the mining industry so that it will feel that it belongs to a clan that has not forgotten it. No better way of securing this personal touch can be effected by mining men collectively than by subscribing to the Comfort Fund. All contributions will be promptly reported in our columns. The officers of the regiment are to assist in administering the Fund. Send us your check drawn to the order of the *Engineering and Mining Journal*. Do it now!

NEW PUBLICATIONS

Report on the Price of Gasoline in 1915. Pp. 224; illustrated. U. S. Federal Trade Commission, Washington.

The Elements of Coal Mining. By Daniel Burns. 4½ x 7¼, pp. 236, illus. $1.10. Edward Arnold, London.

Nova Scotia: Annual Report of the Mines, 1916. Pp. 174, illus. Department of Public Works and Mines, Halifax, N. S.

The Ores of Copper, Lead, Gold and Silver. By Charles H. Fulton. Pp. 45. Technical Paper 143, U. S. Bureau of Mines, Washington.

Relief Map of the State of Oregon. By the Oregon Bureau of Mines and Geology. 36 x 28. James, Kerns & Abbott Co., Portland, Oregon.

Annual Statistical Report of the American Iron and Steel Institute, 1916. 9 x 16, pp. 102. American Iron and Steel Institute, New York.

Salitre Contribucion al Estudio de su Industria. By Nicolas Ugalde. Pp. 145; illustrated. Soc. Imprenta Litografia "Barcelona," Santiago, Chile.

Annual Report of the Department of Mines, New South Wales, for the Year 1916. Pp. 213, illus. New South Wales Dept. of Mines, Sydney, N. S. W.

The Value of Peat Fuel for the Generation of Steam. By John Blizard. Pp. 42, illus. Bulletin 17, Canada Department of Mines, Mines Branch, Ottawa.

Annual Report on the Mineral Production of Canada During the Year 1915. By John McLeish. Pp. 364. Canada Department of Mines, Mines Branch, Ottawa.

Abstracts of Current Decisions on Mines and Mining, from September to December, 1916. By J. W. Thompson. Pp. 84. Bull. 147, U. S. Bureau of Mines, Washington.

The Cretaceous Faunas of the Northeastern Part of the South Island of New Zealand. By Henry Woods. 9 x 11, pp. 42, illus. New Zealand Geological Survey, Wellington.

Geology and Economic Deposits of a Portion of Eastern Montana. By Jesse Perry Rowe and Roy Arthur Wilson. Pp. 58; illustrated. Montana State University, Missoula.

The Molybdenum Industry in New South Wales. By E. C. Andrews. Pp. 199, illus. Mineral Resources No. 24, Geological Survey, Department of Mines, Sydney, N. S. W.

Industrial Poisons Used or Produced in the Manufacture of Explosives. Alice Hamilton. Pp. 141; Bull. 219, Bureau of Labor Statistics, U. S. Department of Labor, Washington.

Geology of a Portion of the Flathead Coal Area, British Columbia. By J. D. MacKenzie. Pp. 53, illus. Memoir 87, Canada Department of Mines, Geological Survey Branch, Ottawa.

The Coal Fields and Coal Industry of Eastern Canada; A General Survey and Description. By Francis W. Gray. Pp. 67, illus. Bull. 14, Canada Department of Mines, Mines Branch, Ottawa.

Geology and Water Resources of Big Smoky, Clayton and Alkali Spring Valleys, Nevada. By Oscar E. Meinzer. Pp. 167, illus. Water Supply Paper 423, U. S. Geological Survey, Washington.

Methods of the United States Steel Corporation for Commercial Sampling and Analysis of Coal, Coke and By-products. Pp. 91; illustrated. $1.50. J. B. Camp, Carnegie Building, Pittsburgh, Penn.

The Geology and Mineral Resources of the Reefton Subdivision. Westport and North Westland Divisions. By J. Henderson. Pp. 232, illus. Bull. 18 (New Series), New Zealand Geological Survey, Wellington.

Report on the Building and Ornamental Stones of Canada. Vol. IV, provinces of Manitoba, Saskatchewan and Alberta. By Wm. A. Parks. Pp. 333, illus. Canada Department of Mines, Mines Branch, Ottawa.

British Columbia: Annual Report of the Minister of Mines for the Year 1916. An account of mining operations for gold, coal, etc., in the province of British Columbia. Pp. 548, illus. Minister of Mines' Office, Victoria, B. C.

Identity of Black Rutile and Strüverite; and the Elimination and Separation of Titanium, Columbium, Tantalum and Zirconium. By William P. Headdon. Mineralogical Notes No. IV, 25 pp. Colorado Scientific Society, Denver, Colorado.

Proceedings of the Second Pan-American Scientific Congress, Washington, U. S. A., 1915-16. Vol. VII, Section VI, International Law, Public Law and Jurisprudence. Compiled and edited under the direction of Glen Levin Swiggett. 6 x 9, pp. 867. Government Printing Office, Washington.

Transvaal Chamber of Mines: Twenty-seventh Annual Report, 1916. Johannesburg, Transvaal. 7 x 9 in., pp. 440. Issued by the Chamber.

Besides the lists of officers and members this volume contains the annual statistical report of production; reports of the meetings and lists of new companies registered and of companies dissolved during the year. There are also a number of reports, including those on native labor, on taxation and special war dues, on miners' phthisis, on training schools, on wages and on encouragement of local industries. An appendix gives a list of acts relating to the mining industry passed by the South African Parliament, with an analysis of the more important laws.

Canadian Mining Manual, 1916-17; a Handbook of Information Concerning the Minerals and Mines of Canada. Edited by Reginald E. Hore. 6 x 9, pp. 448, illus. Mines Publishing Co., Toronto, Canada.

This is the third volume of the new series of the "Manual," which was originally founded by the late B. T. A. Bell, but allowed to lapse after his death, until it was revived in 1913. It gives an excellent summary of the mineral industries of Canada, with statistical reports and many notes of progress and changes made during the year. More than half the book is taken up by the alphabetical list of mining companies operating in Canada. A supplemental list gives the classification of the companies by their products, and an appendix supplies particulars as to several of the more important companies which have been organized or have begun serious work during the year.

The Mineral Industry: Its Statistics, Technology and Trade. Vol. XXV, 1916. Founded by Richard P. Rothwell. Edited by Prof. G. A. Roush. Cloth, 6 x 9, pp. 960. $10. McGraw-Hill Book Co., Inc., New York.

As stated on the title page, this volume is a supplement to Volumes I-XXIV, and it not only includes the statistics for 1916, but also gives corrections of the figures incorporated in previous volumes, presenting the latest available information on each subject treated. It has been prepared with the usual care and with the assistance of contributors especially skilled in various topics. The list of these is too long to be included here, but it includes a number of names well known both for technical and statistical ability.

The general arrangement of the book is the same as that of preceding volumes. In addition to the technical information given in the several articles, there are two special chapters, one by Prof. R. H. Richards on "Progress in Ore Dressing and Coal Washing," and a table of statistics of the "World's Principal Mines," both of which are valuable in their respective lines. A special feature of the present volume is the introduction comparing Vol. I with Vol. XXV, and showing the progress made in the production of the more important metals and minerals during the 25 years covered by the series. This is illustrated by a number of diagrams graphically depicting the changes of the quarter of a century—many of which are strikingly indicated.

It is impossible, of course, to criticize properly a book of this kind until it has had a continued test by constant use and reference. It does seem, however, as if some of the statistics might have been brought more closely up to date by a judicious use of available data. This is especially the case with "Gold and Silver" and with "Iron and Steel." Some estimates which could well have been closely made would have improved the value of both of these articles to the reader who has occasion to refer to them.

That a work of this kind should be able to hold its own and maintain itself for 25 successive years without any great organization to support it is, perhaps, sufficient proof that it has its place in the mining and mineral world. It may be taken now as well established and generally considered a useful and reliable compilation.

Personals

C. M. Weld, of New York, has returned from Cuba.

Frederic R. Weekes, of New York, has moved his office to 42 Broadway.

Dyke V. Keedy has arrived in New York from French Guiana where he spent several months.

Eugene H. Dawson, mining engineer, of New York, has removed from 71 Broadway to new offices at 42 Broadway.

H. A. Baker, chief chemist of the American Can Co., has gone to Washington to become a member of the committee on conservation of tinplate.

C. C. Hascall, formerly with the metallurgical department of the Westen-Mott Co., is now mining engineer for J. M. Longyear at Marquette, Michigan.

William W. Elmer, consulting mining engineer of Portland, Ore., has returned from Alaska where he has been for the past season.

Benjamin Vallat, major of the Michigan Battalion of Engineers, is making a recruiting trip through the copper and iron districts of Michigan.

H. L. Mead has returned to New York from Alaska, where he spent the past season in drilling gold placers in the northern part of the Seward Peninsula.

George H. Utter, mining engineer, formerly of Silver City, N. M., has changed his residence at Long Beach, Calif., from the Alamo Apartments to 329 Cedar Street.

B. M. Conklin, formerly at the Hill Annex mine at Calumet, Mich., has accepted the position of chief engineer of the Great Northern Iron Ore properties, with headquarters at Hibbing, Minnesota.

J. A. Richards has been commissioned a first lieutenant in the National Army. **Ernest Levy**, for many years manager of the Le Roi No. 2 mine at Rossland, B. C., will occupy Mr. Richards' offices and look after his clients' work in his absence.

F. W. Claflin, of the staff of Perin & Marshall, of New York, sailed for India from Vancouver on Nov. 22. He will erect at Sakchi the blast furnace recently dismantled at Battelle, Ala., which will be used by the Tata Iron and Steel Co. for the manufacture of ferromanganese.

R. H. Channing, president of Utah Consolidated Mining Co., and well known as a mining engineer, has returned to New York from a three months' training course at Fort Oglethorpe with a commission as captain in Field Artillery in the U. S. Army. It is said that Mr. Channing was No. 1 in a class of 4000. He is an old campaigner, having been one of the Rough Riders during the Spanish War.

Thomas F. Coyne was chosen to head the Mine Operators' Safety and Sanitation Association for southwest Missouri at a meeting held in Webb City on Nov. 30. He is a prominent operator of district and succeeds W. B. Shackelford. **C. T. Orr**, of Webb City, a member of the Government's zinc commission, was elected first vice-president, and **Howard I. Young**, district manager of mines for American Zinc, Lead and Smelting Co., second vice-president.

L. Douglas Anderson, superintendent of the Midvale, Utah, smeltery of the United States Smelting Co., has been appointed manager of smelteries for the company at Salt Lake City, Utah. The other members of this company's organization are as follows: George W. Heintz, general manager, Salt Lake City, Utah; C. E. Allen, manager of mines, Salt Lake City, Utah; A. R. Campbell, manager of smelteries, Kansas City, Mo.; D. D. Muir, Jr., manager of mines, Miami, Okla. One group is in charge of the Western business, while the other group is in charge of the zinc business. The company is a subsidiary of the United States Smelting, Refining and Mining Company.

Obituary

Henry E. Jacob, shipping agent at New York for the Calumet & Hecla Mining Co. since the company's organization in 1871, died at his home at 891 Park Place, Brooklyn, N. Y., on Dec. 8, in his 73rd year. He was born in Manchester, England, and came to New York 65 years ago. He was a member of the Union League Club of Brooklyn. He is survived by a widow, five sons and a daughter.

Arthur Lakes died at Nelson, B. C., on Nov. 21, aged 75 years. He was born in Cornwall, England. He came to this country as a young man and eventually became associated with the Colorado School of Mines, being engaged there from its start until 1895 as professor of geology. He became well known throughout the West as a mining geologist. He was the author of the "Geology of Western Ore Deposits" and made numerous contributions to the descriptive geology of Colorado. His facility in pen-and-ink illustration added much to the attractiveness of his writings on these subjects.

Alfred Adair, chemist and metallurgist of South Africa, died in September at the age of 63. He was born in Whitehaven, Cumberland, England, and educated at Owen's College, Manchester, and at the Royal School of Mines. He also studied at Heidelberg and Berlin under Bunsen and Hoffman. He was chemist at the Seaton-Carew Ironworks near Middlesborough, and was for a time at Nobel's Works in Scotland, and also at the Cyanide Manufacturing Works in Paris. For two years he was manager of the Great Britain Gold Mining Co. of the Witwatersrand. He was the originator of the Adair-Cruickshanks patent, taken out in 1899, in reference to fine grinding. The soundness of his views on this point was confirmed in later years by the general adoption of the tube mill. Later he came into prominence in connection with the Adair-Usher patent for dealing with slimes. He was a man of considerable scientific attainments and great originality of mind.

Societies

Mackay School of Mines, Reno, Nev., will repeat the "Prospectors Short Course" for the fourth time, beginning Monday, Jan. 7, 1918, and continuing four full weeks. This course is designed to aid prospectors and includes lectures on prospecting, assaying, mineralogy, geology, chemistry, hygiene, sanitation and mining law, together with laboratory work in assaying, mineralogy, power and first aid to the injured.

Montana Section of the American Institute of Mining Engineers held its semi-annual meeting at the Silver Bow Club in Butte, on Nov. 16. The technical session was preceded by an informal dinner. E. M. Norris presented a paper on the work done in fireproofing the Tramway shaft of the Anaconda company. C. L. Berrien and C. E. Nighman explained the process of hydraulic filling for extinguishing fires at the Anaconda company's Leonard and adjoining mines. Addresses were made by Benjamin B. Thayer, Spencer Miller and Robert Sticht.

Société de Chimie Industrielle has been formed in France with the object of creating a group open to all to aid the expansion of French chemical industry in all its branches; to call together all the industrial heads, professors, engineers, chemists, mechanical engineers, etc., who are interested in French chemical industry; to advance the industry both from an economic and a scientific standpoint. The means to accomplish these results are said to be the publication of a review; the organization of a congress, conferences, lectures, expositions, etc.; the establishment of an office for industrial chemistry and of a library, etc. The executive council is organized as follows: A. Haller and Henri Le Chatelier, honorary presidents; Paul Kestner, president; Felix Binder, M. Buchemin, M. Matignon and Edmont Stauh, vice-presidents; Jean Gerard, general secretary; René Engel, secretary; M. de Germiny, treasurer; Paul Schoellhammer, librarian-historian.

Advisory Council for Scientific and Industrial Research in Canada has appointed subcommittees of scientists to assist its investigations. The sub-committee on mining and metallurgy consists of Dean Frank D. Adams, of McGill University, chairman; Prof. S. F. Kirkpatrick, Queen's University, vice-chairman; Major Charles L. Cantley, acting works manager, Nova Scotia Steel and Coal Co.; A. A. Cole, Cobalt, mining engineer for the Temiskaming & Northern Ontario Railway Commission; C. V. Corless, general manager Mond Nickel Co.; T. Denis, superintendent of mines, Province of Quebec; Charles Fergie, Montreal; A. R. Globe, assistant manager Hollinger Consolidated Gold Mines; Prof. George E. Guess, University of Toronto; Prof. J. C. Gwillim, Queen's University; E. H. Hamilton, Trail, B. C.; Prof. H. E. T. Haultain, University of Toronto; Prof. A. Mailhiot, Ecole Polytechnique, Montreal; E. P. Mathewson, Toronto, general manager British-American Nickel Corporation; Lieut.-Col. D. H. McDougall, Sydney, N. S., general manager Dominion Steel Corporation; J. G. Morrow, Hamilton; Prof. J. Bonsall Porter, McGill University; F. D. Reid, Cobalt; W. Fleet Robertson, provincial mineralogist, British Columbia; F. H. Sexton, president Nova Scotia Technical College; Prof. A. Stansfield, McGill University; John T. Sterling, chief inspector of mines, Alberta; R. H. Stewart, Vancouver; J. B. Tyrrell, Toronto; O. E. S. Whiteside, Coleman, Alberta.

Industrial News

Marion Steamshovel Co. has sold the third 300-ton shovel in the Hibbing district, the first having been sold last spring to the Webb mine, the second to the Sellers mine and the last to the Winston Dear Stripping Co., for stripping the Scranton mine according to contract with Pickands Mather and Company.

C. D. Pruden Co., manufacturers of "Prudential" portable galvanized-steel buildings, Underwriter's hollow-metal windows and Kalamein doors and windows, with main office and factory at Baltimore, Md., will open a general sales office on Dec. 1, 1917, for their products in rooms 806-807 Wallace Bldg., 56-58 Pine St., New York. The office will be in charge of Leigh Pruden, vice-president of the company.

De la Vergne Machine Co., New York, announces the purchase of the company by William Cramp & Sons Ship and Engine Co., of Philadelphia. The new owners will continue both the oil-engine and ice-machine business. The De la Vergne shops will also assist in the production of marine steam engines and other work now being done by the Cramp company for the Government. No changes will be made in the organization with the exception of a new board of directors.

Trade Catalogs

Wire Rope and Cable. Walter A. Zelnicker Supply Co., 325 Locust St., St. Louis, Mo. Bulletin No. 225. Pp. 2; 3½ x 8½ inches.

Automatic Pumps and Receivers. Worthington Pump and Machinery Corp., 115 Broadway, New York. Bulletin D-1301. Pp12; 6 x 9 in.; illustrated.

Du Pont Products. E. I. du Pont de Nemours & Co., Wilmington, Del. 5 x 8 in. Pp. 191. In addition to the various explosives made by the company, this book also describes Fabrikoid, a leather substitute, Pyralin, chemicals and paints made by its associated companies.

New Patents

United States patent specifications listed below may be obtained from "The Engineering and Mining Journal" at 25c each. British patents are supplied at 40c each.

Alloy Containing Iron, Cobalt and Silicon. Frederick M. Becket, Niagara Falls, N. Y., assignor to Electro Metallurgical Co., Niagara Falls, N. Y. (U. S. No. 1,247,206; Nov. 20, 1917.)

Aluminous Abrasive. Lewis E. Saunders and Ray Hill White, Niagara Falls, N. Y., assignors to Norton Co., Worcester, Mass. (U. S. No. 1,247,337; Nov. 20, 1917.)

Barium Hydrate, Process for Obtaining. Camille Deguide, Ixelles, Belgium, assignor of one-half to Désiré Barbais, Charleroi, Belgium. (U. S. No. 1,247,510; Nov. 20, 1917.)

Dump Car. William L. Burner, Columbus, Ohio, assignor to the Kilbourne & Jacobs Manufacturing Co., Columbus, Ohio. (U. S. No. 1,245,866; Nov. 6, 1917.)

Earth-Boring Machine. Albert Hunter, Spokane, Wash. (U. S. No. 1,245,348; Nov. 6, 1917.)

Excavator. Frank Hightower, Montrose, Colo. (U. S. No. 1,245,590; Nov. 6, 1917.)

Filtration—Method of Metallurgical Filtration. Percy A. Boeck, Los Angeles, Calif., assignor to Celite Products Co., Los Angeles, Calif. (U. S. No. 1,245,557; Nov. 6, 1917.)

Grinding Mill. James B. Shackey, San Francisco, Calif. (U. S. No. 1,245,625; Nov. 6, 1917.)

Ore Treatment, Process of and Apparatus for Pulverizing and Treating Ores, Clay and Other Mineral Substances. Alfred B. Willoughby, Philadelphia, Penn. (U. S. No. 1,246,514; Nov. 13, 1917.)

Phosphate Rock, Method of Treating. Herbert H. Meyers, Pittsburgh, Penn., assignor to Armour Fertilizer Works, Chicago, Ill. (U. S. No. 1,246,636; Nov. 13, 1917.)

Editorial Correspondence

SAN FRANCISCO—Dec. 8

Comstock Ore sampling $88.89 a ton was extracted from No. 1 stope on the 2400-ft. level of the Union Consolidated recently according to reports from Virginia City, Nev. From No. 2 stope the ore sampled $49.12 a ton. A total of 181 tons was extracted from the two stopes. In addition to this 154 tons of ore was saved from the work done in repairs and timbering and placing of chutes in the three other stopes on the same level; this ore averaged $15.30 to $17.80. The Mexican mill treated a total of 376 tons of ore during the week ended Dec. 5, averaging $26.59 a ton. Repairs to the hoist and winze on the 2900-ft. level in the Mexican were in progress. Sierra Nevada is making progress in repairs and extending crosscuts and raises. Andes saved 81 cars of $10.30 ore. Ophir disclosed a vein on 2100-ft. level assaying $15.21 per ton for a distance of 30 feet.

Stock of No Par Value is provided for in a legislative act passed at the 1917 session of the legislature. The first California corporation to take advantage of this statutory enactment is the Buhles Process Co., represented by Judge Marcel E. Cerf It is organized for the purpose of joining conflicting interests in patent applications now pending at Washington. The corporation has obtained authority from the corporation department of the state to issue its securities. The company is permitted to issue 1001 shares, 500 shares of which are issued to Julius A. Landsberger and 501 shares to William R. Pentz for total of $1001 cash. The law providing for this class of corporations was enacted at the suggestion of H. L. Carnahan, commissioner of corporations, who drafted the law following substantially the New York statute, so that California corporations may adopt this form of organization which is deemed advantageous in many cases.

Petroleum Engineers are in demand by the State Mining Bureau and a request has been made by State Mineralogist Hamilton and Oil and Gas Supervisor McLaughlin to the State Civil Service Commission that an examination be given applicants for such position with the petroleum department of the bureau. Carrying on the necessary and urgent work of the department has been greatly retarded by enlistment of engineers from the bureau into the Officers Reserve Corps, U. S. Army. The examination will be limited to persons having university training in geology and engineering. Prior experience in oil field work will be favorably considered at the time of examination, but is not essential, as the present engineering staff of the bureau has developed technical methods available to applicants having proper scientific education. The development of oil fields on scientific principles has been the basis of the building up of a department in the bureau that has demonstrated its need to the oil producers. Therefore the field for technically trained men will continue to widen

BUTTE—Dec. 8

Anaconda's Taxes in Silver Bow County on the net proceeds of the mines and on all property amounted to $1,070,527 paid on Nov. 30. Another sum amounting to $101,339 was paid by the company into the city treasury as taxes on property and net proceeds from mines within the limits of Butte City, and the sum of $10,924 was paid to the Walkerville treasury for the same purpose, making a total of $1,182,790, which is more than half the taxes collectable by Silver Bow County for the present year. In other counties of the state the Anaconda company paid in taxes $485,763. The new corporation tax amounting to $428,376 was paid into the state treasury by the Anaconda company, last June, making the total sum of $2,097,000 for taxes paid by the company in Montana. Other mining companies of Butte paid taxes into the county treasury approximately as follows: W. A. Clark, $150,000; Butte & Superior Mining Co., $120,000; North Butte Mining Co., $56,000.

Tobacco Root Range in Madison County is the scene of much activity. Mining in this range of mountains, lying between Madison and Jefferson Rivers, has been stimulated during the year and promises to develop into considerable importance during the year to come. The Bielenberg & Higgins group of properties at the head of Bear Gulch is employing about 40 men and during the year was connected with a power line from the substation at Twin Bridges, permitting concentrator to be run by electric power. At the Lake Shore properties, located at the head of Wisconsin Creek, the mill is being remodeled and changed from steam to electric power. When completed about 40 men will be put to work at mine and mill The Miller & Roach mill on the upper Wisconsin has been moved to the Little Goldie in Goodrich Gulch to treat the ore from this and the Eleanor claims which have been steady shippers for the last three years. At the Nick Traufler properties in Dry Georgia Gulch, which were recently sold to Washington men, a mill and other buildings are under construction and power line is being erected to connect the mines with the main line of Montana Power Co. Leasers and prospectors are active in almost every corner of the Tobacco Root Range and report having had good results in opening up new bodies of gold, silver, copper and zinc ores with prospects of developing them into producing mines.

Montana Silver Producers will join in protest against Government price-fixing and excess-profits tax. Senator Ravenel McBeth of Idaho spent Dec. 1 in Butte to urge upon Butte and other Montana silver-mining men the necessity of being present at a conference held in Salt Lake City, Utah, on Dec. 4, for the purpose of discussing the forthcoming Government price-fixing of silver and for drawing resolutions protesting against the new excess-profits tax provision of the income-tax law. The provision is considered to be not only not fair to all mine operators alike but to be so vague, ambiguous and contradictory as to be practically incapable of understanding and unworkable. While in Butte, Senator McBeth received a wire from Senator Borah of Idaho to the effect that the Secretary of the Treasury will hold the matter of price-fixing open until after the Salt Lake meeting. The arbitrary fixing of the price by the Government would render precarious many of the enterprises which have been recently undertaken in the expectation that the rise of the market price of silver corresponding to the natural demand for the metal would not be interfered with by artificial price-fixing, at least not without the consultation of the producers and without a careful investigation into the present cost of production. Butte being one of the largest silver producers in the country—Anaconda alone producing annually 13,000,000 oz.—is vitally interested in the subject of price-fixing and taxation and it is hoped here that the decisions of the Salt Lake conference will get an intelligent hearing from the Government officials before any serious harm is done. The muddle in which the coal situation of Montana and other states is now finding itself, shows what can happen when hasty action is taken in matters that are of vital concern to certain sections of the country and require for their intelligent administration the expert judgment of those who have made a life-long study of such matters and whose technical knowledge of local conditions entitles them to a hearing before they are arbitrarily interfered with in their legitimate activity.

SALT LAKE CITY—Dec. 8

Refund to Utah Copper Co. of $49,975 will be made on taxes paid in 1912 and 1913 to Salt Lake County, under protest. This amount is the difference between the amount paid by the company and the sum later fixed by the terms of judgments entered in the Federal courts.

Conference of Silver-Mine Operators was held in Salt Lake City on Dec. 4 and Dec. 5, having 75 representatives present from six Western states—Utah, Idaho, Washington, Montana, Colorado and Montana. The conference was the result of the efforts of the Utah chapter of the American Mining Congress and Idaho Mining Association. The meeting voted to form a permanent committee composed of two or more delegates from each Western state interested in the metal industry, to place the interests of metal producers before the proper authorities in Washington on Dec 14. The delegates are to be appointed by the mining organizations of the states represented at the meeting. The Utah chapter of the American Mining Congress chose C. E. Allen, W. R. Wallace, and A. G. MacKenzie as representatives from this state. There were embodied in resolutions unanimously adopted a protest against Government price-fixing of silver other than for patriotic reasons and an appeal to Congress for correction of inequalities in the excess-profits tax law. A telegram to William G. McAdoo, Secretary of the Treasury, at the close of the conference, stating briefly the action taken by the meeting, informed him that the committee would be in Washington on Dec. 14, to discuss the matter fully. The highest degree of patriotism was given expression to in the resolutions of the conference, in that the metal industry of the West would accept without a murmur burdens, which literally meant confiscation, if such action should be necessary in bringing the war to a successful conclusion. The principle of an excess-profits tax was indorsed, but it was urged that the burden of taxation should be more equitably distributed. Some general exceptions were taken to the law in its present form, and these, as well as the appeal for relief, are given as follows:

"Whereas, this convention unanimously indorses the principle of an excess-profits tax and declares that the mining industry should bear its full proportion of such tax, a careful examination of the recently enacted war excess-profits tax law, however, reveals that its provisions will, in a very large number of cases, cause discrimination in favor of excessive capitalized companies as compared with those conservatively capitalized. Among the obvious defects disclosed by analysis, we point out the limitations imposed by sections 203 and 207, which are particularly objectionable, and which, when graphically illustrated, prove that inequality and injustice will result from the application of the law as enacted. Now, therefore, be it Resolved, That this convention respectfully appeals to the Congress to correct the manifest inequalities of the law as it now stands, and that copies of this resolution be sent to the President of the United States, the members of the cabinet, and Senators and Representatives in Congress." Before leaving the convention voted to take no action in regard to lead and zinc until such a time as the question of price-fixing in regard to these metals should be under consideration by the Government.

SPOKANE, WASH.—Dec 6

Coal Mines of Washington, in addition to extending their selling territory to points in the eastern part of the state which have been unable to secure their usual supply from states further east, are now furnishing points in Oregon and Idaho with an increasing amount of fuel. During the last week in November coal companies operating in Washington shipped 73 cars to Oregon, 10 to Idaho, four to California and one to British Columbia, with an average of 45 tons each, making an export total of about 3960 tons.

Treatment of Tailings is the purpose of the Spokane Metals Recovery Co., capitalized at $100,000 and recorded at Wallace, Idaho, with principal place of business at Mullan. The concern has a lease on a flat on Nine Mile, where 50,000 tons of tailings from the Rex mine have accumulated and has also arranged to secure tailings from the Interstate Callahan, Success and other mills. Samples of tailings show assays running over $6 per ton. The company expects to make a profit of $1.50 a ton on these tailings.

WALLACE, IDAHO—Dec. 8

Suit Against Hercules Mine Owners by Mrs Mathilde Cardoner, who claims that she was induced to sell a one-sixteenth interest in the Hercules mine at a figure far below its actual value, was called in the U. S district court at Cœur d'Alene on Dec. 6. The complaint was filed last March, the details of which were given in the "Journal," Mar. 31, 1917 The action is directed against all the owners of the Hercules, but specifically the defendants are Eugene R Day and his sister, Eleanor Day Boyce, the purchasers of the interest, and Harry R. Allen, who the plaintiff alleges induced her to sell through misrepresentations. In their answer to the complaint Eugene R. Day and Eleanor Day Boyce deny all allegations and assert that the price paid Mrs. Cardoner "largely exceeds a fair consideration for the property." The answers of Harry L. Day and Jerome J. Day disclaim connection with the deal, but state that they subsequently purchased one-fourth each of the Cardoner interest on the same valuation at which it had been purchased, which they regard as more than a fair consideration. In view of the valuation placed on the Cardoner interest in the answer filed by the Days, it is significant that within two months after the complaint was filed, a sworn statement showing that the net earnings of the company during the preceding calendar year amounted to $2,931,136, was filed with the county assessor by Eugene R. Day as manager of the Hercules.

TORONTO—Dec. 6

Victory Loan Subscriptions from the mining companies of northern Ontario were liberal. Among the largest subscriptions are the following: Mining Corporation of Canada, $500,000; Nipissing, $500,000; Hollinger Consolidated, $500,000; Kerr Lake, $250,000; Temiskaming, $200,000; McIntyre, $100,000, Dome, $50,000; Coniagas, $50,000, and McKinley-Darragh, $50,000.

Iron and Steel Production in Canada is rapidly increasing owing to the war demand. Returns received by the Mines Branch of the Canada Department of Mines covering the first nine months of 1917 show an output of 1,265,183 tons of steel ingots and direct-steel castings, as against 911,051 tons during the corresponding period of 1916, making an average monthly production of 140,572 tons, as against an average monthly production of 106,268 tons throughout 1916. A significant feature is the great increase in the output of steel in electric furnaces included in the above figures, 30,960 tons having been produced during the first mine months of 1917, as against a total of 19,639 tons for the entire year 1916. The production of pig iron was 895,307 tons as compared with 844,717 tons for the first nine months of last year.

THEDFORD MINES, QUEBEC—Dec. 10

Asbestos Mining is active in the Thedford district as shown by the organization of new companies, installation of new machinery and the amount of construction work completed recently. The Bennett-Martin Chrome and Asbestos Co. has recently been organized with a capital of $1,500,000, for the mining and exploitation of chrome and asbestos on the estate of the King Bros. Ltd., in the Black Lake-Coleraine district. The financial interests are largely the same as those in the Martin-Bennett Asbestos Co., Thedford Mines. Lot 26, Range 3, of this property was worked for crude ore last season and the results obtained were highly satisfactory. The company has commenced the erection of an asbestos mill which will be installed during the winter. The Windsor Asbestos Co., at Coleraine, has completed its asbestos mill, and will commence operation as soon as electric motors arrive. The Jacob's Asbestos Co. at Thedford Mines has its new shaft down 400 ft., and the steel headframe for same is now in place. This departure in asbestos mining will be tried out by the Jacob's company, and will demonstrate whether quarry or pit mining is most suitable to asbestos. The milling system will be employed, and it is held that many of the objections experienced in the quarrying method will disappear. In contrast to this the quarrying men are speeding up production by the introduction of steam shovels of various types. The Jacob's interests have acquired control of the Federal Asbestos Co., at Robertson, and J. M. Forbes, formerly of the Black Lake Consolidated Asbestos Co., has replaced A. E. Audette as superintendent. Wages have been rapidly advancing during last year, and now stand at 30c. an hour for the quarry labor. One company has broken away from the established custom by paying the surface men the same as the quarry men, though it is generally held to be good practice to pay the higher wage to the miner, as there is always the greatest shortage in this class of labor. Probably, in this respect the asbestos industry is unique among mining camps of the world as the one where there is perfect discord among the operators. Feeble attempts have been made in the past to have current practices standardized but with little success. The popular practice of the incoming superintendent is to condemn and discard the principle and system worked out by his predecessor. Owners and operators insist on divergent policies even though it destroys the united front which might be employed to put the industry on a sound and permanent paying basis. The present period of prosperity might well be employed to establish the unity characteristic of successful mining camps.

The Mining News

ALABAMA

Jefferson County

REPUBLIC IRON AND STEEL CO. (Birmingham)—Two of the three Thomas furnaces blown out because of coke shortage, fire having destroyed tipple and coal washer at Sayreton mines. Will reduce iron production of district, 500 to 600 tons per day.

UNITED STATES STEEL CORPORATION will have ships built at Mobile by the Chickasaw Shipbuilding Co., which has been recently organized as a subsidiary company. Officers: Geo. G. Crawford, president; H. C. Ryding, vice president; J. F. Coleman, general superintendent; L. T. Beecher, secretary-treasurer. Will begin work at once; 10 shipways will be laid down; large power plant, shops and office to be erected. Two large villages laid out, one for white and one for colored employees. About 1600 houses will be completed during coming year.

ALASKA

JUALIN ALASKA MINES CO. (Jualin)—Work suspended pending readjustments and preparations for resumption on much larger scale before spring. Will increase present 10-stamp mill, by addition of pebble mill, to capacity of 150 tons per day. Work on 7800-ft. tunnel crosscutting property and draining mine will be resumed; tunnel now advanced 2000 ft. Recovery of gold during last 12 months amounted to $197,296. Controlled by Belgian and French capital; main office in Paris, France. Charles G. Titus, of Jualin, Alaska, manager.

ARIZONA

Gila County

INSPIRATION (Miami)—November production of copper amounted to 2,500,000 lb., compared with 2,400,000 lb. in October.

OLD DOMINION (Globe) — Production for November was 2,811,000 lb. copper, comparing with 2,623,000 lb. in October.

Mohave County

TWINS (Kingman)—Purchased by Dalsell Mining and Milling Co., of New York. The old shaft over 300 ft. deep will be unwatered, retimbered, and sinking will be resumed.

Pima County

MORGAN (Tucson) — Recent developments on first and second levels under direction of new management opened considerable tonnage. Has been opened to depth of 900 feet.

Pinal County

PINAL CONSOLIDATED (Price)—Repairs on wagon road completed and ore hauling begun. Development satisfactory and large output expected soon.

BROKEN HILLS (Ray)—Wagon road nearly completed. Hoist will be installed when it can be put on ground; working force to be doubled.

MAGMA CHIEF (Superior)—Diamond-drill exploration begun from 900-ft. point in Watson tunnel. At present making 15 ft. per day. First hole will be about 600 ft. deep.

RAY LEAD (Ray) — Purchased large number of pack animals and will increase shipments to 1000 tons a month. Surveys being made to determine advisability of connecting with Broken Hills road.

ARKANSAS

Boone County

ZINC CAMP OPERATIONS hampered by car shortage on White River division. From 20 to 25 carloads hand-cobbed silicate of zinc and concentrates in various mine bins awaiting shipment. McCurry Mining and Milling Co. has repaired custom mill; machinery purchased by the same company for 100-ton mill on Rhodes-Manchester mine. L. L. Brown mill, shut down for repairs for several weeks, is again running.

CANTRELL (Lead Hill)—Coy Cantrell started deep drilling operations on ground three miles north of here. Expects to go to depth of 500 ft. for lead or zinc; is down now 50 ft.

Newton County

CONFEDERATE (Cave Creek)—Mill of 300 tons capacity at Confederate mine put in operation. Property was opened by Confederates during Civil War and furnished lead for munitions. Operated by three shafts and opencut, producing lead and zinc ore. James P. Aylward, president; Harry Sandler, secretary-treasurer.

CALIFORNIA

Amador County

PINE GROVE MINING CO. (Pine Grove)—Permit for issue and sale of stock revoked by commissioner of corporations.

PLYMOUTH CONSOLIDATED (Plymouth)—In October treated 10,800 tons ore, with estimated yield of $56,215; working expenses, $31,010; development, $4743. Surplus over working and development, $17,461; capital expenditure, $1161.

OLD EUREKA (Sutter Creek)—Bottom of shaft reached at depth of 2065 ft. From 1600-ft. level down, former owners prospected and mined by single-compartment shaft. Has been enlarged as work proceeded to a three-compartment shaft. Work has been difficult on account of cleaning out old debris and removing caved ground. Now repairing and enlarging 2000-ft. station. Pay ore in sight at this level and expected development at this point will proceed and at upper levels before deepening shaft.

Butte County

OROVILLE DREDGING (Oroville) — Boston No. 4 dredge will start redredging old ground worked several years ago by Risdon boats. Early day dredging did not recover all gold and believed that sufficient amount remains to warrant redredging. Gross returns for week ended Oct. 11 for two dredges was $4109; for week ended Oct. 18, $4042.

Calaveras County

TANNER (San Andreas)—Explosion in tunnel caused injury to two men who were able to escape before second explosion followed. Supposed to have been result of missed holes.

Eldorado County

LIVINGSTON (Fairplay)—Reported that Frank Dittmar and W. Pittenger of Dillon, Mont., are examining property with view to reopening it.

MISSION FLAT (Placerville)—Unwatering old 65-ft. shaft of this copper mine completed. Reported vein 18 in. wide disclosed carrying chalcopyrite and bornite with good copper contents. If development warrants, a concentrating plant may be constructed.

Inyo County

ZINC OREBODY reported disclosed nine miles from Darwin. Ore is said to be near surface and vein has width of 500 ft. Being developed by Utah men.

FRIDAY (Bishop)—Reported sold to M. Yalovica and associates of Goldfield for $10,000. Ore assaying high in silver and carrying some lead and gold said to have been disclosed by short tunnel opening a 30-in. vein.

Kern County

CALIFORNIA KALI CO. (Los Angeles)—Permitted to sell 5000 shares capital stock at $1; proceeds for prospecting and developing placer claims for potash deposit in southeastern part of county.

BUTTE (Randsburg) — Test run on waste dumps in new 10-stamp mill reported profitable. Dumps above mill are broken down into chute carrying material to cars on track below, and then trammed to mill bins. Gross returns said to average about $6 per ton.

Los Angeles County

WALNUT CREEK MINING AND MILLING CO. (Los Angeles)—Supplementary permit to sell 20,000 shares capital stock at 50c., to present stockholders.

Nevada County

YOU BET (Dutch Flat)—Reported completion of débris restraining dam in Missouri Canyon and construction of long flume; hydraulic mining will be resumed within short time. Resumed mining at You Bet by San Francisco men with Mr. Gerdetz, superintendent. Old You Bet mines were former gold producers but anti-débris law prohibiting running of tailings into navigable streams or tributaries caused shutdown.

Placer County

SAN FRANCISCO (Forest Hill) — San Francisco men prospecting this property, situated below Dardanelles mine and about 2½ miles southwest of Forest Hill. Opened in early days by tunnel.

Sacramento County

NATOMA NO. 10 (Natoma)—Was first steel-hull dredge built in California; undergoing repairs to be completed in December. No. 10 was experiment in steel-hull construction and at time of installation was disappointing because of inadequate flotation. This fault was corrected before digging began; afterward handled the heaviest kind of gravel and proved dredge to be substantially constructed. It has been operating five years and with necessary repairs is good for another five years' work.

San Mateo County

LIBERTY OIL REFINING CO. (Oakland)—Authorized to issue 110,000 shares at $1, in exchange for leases in Purisima Creek district, containing 900 acres. Company required to reassign 10,000 shares to the corporation to be disposed of as treasury shares at 50c. per share; proceeds to be utilized in repairing and improving equipment. Further permit to sell 15,000 shares, proceeds to be used in development. There are four cased wells, two of them producing about 2 bbl. of oil each per day and 3000 cu.ft. of gas per hour. Other wells and oil producing equipment are included.

Shasta County

GREENHORN (French Gulch) — Shipment of 800 tons of copper ore being hauled by motor trucks to Redding for transportation by rail to Mammoth smeltery at Kennett. Situated near Tower House; motor road distance about 22 miles; trucks carry about five tons.

Yuba County

YUBA CONSOLIDATED GOLD FIELDS (Hammonton)—Reported to contemplate construction of another new dredge to be known as No. 18. Will probably be constructed by Yuba Manufacturing Co.

COLORADO

Boulder County

MELVINA (Salina)—Three shifts engaged in unwatering property; 700-ft. shaft unwatered to 640-ft. depth. When completed active development will be started. Surface plant overhauled and placed in working order. A. Murphy, manager.

VICTORIA (Summerville)—Employing 10 men on development. Property opened to 470-ft. depth. Two triplex plunger pumps will keep mine unwatered; one on 270-ft. level driven by 15-hp. motor, and other on 470-ft. level driven by 25-hp. motor. Will work one Dreadnaught drifter and two stoper drills recently added to equipment. Carload of 53-oz. silver ore recently shipped from development. Frank M. Pickard, superintendent.

YELLOW PINE (Boulder) — Several leases in successful operation. Cochran Bros. developing Michener vein on sixth level, 900 ft. from beginning of tunnel; ore opened shows good silver, copper and lead contents. Pocket of high-grade assayed $1200 a ton; 12-ton shipment of 200-oz. silver ore made recently. Ore opened in block being operated by Al. Steelsmith assays from 170 to 780 oz. silver per ton. Another block on same vein, operated by Wallace & McHarg produced 12 tons high-grade shipping ore. Peter Burges, employing 10 men on Mudd vein, shipping two cars per month; last shipment of 14 tons assayed 180 oz. silver per ton. Drift advanced 100 ft. on Mudd vein by Ernest Meyring and Arthur Meyers under contract. On Yellow Pine vein, Adams & Stromberg working 1000 ft. from tunnel portal and 700 ft. below level. Old stope yielded several carloads of 50-oz. silver ore. Development being done on Gray Copper vein by Pearl Horton. Payable ore opened on Duroc and Vancluse veins. Most of ore shipped is purchased by W. J. Chamberlain Ore Company.

Clear Creek County

ORE SHIPMENTS FROM IDAHO SPRINGS during October were heavier than in any previous month during 1917; 61 cars of 20 tons each shipped having value above $25 per ton. Total output from Clear Creek County during month was about $100,000

Gilpin County

GILPIN-EUREKA (Central City)—Mill operating two shifts to treat increased production. Good-grade ore opened on 700-ft. level. Smelting-grade ore also mined. Shaft sinking will be resumed soon.

Saguache County

KAPI (Bonanza)—Continues development in May Bell tunnel being driven to cut Shawmut vein. New compressor plant installed. Curtis compressor and Wagner motor supplied by Mine and Smelter Supply Co., of Denver. Drilling equipment purchased from Denver Rock Drill Manufacturing Co. W. H. Wright, of the Malm-Wolf Co., consulting engineer.

San Juan County

WAR EAGLE (Silverton)—Development discontinued for winter; will be resumed early next spring under management of P. J. Holngrain.

CRATER GOLD (Durango)—New lower tunnel advanced 200 ft., opened vein of low-grade milling ore. Shipping ore produced from development in upper tunnel. Emma N. tunnel advanced 50 ft., and a shoot of good-grade ore opened. Ore bins built at mine, but owing to shortage of labor new bunkhouse not completed in time for winter use, and operations discontinued until early spring. M. H. Kingsley, manager. Mine near Animas Forks.

San Miguel County

SHIPMENTS FROM TELLURIDE during October were as follows: Tomboy, 50 cars of concentrates; Smuggler-Union, 40 cars; Black Bear, 28 cars; Liberty Bell, 8 cars; lessees, 2 cars; total, 128 cars.

NEW DOMINION (Ophir) — Shipped payable crude ore from development; small concentrating mill under consideration.

LEWIS (Telluride)—Main shaft unwatered to first level. Development and mining will be resumed when property is completely unwatered.

GERTRUDE (Telluride)—Mine situated in Bear Creek; developed during last season by Farrell & King. Silver and copper ore opened; a lower crosscut tunnel under consideration.

LEWIS (Telluride)—Winter supplies being laid in; elevation is 12,000 ft. and inaccessible during winter. Work will continue all winter; mine to be reopened, mill remodeled and flotation installed; carload of machinery received

Summit County

ROYAL TIGER (Breckenridge)—Reopening old I. X. L. mine; machine drills will be installed soon. Boarding and bunk house and saw mill built recently.

Teller County

BACKOFF LEASING CO. (Cripple Creek)—Operating Midget mine, of Midget-Bonanza Gold Mining Co., discovered rich ore.

ELKTON (Elkton) — Lessee Barnard shipping high-grade ore from block between 3rd and 4th levels of Elkton shaft, on Henley vein.

ISABELLA (Cripple Creek)—Lateral development on 1500-ft. level of winze from 1250-ft. level of Lee shaft. Drifting on East Vindicator vein, and crosscutting 220 ft. to Buena Vista vein.

IDAHO

Bonner County

ARMSTEAD MINES (Talache)—During November reported main tunnel known as No. 3 advanced 489 ft. in 28 days, comparing with 488 ft. in 29 days in October. Both figures are records for tunnel driving in Northwest. Cost is estimated at $15.21 per foot. Tunnel being driven to cut vein on lowest level.

Shoshone County

CALEDONIA (Wardner)—Earnings for October were $90,000, a decrease of about $20,000 from the 1917 monthly average. Efforts to find oreshoot on Keating level failed; upper workings nearing exhaustion. Has $800,000 surplus, which will be disbursed eventually.

CARBONATE HILL GIANT (Mullan)—Following acquisition of control of Carbonate Hill and Idaho Giant a few months ago, W. D. Greenough organized Carbonate Hill Giant Mines Co. and has had engineers formulating extensive plan of development to begin about Jan. 1.

SHERMAN (Burke) — Shipping ore struck in raise from main tunnel, starting on 2-in. stringer of galena, which widened to 14 ft. after raising 35 ft. About 500 ft. below upper tunnel and about 700 ft. from surface much ore is exposed. About 500 ft. more depth can be obtained by lower tunnel, which is contemplated.

DOUGLAS (Beeler) – Shipments almost suspended on account of bad condition of road. Ore developed in tunnels Nos. 2 and 3 and in drift from shaft 100 ft. below No. 3. Vein recently discovered on opposite side of canyon, showing 14 in. of oxidized zinc-lead ore with a little sulphide. Under lease to Anaconda company; 70 men employed.

REX CONSOLIDATED (Wallace) — Bond held by this company on property of the old Rex Mining Co. taken up by acceptance of old company of 1,000,000 shares in the consolidated company. Bond was for $200,000 and expires in July, 1920. This action was taken by the stockholders of Rex Mining Co. at meeting held in Augusta, Maine, on Nov. 19. Rex Consolidated Co. has capital stock of 5,000,000 shares, 2,000,000 of which will be sold for development purposes. No less than $75,000 is to be spent on Rex property, the work to include extending shaft 300 ft. from 700-ft. level. Company also owns tract of lead-zinc land in the Miami district, Oklahoma, which will also be developed.

MICHIGAN

Copper

SOUTH LAKE (Houghton)—Produced 2345 tons of rock in November.

FRANKLIN (Demmon)—Output was 27,720 tons for November.

ADVENTURE (Greenland) — Following suspension of work, mine shipped 35 tons to mill.

MASS (Mass)—At present producing 1000 tons of rock daily; gradually increasing output. November production was 19,000 tons.

ALLOUEZ (Allouez)—New boilers installed throughout and entire surface plant being improved. Production maintained at 1800 tons daily.

CHEROKEE (Houghton)—Exploration work continues to show small mass and shot copper east of 420-ft. level; west drifts advanced 70 ft.

SENECA (Mohawk)—One boiler now working; one stack erected and another ready for erection. All machinery installed. Will start mining on Jan. 1.

AHMEEK (Ahmeek)—Output continues to break all previous records, being close to combined output of three Copper Range mines. Shipped 104,000 tons in November.

CENTENNIAL (Calumet) — Yield for present year will be close to 2,250,000 lb. an increase of three quarters of a million pounds over 1916, owing to richer quality of ore and slight increase in tonnage.

CALUMET & HECLA (Calumet)—Production for November from C. & A. mines was 245,000 tons; Isle Royale, 13,000 tons to Point Mills plant and 54,000 tons to own mill at Pilgrim; Osceola, 97,500 tons.

LA SALLE (Calumet)—Stoping only in No. 1 shaft, down to 15th level inclusive. Rock shipments amount to 50 tons daily, half from this shaft and half from No 2. At latter, now drifting on bottom, the 21st level; grade of rock is so low that it just permits working.

COPPER RANGE (Painesdale)—Three mines maintaining production; a slight falling off may occur in November output but total rock tonnage was same as for October; both months under average for 1916. Champion is producing over 60,000 tons per month; Baltic, 30,000 tons; Trimountain, 20,000. Trimountain showed a slight increase in tonnage last month and falling off occurred in Baltic's tonnage.

MINNESOTA

Mesabi Range

ALPENA (Virginia)—Oliver Iron Mining Co. testing two types of underground loading machines developed on Mesabi, the Middlemiss and the Hoar. Middlemiss machine developed by Bruce Middlemiss, superintendent for Todd-Stambaugh interests; other machine is invention of Captain Hoar of M. A. Hanna interests.

MONTANA

Deerlodge County

NATIONAL TUNGSTEN CO. (Anaconda)—First shipment of 2800 lb. of concentrates to eastern refineries made from Windy Gap mines, said to be worth $1 a lb. At Hidden Lake, construction of mill and cyanide plant to be completed shortly.

Madison County

IN SHERIDAN DISTRICT, reported that Bedford mine and mill will resume. Mill and electric power line completed some years ago and property is ready for exploitation and treatment of ore.

IN TWIN BRIDGES DISTRICT, Michael Miller is making small shipment of silver ore from mine above Governor Pollinger Springs, between Bear and Dry Gulches. George Bonantz has well-developed property near old Tidal Wave between Dry Georgia and Goodrich Gulches; shipping ore during the summer.

Silver Bow County

ANACONDA (Butte)—November production was over 21,666,000 lb. of copper and about 4,000,000 lb. of zinc. Prior to last summer's labor disturbances, monthly output averaged 28,000,000 lb. of copper, including North Butte production, making present Anaconda production nearly 90% of normal with prospects of reaching normal before end of year.

NEVADA

Elko County

HOLDEN MINING AND MILLING (Tuscarora)—Will introduce a new system of milling as flow sheet includes electrocyaniding, introduced by Prof. E. R. Holden, of Los Angeles, formerly of the Colorado School of Mines. J. D. Hubbard, superintendent.

Lander County

GOLD TOP MINING (Battle Mountain)—Installed 35-ton ball mill and started operating. Six claims with 585 ft. of tunnel; crosscutting and connecting shaft completed. Ore taken out through tunnel. Situated in Copper Basin district, about seven miles from Galena.

Nye County

TONOPAH ORE PRODUCTION for week ended Dec. 1 amounted to 10,061 tons valued at $176,067, comparing with 10,093 tons, the previous week. Producers were: Tonopah Belmont, 2565 tons; Tonopah Mining, 2800; Tonopah Extension, 2380; Jim Butler, 500; West End, 1128; MacNamara, 470; Montana, 116; North Star, 56; and miscellaneous, 46 tons.

White Pine County

MINERVA SCHEELITE MINE, situated 20 miles south of Osceola, in Snake Range, recently sold to a Mr. Werner, of Los Angeles, a $5000 cash payment being made. Two-ton mill on property, but unknown if property will be worked.

NEW MEXICO

Grant County

BONNEY (Lordsburg)—Water on 400-ft. level under control. Lawrence Mining Co. operating property; will work ore lenses encountered in development.

85 MINING CO. (Lordsburg) — Constructing 400-ton mill. Allis-Chalmers ball mill just received. Plant to be operating by March. Preparing for installation of fourth Deisel-engine unit, making four Lyons-Atlas 500-hp. engines in use.

SOUTH CHINO COPPER CO. (Lordsburg)—Will be name of new company, formerly known as Atwood Consolidated Mining Co., operating Atwood and Southern groups. Financed in Boston; payments completed on property until January, 1917.

Lincoln County

VERA CRUZ (Carrizozo)—Mill equipment and electrical machinery for mine shipped for working property on large scale.

OREGON

ANDERSON'S (Kerby) — This placer mine on Illinois River, six miles from here, installing Joshua Hendy elevator purchased from Logan placer mine. George Anderson, owner.

BIGELOW & BOUR (Kerby)—Hydraulic equipment installed at this chrome mine on Illinois River six miles from here. Soil surrounding the chrome to be piped away. William Bigelow and David Bour, of Kerby, owners and managers.

KERBY QUEEN (Waldo) — Reopening this chrome mine five miles northeast of Waldo. Developed by 900-ft. adit on lower level and 300-ft. adit on upper. Considerable tonnage of 1% copper ore on dumps; ore averaging $6 gold per ton being shipped.

UTAH

Juab County

TINTIC SHIPMENTS for November, covering five weeks, amounted to 893 cars as compared with 634 in September and 929 in August, also of five shipping weeks. Tonnage estimated at 44,000 tons valued at about $1,000,000. Shipments for two leanest weeks were 129 and 127 cars respectively and last two weeks of month, with improved transportation, over 200 cars each. Heaviest shipper was Dragon Consolidated with 172 cars largely of fluxing ore. Iron Blossom was next with 107 cars and Chief shipped 104 cars. Shipments for week ended Nov. 30 were 183 cars.

TINTIC DRAIN TUNNEL (Eureka)—Stock to be listed on Salt Lake Exchange; capitalization, 3,000,000 shares, par value, 5c., with 1,500,000 shares remaining in treasury; also $26,788 in cash. Owns 24 patented claims, 315 unpatented claims, and 600 acres of land at mouth of tunnel to be driven for development, drainage and irrigation. Ground already opened by shafts, tunnels and winzes shows some ore. Utah Power and Light Co. working on power line extension; expected to have power for drills available in December. Boardinghouse, bunkhouse, blacksmith shop completed and equipment for beginning work installed. Jesse Knight, of Provo, president.

Salt Lake County

ALTA CONSOLIDATED (Alta)—Connections made with Michigan-Utah tram line allows easier shipment from lower workings.

SOUTH HECLA (Alta)—Dwyer tunnel level continues production, new find about 5000 ft. east of older workings said to show indications of orebody.

COLUMBUS-REXALL (Alta)—November shipments amounted to 600 tons. Unfavorable hauling conditions prevent larger shipments.

CARDIFF (Salt Lake)—Bad roads between mine and bins at south fork of Big Cottonwood restricting shipments to this point. So far shipments to smelters from accumulation here, awaiting better market for lead ores, have not been started.

Summit County

PARK CITY SHIPMENTS during November were 13,142 tons of ore and concentrates, according to preliminary figures, this being the heaviest month of the year thus far. Ontario Silver shipped 3990 tons, being the largest output for the year. Judge Mining and Smelting shipped 3409 tons, being its heaviest month also; the electrolytic zinc plant is adding considerably to output. Silver King Coalition and Silver King Consolidated follow with 3270 and 1025 tons respectively. The Daly West shipped 800 tons. Twelve properties shipped.

Tooele County

DUGWAY COPPER (Salt Lake)—Copper reported found on recently acquired claim and work, suspended for some months, resumed. Owns six patented claims and two unpatented claims. Shipping point for camp is Faust Station, 55 miles by wagon-road.

Utah County

SERVICE POWER LINE is being planned by the Earl Eagle, Bellerophon, and Globe Mining companies in American Fork Canyon to furnish power for their properties.

EARL EAGLE (American Fork)—Tunnel in about 1300 ft. Winter supplies in.

BOG MINING (American Fork)—Tunnel being driven for contact, about 400 ft. below old tunnel workings, which have been discontinued.

WASHINGTON

NORTHWEST MAGNESITE CO. (Chewelah)—Producing average of 180 tons calcined magnesite daily. Third metal kiln put in operation and six-mile tramway almost completed. Large calcining plant nearly completed. Cost of plant and tramway, about $250,000.

VALLEY MAGNESITE CO. (Chewelah)—Shipped 20 carloads of 40 tons each calcined material, averaging $32.50 per ton. Operating and hauling cost, $10 per ton; expect reduction to $6 per ton when railroad is built to property. Eight more kilns to be built, making total of 11 and providing capacity of 160 tons daily of calcined material.

CANADA

Manitoba

ELIZABETH GROUP (Herb Lake)—Mines Exploration Syndicate (Makeever Bros., 170 Broadway, New York) has secured controlling interest, which was held by Pas Consolidated Mining Co., of Winnipeg. Mines Exploration Syndicate agrees to spend $250,000 in development during next two years.

Ontario

WHELPDALE (South Porcupine)—Installing small plant.

GIFFORD (Cobalt)—Vein, 10-in. wide, showing native silver cut on 350-ft. level.

BURNSIDE (Kirkland Lake)—Acquired by Alladin Mining Co. The same interests control Chambers Ferland in Cobalt.

PORT ARTHUR COPPER (Mine Centre)—Mining plant, including air compressors, installed, and two working shafts being sunk.

TECK HUGHES (Kirkland Lake)—Will increase capital from $2,000,000 to $2,500,000; new stock to provide for mill extensions and additional development.

HOLLINGER CONSOLIDATED (Timmins)—Reported recent developments on the Millerton give width of orebody opened on 400-ft. level as 70 feet.

LA ROSE (Cobalt)—Received authority to cut capital of La Rose Mines, Ltd., the Ontario company, from 6,000,000 shares of $1 par to 1,500,000 shares of $1 par. Will be transferred share for share with La Rose Consolidated, the American company, which has 1,500,000 shares of $5 par. American company will be liquidated.

KIRKLAND LAKE (Kirkland Lake)—Purchased by Beaver Consolidated, with exception of small amount of outstanding stock. Total purchase price was approximately $300,000 in four instalments. For each payment a corresponding block of stock was delivered. Owing to heavy expenditures of Beaver development and installation of 150-ton mill, about one-half of stock covered by last instalment of $75,000 was not taken over.

Yukon

CANADIAN KLONDYKE (Dawson)—On application of Granville Mining Co. Judge MacAulay appointed Harold G. Blankman, deputy clerk of the Yukon Court, as temporary receiver for Canadian Klondyke Power Co. and Canadian Klondyke Mining Co. on ground of failure to issue bonds for loan of $1,350,000, or to pay interest thereon. Applicants explained that it was not their intention to shut down operations but to secure an adjustment and arrange for payment of all obligations.

MEXICO

EMBARGO ON GOLD AND SILVER ORES will be raised by the Mexican government as the result of an agreement made with the United States. The agreement entails upon the United States the obligation to return the entire gold content of the ore and 25% of the silver extracted from the ore.

CHILE

CHILE EXPLORATION (Chuquicamata)—Production in November was 8,872,000 lb. copper, comparing with 9,050,000 lb. in October. Operations are limited by supply of fuel oil.

PERU

CERRO DE PASCO (La Fundicion)—Production for November, according to cable dispatch, was 6,440,000 lb. blister copper, comparing with 7,325,032 lb. in October.

AUSTRALIA

MOUNT LYELL MINING AND RAILWAY (Mount Lyell, Tasmania)—Cable advices from Melbourne report ore treated during year ended Sept. 30 was: Mount Lyell, 152,668 tons; North Mount Lyell, 82,878 tons; Concentrates, 1019. Ore extraction suspended three weeks in May, owing to strike. Produced 5832 tons blister copper containing 5766 tons copper; 295,126 oz. silver, 7455 oz. gold. Cost of producing blister copper was $6.45 "per ton of ore including concentration." Owing to diminished output, it was only possible to run two furnaces during the year. Smelting was entirely suspended for 19 days and one furnace only was running for 16 days on account of strike. Ore reserves based on last estimate were: Mount Lyell, including South Mount Lyell, 2,013,439 tons; North Mount Lyell, 997,904 tons. Flotation plant treated Comstock and low-grade North Mount Lyell ores totaling 14,129 tons assaying 2.91% copper, and yielding 3902 tons of concentrates assaying 9.31% copper.

INDIA

GOLD PRODUCTION of Kolar Field in Mysore during October was 13,041 oz. fine, being 166 oz. less than in September, and 2020 oz. less than in October, 1916. The decrease was chiefly in the Balaghat and the Champion Reef. For the 10 months ended Oct. 31 the production was 452,554 oz. in 1916, and 432,584 oz.—or $8,911,511 in value—in 1917; a decrease of 19,970 oz. this year.

The Market Report

SILVER AND STERLING EXCHANGE

		Silver				Silver	
Dec.	Sterling Exchange	New York, Cents	London, Pence	Dec.	Sterling Exchange	New York, Cents	London, Pence
6	4 7515	85⅜	42¾	10	4 7515	85⅝	42⅞
7	4 7515	85⅞	43	11	4 7515	85⅝	42⅞
8	4 7515	85⅞	43	12	4 7515	85⅝	42⅞

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

DAILY PRICES OF METALS IN NEW YORK

	Copper	Tin	Lead		Zinc
Dec.	Electrolytic	Spot.	N. Y.	St. L.	St. L.
6	*23½	†88	6¼ @6½	6.25 @6.35	7.50 @7.60
7	*23½	†88	6.25 @6.40	6.25 @6.35	7.50 @7.55
8	*23½	†88	6¼ @6⅞	6.25 @6.35	7.50 @7.55
10	*23½	†88	6¼ @6½	6.25 @6.30	7.45 @7.55
11	*23½	†88	6¼ @6⅜	6.25 @6.30	7⅜ @7½
12	*23½	†88	6¼ @6⅜	6.25 @6.30	7⅜ @7½

† Nominal.

* Price fixed by agreement between American copper producers and the U. S. Government, according to official statement for publication on Friday, September 21, 1917.

The above quotations (except as to copper, the price for which has been fixed by agreement between American copper producers and the U. S. Government, wherein there is no free market) are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

The quotations for electrolytic copper are for cakes, ingots and wirebars.

We quote electrolytic cathodes at 0.05 to 0.10c. below the price of wirebars, cakes and ingots.

Quotations for spelter are for ordinary Prime Western brands. We quote New York price at 17.5c. per 100 lb. above St. Louis.

Some current freight rates on metals per 100 lb. are: St. Louis-New York 17c.; St. Louis-Chicago, 6.3c.; St. Louis-Pittsburgh, 13.1 cents.

LONDON

	Copper			Tin		Lead	Zinc
	Standard		Electrolytic				
Dec.	Spot	3 Mos.		Spot	3 Mos.	Spot	Spot
6	110	110	125	292	290	30½	54
7	110	110	125	293¼	291¼	30½	54
8							
10	110	110	125	296	293½	30½	54
11	110	110	125	298½	295½	30½	54
12	110	110	125	302	296½	30½	54

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2,240 lb. For convenience in comparison of London prices, in pounds sterling per 2,240 lb., with American prices in cents per pound the following approximate ratios are given, reckoning exchange at \$4.7515. £30½ = 6.4696c.; £54 = 11.4545c.; £120 = 25.4544c.; £137 = 29.0605c.; £240 = 50.9089c. Variations, £1 = 0.2121205c.

Metal Markets

NEW YORK—Dec. 12

All of the metal markets this week were characterized by great dullness. However, there were features of interest.

Copper—The matter that was most talked about this week is the forthcoming conference between the copper producers and the War Industries Board to be held in Washington on Dec. 14, at which is to be discussed the matter of price to prevail subsequent to January, 1918, when the present agreement will expire. It is hoped that an announcement will follow soon after the meeting on Dec. 14.

In the meantime, some of the smaller producers have made bitter representations to the Copper Producers' Committee that they cannot supply copper at 23½c. without losing money. It is well known also that producers in South America, whose output is imported into this country, are suffering very keenly from present conditions, the matter of exchange rates adding to the difficulties in their case, and some of them have actually suspended operations with the result of diminishing the supply of American refiners from that quarter.

Another feature of interest this week were sales of copper at 23½c., cash, New York, to domestic consumers for delivery subsequent to January, some contracts having been entered into for delivery as far ahead as June. Several producers booked business of this kind, the volume of which attained proportions considerably larger than in previous weeks. The consumers who entered into these contracts were covering orders that they had already received. The bulk of this business was negotiated at the specific price, without any guarantee against decline.

From Washington we hear that officials interested in copper are much gratified at the gradual increase of production at Anaconda, which now is running at about 90% of capacity. Information reaching Washington is that the December production in Arizona will be greater than was anticipated. Fuel and transportation conditions, as they affect the copper industry, have disturbed officials somewhat; but, through influences they were able to bring to bear, these hindering factors in no case have become serious.

Under the system adopted for less than car load lots, the trade has been provided with small lots in proportion to its requirements and the urgent demand in that quarter seems to have been taken care of fairly well.

Copper Sheets were cut on Dec. 7 to 31½c. per lb., f.o.b. mill, for hot rolled, and 1c. higher for cold rolled. Copper wire is quoted at 26@27c., f.o.b. mill, carload lots.

Tin—Such business as was done was of surreptitious character and in very small lots. We continue to quote the market at 88c., but that is purely nominal and not representative of actual business.

Beginning with Dec. 10 the American Iron and Steel Institute took charge of the distribution of tin supplies, under sanction of the U. S. Government. Hereafter the British consular officers will release tin only to it

Lead—This market was dull and rather spotted in character. Some producers booked a fair amount of business, while others got none at all. In certain cases, producers took no business for the reason that they are sold out for a considerable time ahead. Other producers who had supplies at their work were in some cases unable to accept business owing to impossibility of making the delivery wanted, because of the freight congestion. In some quarters the lead market was thought to exhibit a slightly firmer tone, while in other quarters the opposite opinion was expressed.

The lead producers will meet the War Industries Board in Washington on Dec. 17, at which meeting will be discussed the fixing of a maximum price for lead. The lead required by the Government is being provided at present on the basis of the average monthly quotation of the market at St. Louis.

Zinc—This market was very dull. Some small transactions were reported from day to day at about 7½c., St. Louis, but on Dec 11 the market exhibited a weaker tone.

The zinc requirements of the U. S. Government and of the foreign governments associated with this country in the war are being taken care of promptly. It is understood that the purchases for the Allies of the lower grades are being made in the open market at going prices.

Zinc Sheets—Price of zinc sheets has not been changed. Market is still at \$19 per 100 lb. f.o.b. Peru, less 8% discount.

Other Metals

Aluminum—This market continues dull, No. 1 ingots being offered at 36c. per lb., New York. Aluminum-sheet demand is good, however, the output of one Middle West mill being sold up to July, 1918.

Antimony—This metal was a little weaker and we quote spot at 15@15½c., while futures are quoted at 14c., c.i.f., in bond. The market was dull, but there were unsettling rumors. Some Governmental action is anticipated.

Bismuth—Unchanged at \$3.50 per pound.

Cadmium—This metal is quoted at \$1.50@1.75 per lb., depending on the quantity.

Nickel—Steady at 50c. per lb., premium of 5c. per lb. for electrolytic.

Quicksilver—Some small sales of spot were reported at \$117½@120, but the major market remained at \$115, which price is quoted for quicksilver to arrive. The market has a strong undertone. San Francisco reports, by telegraph, \$112.50, steady.

Gold, Silver and Platinum

Silver — This metal remains quiet and steady, with moderate shipments to London. Business is being conducted with San Francisco for Far Eastern export. Nothing has yet been positively decided in the matter of the purchase by the United States and British governments of all the available silver supplies of the country for redistribution where most needed, coinage requirements being the most pressing need.

Mexican dollars at New York: Dec. 6, 65¾c.; 7, 66¼c.; 8, 66¼c.; 10, 66c.; 11, 66c.; 12, 66c.

Platinum—Unchanged at \$103@105, with the market fairly active.

Palladium—Very strong. We quote \$127.50@130.

Zinc and Lead Ore Markets

Platteville, Wis., Dec. 8—Blende, basis 60% Zn, \$62 base for premium ore down to \$57 base for second grade. Lead ore, basis 80% Pb, \$75 to \$70 per ton. Shipments reported for the week are 3209 tons of zinc ore, 42 tons of lead ore, and 574 tons of sulphur ore. For the year to date the figures are: 138,028 tons of zinc ore, 6689 tons of lead ore, and 27,005 tons of sulphur ore. Shipped during the week to separating plants, 3862 tons of zinc ore.

Other Ores

Manganese Ore—Metallurgical ore, 48% grade, is firm at \$1.20 per unit.

Molybdenite—Demand was very strong and business was done at \$2.25@2.30 per lb. of molybdenum sulphide, basis 90%.

Pyrites—Spanish lump quoted at 15@15½c. per unit, on basis of 10s. ocean freight, buyer to pay excess freight and war risk, except that concession of 2% of war risk is allowed. Ocean rates remain at 35s. for Northern, 40s. for Southern and 42s. 6d. for Gulf ports. However, despite these so-called fixed rate, one importer recently had to pay 42s. 6d. for a charter to Charleston, S. C.

A Georgia producer reports the sale of 300 to 500 tons of 47-50% concentrates at 30c. per unit delivered at customer's works, the freight rate from the mine shipping point being \$1.12 per long ton; Georgia lump, 43 to 45% S, was sold at about 35c. per unit, cinders reserved

Tungsten Ore—Moderate business was reported at somewhat easier prices. Business in the highest grade of ore was reported done at \$22@24 per unit.

Iron Trade Review

NEW YORK—Dec. 12

With no authority which can give assurance of stable prices, consumers are cautious in buying. This is particularly true, says "Iron Age," in lines of product in which Government wants are not dominating. As to plates, shapes, bars and forging steel the average buyer appreciates that contract deliveries are entirely subject to war priorities.

Specifications for Government steel are going to the mills faster than had been counted on, and some classes of mills are more fully operated on war account than seemed likely two months ago. Yet there are gaps due to lack of team work. For example, Canadian plants having contracts for American shells complain of the slowness with which orders for the steel are sent out from Washington to the makers here.

The pig-iron market is working steadily toward a condition in which consumers without war orders will find it wellnigh impossible to secure iron. Philadelphia continues to lead in the volume of new buying. About 60,000 tons was bought there in the week, 30,000 tons being basic for delivery over the first half of 1918.

PITTSBURGH—Dec. 11

The announcement that at yesterday's meeting at Washington between the War Industries Board and the steel producers the matter of prices was mentioned only very incidentally, the discussion being chiefly as to deliveries and methods of distributing Government orders, is a trifle puzzling, because the official announcement that such a meeting was to be held stated specifically that the meeting was for the purpose of considering prices, seeing that they had all been set with the proviso that they could be revised Jan. 1 or later. The conclusion would be that Washington has no serious thought at this time of urging any revision downward were it not that it is announced that there is to be a meeting between the steel producers and the Federal Trade Commission next Friday. Producers as a class would deplore any such change in authority when the arrangement reached with the War Industries Board has been working so smoothly. The opening up of the subject at all is deprecated as having an unsettling tendency upon business and it is stated that business has suffered a distinct decrease in the last few days, owing to the public announcement that the matter of prices was to be considered this week. While producers point out that their costs have increased since the original price agreement, announced Sept. 24, buyers interpret any talk of price revision as meaning a revision downward and not upward.

The decrease of 112,569 tons in November in the Steel Corporation's unfilled obligations, against decreases during the preceding five months running at more than half a million tons a month, represents in part the large contracting for tin plates and sheets for the first half of next year, following the setting of Government prices on Nov. 5, in part an increase in Government orders and in part a decrease in shipments. The decrease in shipments has been exaggerated in some quarters. The best evidence indicates that shipments were about 1500 tons a day less in November than in October, representing about 3% less capacity employed.

The distinction between strictly war steel and commercial steel is being wiped out. The direct war steel, in the form of shell steel, ship steel and other forms required directly by the military forces, for the Government and its Allies, may involve 35 or 40% of the steel-producing capacity in the next few months, but the major portion of the remaining steel is now regarded as war steel in substance, as it is being used in industries indirectly aiding in the prosecution of war. Two instances may be cited, the steel used in oil production and the steel passing to the railroads. Many mills estimate, from this viewpoint, that from 75 to 100% of their output is now going to help prosecute the war. The amount of steel going into luxuries, or what are now called "unessentials" is relatively small.

Pig Iron—Coke receipts at blast furnaces increased somewhat as last week progressed and some banked furnaces were able to resume, but a severe cold snap developed, last Saturday night, and the coke movement was retarded again, with the result that yesterday and today some additional furnaces were banked. While the situation is bad it is not as bad as would have been expected for the circumstances, as the whole trade has been dreading what the first real winter weather would do to the railroads. During the fortnight preceding the congestion at railroad yards and sidings had been in considerable measure relieved through the orders issued by the General Operating Committee, conducting the pool of railroad facilities east of Chicago. There are scarcely any market transactions in pig iron, previous engagements of the merchant furnaces taking up all their output as lately reduced by coke shortage. Government limits are strictly observed when there are sales: Bessemer, $36.30, basic and No. 2 foundry, $33, malleable, $33.50, f.o.b. furnaces, the freight from valleys to Pittsburgh being 95c.

STOCK QUOTATIONS

N. Y. EXCH.†	Dec. 11
Alaska Gold M	2¼
Alaska Juneau	2½
Am Sm & Ref.,com	70
Am Sm & Ref., pf	100¼
Am. Sm. Sec., pf. A	92½
Am. Sm. Sec., pf. B	‡96
Am. Zinc	12½
Am. Zinc, pf	42
Anaconda	55
Batopilas Min	1
Bethlehem Steel	72
Bethlehem Steel, pf.	80
Butte & Superior.	16¼
Cerro de Pasco.	28¼
Chile Cop	13¾
Chino	41½
Colo Fuel & Iron	32½
Crucible Steel.	50
Dome Mines	6¾
Federal M. & S	9
Federal M. & S., pf	30
Great Nor., ore ctf.	24½
Greene Cananea	36
Gulf States Steel	84
Homestake	‡90
Inspiration Con	41
International Nickel	25
Kennecott	29½
Lackawanna Steel	77¼
Miami Copper	26½
Nat'l Lead, com.	42½
National Lead, pf	98½
Nev. Consol	18
Ontario Min	4½
Quicksilver	50
Quicksilver, pf	¾
Ray Con	21¼
Republic I &S.,com.	72½
Republic I & S., pf	93½
Sloss-Sheffield	35
Tennessee C. & C.	12½
U. S. Steel, com.	85¼
U. S. Steel, pf	105¼
Utah Copper.	77
Va. Iron C. & C.	50

N. Y. CURB†	Dec. 11
Big Ledge.	1¼
Butte & N. Y.	75
Butte C. & Z	7
Butte Detroit	1/16
Caledonia	45
Calumet & Jerome.	1¼
Can Cop. Corpo	1¾
Carlisle	3
Cashboy	.04½
Con. Ariz. Sm.	1¼
Con. Coppermines	7
Con. Nev.-Utah.	.03½
Emma Con	1/16
First Nat. Cop.	1¾
Goldfield Con.	¼
Goldfield Merger.	.04
Greenmonster.	⅜
Hecla Min	4 11/16
Howe Sound	3¾
Jerome Verde	11/16
Kerr Lake	5¼
Louisiana.	.05
Magma	39
Majestic	.30
McKinley-Dar-Sa	58
Milford	1¼
Mohican	7/16
Mother Lode	29
N. Y. & Hond	11
Nipissing Mines.	8½
Nixon Nevada	1¾
Ohio Cop	¾
Ray Hercules	3
Richmond	‡.56
Rochester Mines	.38
St. Joseph Lead.	15½
Standard S. L.	1/16
Stewart	25
Success	13
Tonopah	4½
Tonopah Ex	1
Tribullion	¼
Troy Arizona	17
United Cop	.50
United Verde Ext	32½
United Zinc	1½
Utica Mines	08
Yukon Gold	1¼

SAN FRAN.*	Dec. 11
Alta	03
Andes	08
Best & Belcher.	02
Bullion	01
Caledonia	06
Challenge Con	03
Confidence	06
Con. Virginia	17
Gould & Curry	01
Hale & Norcross	02
Jacket-Cr. Pt	07
Mexican	08
Occidental	60
Ophir	08
Overman	04
Savage	.01
Sierra Nevada	17
Union Con	1.00
Utah Con	01
Belmont	3.50
Jim Butler	75
MacNamara	17
Midway	05
Mont.-Tonopah	07
North Star	04
Rescue Eula	08
West End Con.	69
Atlanta	08
Booth	03
Comb. Frac	‡.03
D'field Daisy	‡.02
Florence	08
Jumbo Extension	13
Kewanas	03
Nevada Hills	05
Nevada Packard	‡.15
Round Mountain	20
Silver Pick	05
White Caps	61
Big Jim	‡.75
United Eastern	3.65

BOSTON EXCH.*	Dec. 11
Adventure	‡1
Ahmeek	78½
Algomah	‡.25
Allouez	51
Ariz. Com., ctfs	10½
Arnold	‡.25
Bonanza	‡.21
Butte-Balaklava.	‡.56
Calumet & Ariz	62
Calumet & Hecla.	‡418
Centennial	14
Copper Range	40½
Daly West	‡2
Davis-Daly	4½
East Butte	9
Franklin	4½
Granby	‡65
Hancock	8
Hedley	‡15½
Helvetia	‡.25
Indiana	‡1
Isle Royale	‡23
Keweenaw.	‡1
Lake	5½
La Salle	2
Mason Valley	4½
Mass	6½
Mayflower.	1¼
Michigan	‡1¼
Mohawk	57½
New Arcadian	1½
New Idria	‡13½
North Butte	12½
North Lake	‡.50
Ojibway	‡1¼
Old Dominion	37
Osceola	56½
Quincy	65
St. Mary's M. L.	48
Santa Fe.	74
Seneca	16½
Shannon	5¼
Shattuck-Ariz.	‡18
So. Lake	‡1½
So. Utah.	‡.14
Superior	‡5
Superior & Bost.	2½
Trinity	3½
Tuolumne	1¼
U. S. Smelting	44
U. S. Smelt'g, pf.	45
Utah Apex	2 1/16
Utah Con	10½
Utah Metal.	2½
Victoria.	‡3
Winona	‡1
Wolverine.	‡32
Wyandot	‡.50

BOSTON CURB*	Dec. 11
Alaska Mines Corp	25
Bingham Mines.	9½
Boston Ely	60
Boston & Mont	45
Butte & Lon'n Dev	.13
Calaveras	1
Calumet-Corbin.	‡.01
Chief Con	1½
Cortez	10
Crown Reserve.	20
Crystal Cop	.50
Eagle & Blue Bell.	2
Gila Copper	17½
Houghton Copper	.60
Intermountain	80
Iron Cap, Com	14½
Iron Cap Cop., pf.	‡14½
Mexican Metals	27
Mines of America	1¼
Mojave Tungsten	25
Nat. Zinc & Lead.	28
Nevada-Douglas	1¼
New Baltic	.75
New Cornelia.	14
Oneco.	.25
Pacific Mines	‡.35
Rex Cons	09

SALT LAKE*	Dec. 10
Bannack	26
Big Four	‡.01
Cardiff	2.00
Colorado Mining	10
Daly	1.00
Daly-Judge	6.00
Empire Copper.	1.17
Gold Chain	11
Grand Central	58
Iron Blossom	65
Lower Mammoth.	‡.03
May Day	‡.03
Moscow	11
Prince Con	51
Rico Wellington	18
Silver-King Coal'n	2.50
Silver King Con.	2.60
Sioux Con	03
So. Hecla	76
Tintic Standard	1.45
Uncle Sam	02
Wilbert	‡.15
Yankee	‡.02

TORONTO*	Dec. 10
Adanac	12
Bailey	.05
Beaver Con	29
Chambers Ferland	09
Coniagas	2.90
Hargraves	08
La Rose	37
Peterson Lake	12
Temiskaming	26
Wettlaufer-Lor	05
Davidson	.30
Dome Exten	09
Dome Lake	13
Hollinger	4.90
McIntyre	1.34
Newray	.35
Porcu. Crown	22
Teck-Hughes	25
Vipond	10
West Dome	‡.13

STOCK QUOTATIONS—Continued

COLO. SPRINGS	Dec. 11
Cresson Con	4.87½
Doctor Jack Pot	.03½
Elkton Con	03½
El Paso	15
Gold Sovereign.	02
Golden Cycle	1.63
Granite	42
Isabella	09¾
Mary McKinney	05½
Portland	1.15
United Gold M	14
Vindicator	34½

LONDON	Nov. 21
Alaska Tre'dwell	‡£1 0s 0d
Burma Corp	3 19 4½
Cam & Motor	0 11 6
Camp Bird	0 7 6
El Oro	0 9 0
Esperanza	0 8 0
Mexican Mines	5 12 6
Min. Corp. Can.	0 16 9
Nechi, pfd.	0 10 0
Oroville	0 19 3
Santa Gert'dis.	0 14 0
Tomboy.	1 1 6

* Bid prices. † Closing prices. ‡ Last Quotations.

MONTHLY AVERAGE PRICES OF METALS

Silver	New York			London		
	1915	1916	1917	1915	1916	1917
Jan.	48.855	56.775	75.630	22.731	26.960	36.682
Feb.	48.477	56.755	77.585	22.753	26.975	37.742
Mar.	50.241	57.935	73.861	23.708	27.597	36.410
April	50.250	64.415	73.875	23.709	30.662	36.963
May	49.915	74.269	74.745	23.570	35.477	37.940
June	49.034	65.024	76.971	23.267	31.060	39.065
July	47.519	62.940	79.010	22.597	30.000	40.110
Aug.	47.163	66.083	85.407	22.780	31.498	43.418
Sept.	48.680	68.515	100.740	23.591	32.584	50.920
Oct.	49.385	67.855	87.332	23.925	32.361	44.324
Nov.	51.714	71.604	85.891	25.094	34.192	43.584
Dec.	54.971	75.765		26.373	36.410	
Year	49.684	65.661		23.675	31.315	

New York quotations cents per ounce troy, fine silver. London, pence per ounce, sterling silver, 0.925 fine.

Copper	New York		London			
	Electrolytic		Standard		Electrolytic	
	1916	1917	1916	1917	1916	1917
Jan.	24.008	28.673	88.083	131.921	116.167	142.895
Feb.	26.440	31.750	102.667	137.895	133.167	148.100
Mar.	26.310	31.481	107.714	136.750	136.000	151.000
April	27.895	27.935	124.319	133.842	137.389	147.158
May.	28.625	28.788	135.457	130.000	152.522	142.000
June	26.601	29.962	112.432	130.000	137.455	142.000
July.	23.865	26.620	95.119	128.409	125.500	140.409
Aug.	26.120	25.380	110.283	122.391	126.304	137.000
Sept.	26.855	25.073	113.905	117.500	134.071	135.250
Oct.	27.193	23.500	122.750	110.000	142.523	125.000
Nov.	30.625	23.500	134.659	110.000	155.432	125.000
Dec.	31.890		145.316		162.842	
Year	27.202		116.059		138.281	

Tin	New York		London	
	1916	1917	1916	1917
January	41.825	44.175	175.548	185.813
February	42.717	51.420	181.107	198.974
March	50.741	54.388	193.609	207.443
April	51.230	55.910	199.736	220.171
May	49.125	63.173	196.511	245.114
June	42.231	62.053	179.466	242.083
July	38.510	62.570	168.357	242.181
August	38.565	62.681	169.870	243.978
September	38.830	61.542	171.345	244.038
October	41.241	61.851	179.307	247.467
November	44.109	74.740	186.932	274.943
December	42.635		183.368	
Av. year	43.480		182.096	

Lead	New York		St. Louis		London	
	1916	1917	1916	1917	1916	1917
January	5.921	7.626	5.826	7.530	31.167	30.500
February	6.246	8.636	6.164	8.595	31.988	30.500
March	7.136	9.199	7.375	9.120	34.440	30.500
April	7.630	9.288	7.655	9.158	34.368	30.500
May	7.463	10.207	7.332	10.202	32.967	30.500
June	6.936	11.171	6.749	11.123	31.011	30.500
July	6.352	10.710	6.185	10.644	28.137	30.500
August	6.244	10.594	6.088	10.518	29.734	30.500
September	6.810	8.680	6.699	8.611	30.786	30.500
October	7.000	6.710	6.898	6.650	30.716	30.500
November	7.042	6.249	6.945	6.187	30.500	30.500
December	7.513		7.405		30.500	
Year	6.853		6.777		31.359	

Spelter	New York		St. Louis		London	
	1916	1917	1916	1917	1916	1917
Jan.	16.915	9.619	16.745	9.449	89.810	48.329
Feb.	18.420	10.045	18.260	9.875	97.762	47.000
Mar.	16.846	10.300	16.676	10.130	95.048	47.000
April	16.695	9.130	16.525	9.289	99.056	54.632
May	14.276	9.362	14.106	9.192	94.217	54.000
June	11.752	9.371	11.582	9.201	68.591	54.000
July	8.925	8.643	8.755	8.473	50.750	54.000
Aug.	8.730	8.360	8.560	8.190	51.587	54.000
Sept.	8.990	8.136	8.820	7.966	52.095	54.000
Oct.	9.829	7.983	9.659	7.813	54.159	54.000
Nov.	11.302	7.847	11.422	7.672	56.023	54.000
Dec.	10.665		10.495		55.842	
Year	12.804		12.634		72.071	

New York and St. Louis quotations, cents per pound, London, pounds sterling per long ton.

Pig Iron, Pgh.	Bessemer‡		Basic‡		No. 2 Foundry	
	1916	1917	1916	1917	1916	1917
January	$21.60	$35.95	$18.78	$30.95	$19.70	$30.95
February	21.16	36.37	18.9	30.95	19.51	30.95
March	21.81	37.37	19.20	33.40	19.45	35.91
April	21.65	42.23	18.95	38.90	19.45	40.06
May	21.78	46.94	19.11	42.84	19.58	43.60
June	21.95	54.2	18.95	50.05	19.34	50.14
July	21.95	57.45	18.95	53.80	19.20	53.95
August	21.95	54.17	18.95	50.37	19.22	53.95
September	22.88	46.40	19.58	42.24	19.53	48.58
October	24.61	37.25	21.26	33.95	21.51	31.95
November	30.07	37.25	28.18	33.95	26.55	33.95
December	35.16		30.95		30.79	
Year	$23.88		$20.98		$21.15	

‡ As reported by W. P. Snyder & Co.

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The Mining Districts of Joplin and Southeast Missouri—I

BY H. W. KITSON

The lower Mississippi Valley has developed the greatest zinc and lead industry in the world. The Ozark uplift rises from the plains a dome of sedimentaries from Cambrian to Carboniferous age deeply eroded to a plateau exposing a basement core of granite in the St. Francois Mountains. The lead deposits of Southeast Missouri occur in an outcropping Cambrian dolomite, the zinc and lead of Joplin in a higher Mississippian limestone. The region acquired by the Louisiana Purchase was settled by an agricultural people, and with the exception of a few surface workings most of the mines were discovered while sinking for water.

COMPARATIVELY few mining men in the United States, and especially in the West, have visited the country's greatest zinc and lead districts—Joplin and Southeast Missouri. Until recently there has been a dearth of technical literature from either district, which may be attributed in part to the unconventional practice in mining and milling at Joplin, and to the policy of nonpublicity of the part of the companies operating in the Southeast Missouri area. It is, therefore, not surprising that, with the exception of those engineers whose activities have at some time centered in one or the other of these sections, so little is generally known concerning either. To many Joplin is but a familiar name associated with lead and zinc somewhere in Missouri, and the Southeast Missouri lead district is either confused with it or is altogether unknown. Those members of the American Institute of Mining Engineers who attended the recent meeting of that body in St. Louis, and who for the first time visited the coal, zinc, lead, oil and gas fields of Missouri, Illinois, Kansas and Oklahoma, and read the technical papers and other literature descriptive of the region presented at the meetings, will agree that the present and future wealth of the lower Mississippi Valley is beyond any previous conception they may have formed in regard to the variety, quantity and extent of the region's mineral resources.

It is the purpose of this series of articles to present first a long-distance view of the entire area of the lower Mississippi Valley, later viewing the Joplin and then the Southeast Missouri districts at closer range and describing each in turn, first as a whole, and then subsequently in its various phases. Technical papers descriptive of the ores, geology, mining and milling of both districts have been published in recent bulletins of the American Institute of Mining Engineers and deal with various technical problems with a thoroughness that need not be undertaken in the present article, which aims only to incorporate all that has been written in a general descriptive manner with information

GENERAL VIEW OF JOPLIN DISTRICT BETWEEN WEBB CITY AND ORONOGO, MO.

Note—The first of a series of articles dealing with the region of the Ozark uplift, to be followed by papers on mining and milling in Joplin and on the practice in Southeast Missouri.

gathered during a recent visit both to Joplin and Southeast Missouri. The miner from the mountainous West will wonder at the smoothness of topography, the absence of "blowouts" and evidence of past mountain-making and ore-making igneous activity. He will marvel that a country can have a cultivated field on the surface and a mine below, and will be puzzled to learn that he cannot stake out a mining claim on land that is more valuable for mining than for agricultural purposes. The millman will note with astonishment the countless number of small mills dotting the landscape so profusely in the vicinity of Joplin and Webb City, each with its conical tailings pile, said to carry from 0.5 to 1% zinc, and collectively appearing like huge sand dunes on a desert, and until he has seen the cost sheets and realized the economic situation as it actually exists, he may think he has found a rare field for betterment of practice both in mining methods and in milling. But in this instance hastily formed conclusions are likely to be misleading.

THE WORLD'S LARGEST ZINC AND LEAD DISTRICTS

The value of the mineral products of the lower Mississippi Valley, a region centering in the State of Missouri and extending into the adjacent parts of Illinois, Indiana, Kentucky, Tennessee, Arkansas, Oklahoma and Kansas, amounted in 1916 to nearly six hundred million dollars.[1] The district is the largest zinc and lead producer in the world, accounting respectively for one-third and one-seventh of the total of each. In oil Oklahoma and Kansas produced 40% of the total in the United States; and from the entire section there was a large production of bituminous coking and non-coking coal, and some semi-bituminous and semi-anthracite of high grade. In addition the field produces barite, bauxite, cement, clay, fluorspar, gypsum, lime, manganese, oilstone, phosphate rock, pyrite and salt, and also limited quantities of cobalt, copper, nickel, gems and precious stones, sand and gravel, stone, tripoli, and tungsten. Iron ores are not produced extensively at present, but there are large known deposits in Kentucky, Tennessee and Missouri. Other valuable deposits known to exist are asphalt, feldspar, fullers earth and pumice. The development of vast mineral resources in metals and fuel, the equally great agricultural yield of wheat, corn, cotton, fruit and other products of the soil, the abundant rainfall, moderate climate and natural facilities for railway construction and river transportation have built up great industrial and distributing centers at St. Louis and Kansas City, smelteries and refineries in Kansas, Oklahoma, Illinois and Missouri, and numerous mining and manufacturing towns throughout the entire region.

The two main sources of lead and zinc in the lower Mississippi Valley are in the Southeast Missouri section and in the Joplin district covering southwest Missouri, northeast Oklahoma and southeast Kansas. Productive areas of lesser importance are in northern Arkansas, southeast Illinois, northwest Kentucky and throughout the central part of Missouri. The disseminated lead deposits of the Southeast Missouri district lie in St. Francois and Madison counties, and to a lesser extent in Washington and St. Genevieve counties, and are concentrated chiefly within a radius of approximately five miles centering at Flat River and encircling Bonne Terre on the north, Leadwood on the west and Fredericktown on the southeast. The principal mining activities are at Bonne Terre, Rivermines, Leadwood, Flat River, Elvins, St. Francois, and Desloge. The zinc-lead district of Joplin in southwest Missouri covers a roughly elliptical area, with the long axis approximately east and west, commencing in the vicinity of Springfield, Mo., and extending westward through Joplin and Webb City, and into Galena and Baxter Springs, Kan., and Picher, Commerce and Miami, Okla.

A MINING REGION OF SMOOTH TOPOGRAPHY

The Ozark uplift centers in southern Missouri, rising gently from the plains as an elliptical plateau which extends on the south into northern Arkansas, on the west into the extreme eastern parts of Oklahoma and Kansas and on the northeast into western Illinois. The ascent from the plains on the west, north and northeast is gradual, attaining an average elevation of from 800 to 1500 ft. and rising east of its center in the St. Francois Mountains to 1800 ft. On the south the plateau attains its greatest height at 2000 ft., forming the Boston Mountains, which range along the north side of the Arkansas River, an abrupt southern termination of the plateau region. The topography west of Springfield, Mo., and south of Joplin varies from somewhat broken hilly country to level and occasionally gently rolling prairie. The contrast of this smooth, nearly level country in the Joplin zinc district to the rugged mountainous mining districts of the West is marked. None of the mountain-making eruptives of the Rockies or southwest deserts are evident. Outcrops are rare and gossan is unknown. On the contrary, most of the soil is under cultivation even in the heart of the districts of active mining and in many cases both industries thrive on the same tract. The surface drainage channels of the lower Mississippi Valley are toward that river, but the smaller tributaries on the western slope of the Ozarks course southwestward into the Arkansas.

TAILINGS PILE OF FEDERAL LEAD CO.'S MILL NO. 3, FLAT RIVER, MO

OZARK PLATEAU AN ERODED DOME OF SEDIMENTARIES

The St. Francois Mountains of Madison, Iron and St. Francois counties rise from the plateau near its eastern edge, a structural center of outcropping granite and porphyry of pre-Cambrian age—a basement underlying the entire region—sloping with a gradual flattening of dip radially from this eminence under its domed overburden of later sedimentaries[2]. An east-west section of the Ozarks is shown in Fig. 4. In the Southeast Missouri disseminated lead district, in the vicinity of Bonne Terre, the granite underlies sedimentaries at a depth of 650 ft. below the surface. Northwest, at Sullivan, Franklin County, the granite lies at a depth of 1200 ft.; at Rolla, Phelps County, at a depth of 1800 ft.; at Carthage, in the Joplin district, at a depth of 1850 ft., and at Kansas City and St. Louis, respectively, at 2350 and 3550 ft. The contact between the granite and the overlying Cambrian sandstone is unconformable and represents a period of sedimentation subsequent to an era of erosion during which the granite surface was deeply carved by drainage systems. This sandstone formation, known as the La Motte, has an average thickness of 200 ft. It is conglomeratic at the base and merges with alternate layers of sandstone and dolomite into the overlying Bonne Terre dolomite which outcrops at the surface in the Southeast Missouri lead district and constitutes the ore-bearing formation. The Bonne Terre dolomite is of Cambrian age, has a thickness of 350 ft. and rests conformably upon the La Motte sandstone. The higher formations of the Cambro-Ordivician period have been removed by erosion from the immediate vicinity of the district and outcrop further out from the granite area in the order shown in the columnar section in Fig. 2. The still higher Silurian, Devonian, Mississippian and Pennsylvanian formations outcrop throughout the Ozark region in roughly concentric succession about the Cambrian, as shown in the areal map in Fig. 3. With two exceptions comparatively little faulting or folding has occurred within the region. The exposures of granite in the St. Francois Mountains are the result of faulting, with a subsidence of the later surrounding formations, some of which faulting is evident in the Bonne Terre-Flat River district. In northern Arkansas faulting is associated with ore deposits and in the Joplin district also some faulting has occurred.

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[1] Advance figures published at the St. Louis meeting of the American Institute of Mining Engineers by permission of the U. S. Geological Survey.

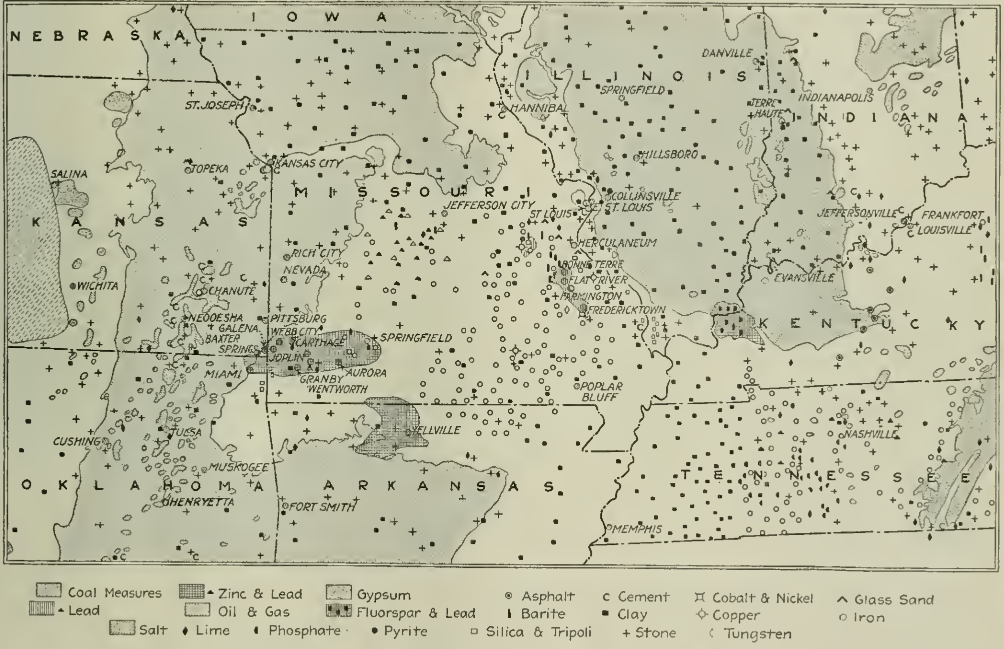

FIG. 1. AREAL DISTRIBUTION OF MINERAL RESOURCES IN THE LOWER MISSISSIPPI VALLEY

There are two important horizons of zinc and lead mineralization. The ore deposits of the Southeast Missouri disseminated lead district occur in the older of these two—the Bonne Terre dolomite of Cambrian age. In the Joplin zinc-lead district the ore deposits occur in the cherty limestone of the Boone formation, of the later Mississippian age. Both of these formations outcrop in their respective districts, and, although widely separated geographically as well as stratigraphically, the ore deposits bear marks of similarity in mode of occurrence and genetic origin.

Some mineralization has taken place close to the upper contact of the La Motte sandstone near the ore deposits in the Bonne Terre dolomite of the Southeast Missouri district; and in the Joplin district the Chester (sandstones and limestones) of the upper Mississippian is the horizon of the first discovered shallow lead-zinc deposits. An intervening period of erosion removed most of the Chester formation prior to the succeeding unconformable deposition of Cherokee sandstone and shale of early Pennsylvanian age. Isolated remnants of the Chester are to be found scattered throughout the Joplin district and upper Boone area of outcrop, deposited in ancient sink holes in the Boone which protected the later formation during the ensuing period of erosion.

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[2] "Geology and Mineral Deposits of the Ozark Region," by H. A. Buehler, Bulletin, A. I. M. E., October, 1917.

A similar condition of deposition in sink holes and depressions of erosion has protected the Cherokee of the Pennsylvanian from the present erosion, and with the exception of these outlying remnants the Chester and Cherokee do not constitute the surface rock except at the extreme western border of the Oklahoma-Kansas portions of the Joplin district. Some mineralization also occurs in the Pennsylvanian in connection with the sink-hole deposits near their contact with orebodies in the Mississippian.

Other ore deposits of lesser importance occur in the intervening formations between the Bonne Terre and the Boone. Bordering the Bonne Terre area in the Southeast Missouri district are the successive Davis shale, Derby and Doe Run formations and the Potosi cherty dolomite of Cambrian age. In Washington and Jefferson counties galena associated with barite occurs in joint planes and horizontal seams in this heavy-bedded gray dolomite. The beds of chert interstratified with the Potosi dolomite are the lowest in order of stratification in the Ozark region. The irregularity and shallowness of these ore deposits have not produced any mines of consequence. Shallow veins of the fissure type containing galena and barite occur in Franklin County. Deposits of lead, zinc and barite occur in the Jefferson City dolomite of Ordovician age and have been productive in the north-central part of Missouri. In northern Arkansas lead and zinc have been mined from the Cotter and Powell formations of the same age. In St. Genevieve County these formations have produced some copper. In the vicinity of Fredericktown, southeast of the Flat River district, cobalt copper and nickel and some disseminated lead occur in the La Motte sandstone and lower Bonne Terre. Carbonates of copper have been mined in Shannon County, occurring on the contact of the sedimentaries and the granite.

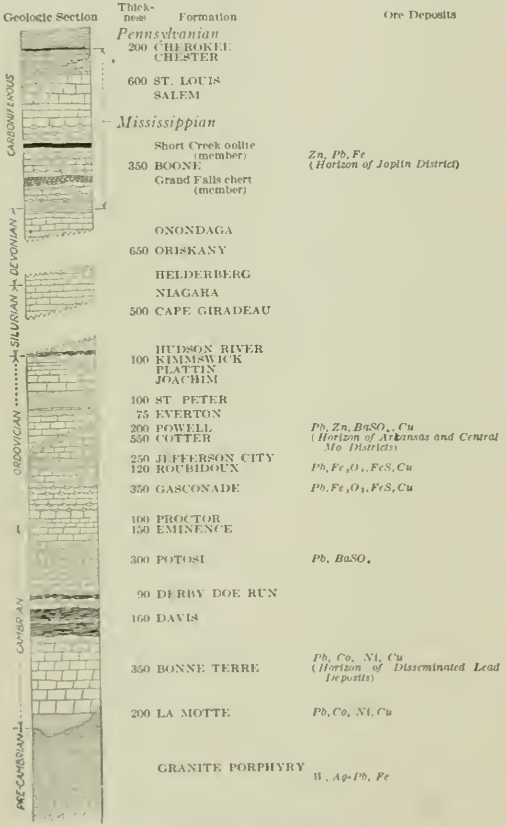

FIG. 2. GEOLOGIC COLUMN OF THE OZARK REGION—AFTER BUEHLER

Veins of argentiferous galena occur in the pre-Cambrian granite, in which mines were opened up in the early days. These veins are now being worked on a small scale for tungsten, which occurs in association with the galena as huebnerite. Specular-iron ore has been extensively produced from the pre-Cambrian porphyry in the Iron Mountain and Pilot Knob districts. Hematite and limonite ores also occur in Crawford County, east Missouri and Arkansas, and barite is produced from Washington and Jefferson counties in large amounts.

Throughout this vast area of mineralization little or no metamorphism of the sedimentaries has taken place. Igneous activity has been confined to but two known intrusions of an age later than the sedimentaries. Small basic dikes occur as intrusives in the granite and porphyry in the St. Francois Mountains, and in Camden County the sedimentaries are cut by a dike of pegmatitic character. The granite and rhyolite porphyry belong to the oldest series in the region and are thought to have formed part of one magma and to be of Laurentian age. The veins occurring in the pre-Cambrian igneous rocks are undoubtedly depositions resulting from emanation of gases and solutions of an expiring period of volcanism, and analyses of the older rocks show that they contain minute quantities of both lead and zinc.

ORE DEPOSITS DERIVED FROM SURFACE SOLUTIONS

In the light of later theories on ore deposition, the deposits of lead and zinc in the sedimentaries of the Ozark region are attributed to a deposition in channels from waters descending from the surface containing lead and zinc in solution, metals derived from the eroded portions of the older rocks and precipitated both in open cavities and by metasomatic replacement of the limestone. Calcite, dolomite and chert of a secondary character are the common associated gangue minerals in the Joplin and Southeast Missouri districts, and their presence is evidence of the action of cold descending carbonated solutions of an acid character. The prevalence of an extensive artesian underground circulation accounts for the migration of such solutions over considerable distances governed by the impervious beds and the erosion over a wide area of drainage of all the stratified formations across their dip.[3] Such action is shown diagrammatically in Fig. 5. In the absence of alteration products and the metamorphism of the rocks that invariably accompanies the genesis of orebodies formed from solutions of plutonic origin, the possibility that such a source could account for the deposits of zinc and lead in the Joplin and Southeast Missouri districts seems remote.

[3] C. E. Siebenhal, "Bull. 606," U. S. Geol. Surv.

Unlike most mining sections of the West, where public land bearing valuable minerals is given prior right in the mining laws of the United States over agricultural claims, the Missouri mining districts have been parceled into tracts of 160 acres and the region was taken up by an agricultural people long before its value as mineral land was discovered. This was the case in the Joplin district of southwest Missouri and southeast Kansas. The mining land in northwest Oklahoma was originally known as Indian Territory and remains in the ownership of the Indians of that section. In southeast Missouri the land is partly surveyed into sections, but the eastern part is cut up into irregular areas, a relic of the old land-grant system.

The earliest records of mining in Missouri date back to the French occupation in the eighteenth century. The Mississippi was discovered by Spaniards under De Soto in 1541, but abandoned by them for the greater riches in gold of Mexico and Peru. In 1682 La Salle came down the Mississippi from the upper valley, at that time being explored and settled by the French, and, arriving at the mouth of this river, took possession of the whole territory drained by the Mississippi and its tributaries in the name of King Louis XIV of France and to it he gave the name of Louisiana. This vast acquisition embraced more than half the North American continent, including, as it did, all the territory north of the Gulf of Mexico from the Rockies on the west to the Alleghanies on the east and extending northward through Canada to Hudson Bay. Toward the end of the series of wars that took place between England and France, beginning in 1689 and ending with the Treaty of Paris in 1763, mining in Missouri according to E. R. Buckley was started in Washington County at Mine à Renault in 1725. Operations at Mine à Gebore were conducted on a small scale between 1742 and 1762. In 1767 Pierre Laclede founded a trading post on the Mississippi River and named it in honor of Louis XV, and in 1775 it had become a well-known fur-trading depot. At the Treaty of Paris, France ceded all her territory in Canadian North America to England, and the territory south of Canada was ceded to Spain. The French who remained in the territory, however, evidently continued their mining operations, as Mine à Layne was discovered in 1795, Mine à Manteo on Big River in 1799, and Mine La Plate about the same period. Winslow estimates that during this century St. Francois County produced about 1000 tons and Washington County 19,000 tons of lead ore. Mine à Burton was discovered about 1763 and "Old Mines" dates as far back as the earliest discovery and has been worked intermittently up to present time. Mine La Motte is among the oldest in the district and is being worked today.

OUTCROP OF BONNE TERRE DOLOMITE AT RIVERMINES, MO.

The Napoleonic wars returned the Lousiana province to France in 1801, and two years later this great territory of about 900,000 square miles was acquired by the United States, during the Jefferson administration, for $15,000,000. In 1804 Capt. Stoddard, of the U. S. Army, succeeded the Spanish commandant at St. Louis, and the region was organized into the Territory of Louisiana, and St. Louis made the capital. From this territory the states of Louisiana, Arkansas, Missouri, Iowa, Kansas, Nebraska, Wyoming, Montana, North and South Dakota and parts of Minnesota, Colorado and Oklahoma were formed. In 1812 Louisiana became a state, and the name of the territory was changed to the Missouri Territory. Missouri came into the Union as a slave state under the Missouri Compromise in 1820. The railroad land-grant system originated in 1835, and the transcontinental roads received vast tracts of land aggregating millions of acres along their routes. The first railroad in the state was opened with 38 miles of track in 1852. By the Preëmption Act of 1841 any genuine settler could take up 160 acres of public land and make his payments on long and easy terms at a rate fixed in 1862 of $1.25 per acre.

JOPLIN ORES DISCOVERED BY ACCIDENT

In the Joplin district the first-reported discovery was made by William Foster at Granby in 1850. This, like other succeeding discoveries, was made by accident in the course of well digging for water. Galena was the ore mined from the shallow deposits where shafts were first sunk. Small furnaces were soon after erected and lead bullion was hauled by wagon to Fort Smith, Ark., and transported by boat to New Orleans, New York and Boston. In 1856 Blow & Kennet started operations on a larger scale. Lands were leased and furnaces erected, and railroad construction started. The Civil War put a stop to development in 1861, but the mines were operated alternately by both sides during that period. Right after the war the Granby Mining and Smelting Co. was organized, the various interests combined and operations resumed. Galena and cerrusite were the first ores mined. Calamine and sphalerite were later recognized, and upon completion of the railroad to Granby, zinc ores were shipped.

For the first 30 years galena and calamine were the main ores of the district, but later sphalerite ores took the lead, with calamine second and galena third. The first modern concentrator was built in 1898, the ores up until that time having been concentrated in hand jigs.

The history of the district is one of spasmodic rushes and booms, followed by hasty production on a profitable if wasteful scale. The land, primarily agricultural, was largely settled by a farming people who knew little of mining. For a number of years Granby was the center of prospecting. Later, strikes were made by accident at Joplin and at Oronogo, at which points mining activitity became intense. Discoveries followed at

Webb City, again by accident, and another rush was made to this section, and such has been the development of the region from the beginning. Strike after strike was made, with intense exploitation in each section, until there became a scattered group of camps with Joplin as a center. Between most of the camps there are wide stretches undeveloped that may prove to be valuable mining ground. There are well-known instances where mining activities have linked together neighboring mining camps by the lateral extension of the orebodies, as from Oronogo on through to Duenweg, a stretch of seven miles, and more recent operations point to a probable repetition of such expansion in other parts of the district. It is possible that the ground between Duenweg and Granby, under the stimulus of efficient prospecting, may prove to be a continuous run of ore. The undeveloped stretch between Carthage and Neck City forms another possibility for the future. The development of the district has progressed steadily since the sinking of the first shallow shaft for lead. Types of each stage of progress in methods are still to be observed and the history of the area's development can be pieced together. Early exploitation was made on the grubstake plan, prospecting for the

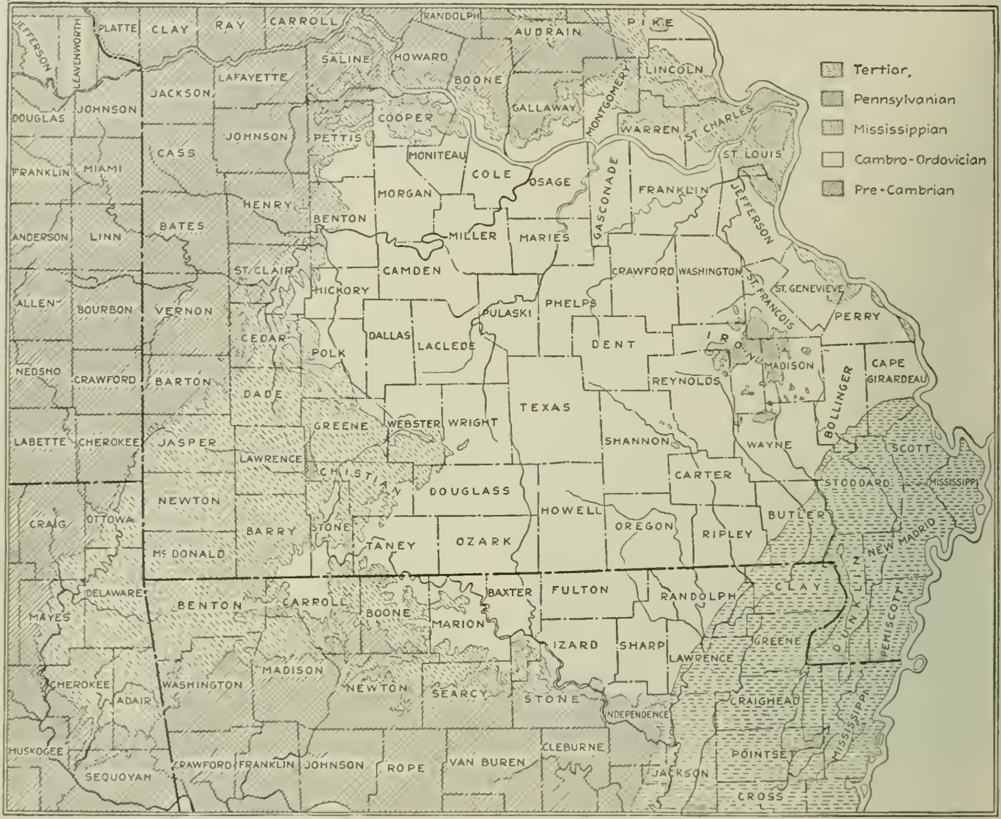

FIG. 3. GEOLOGICAL MAP OF THE OZARK REGION—AFTER BUEHLER

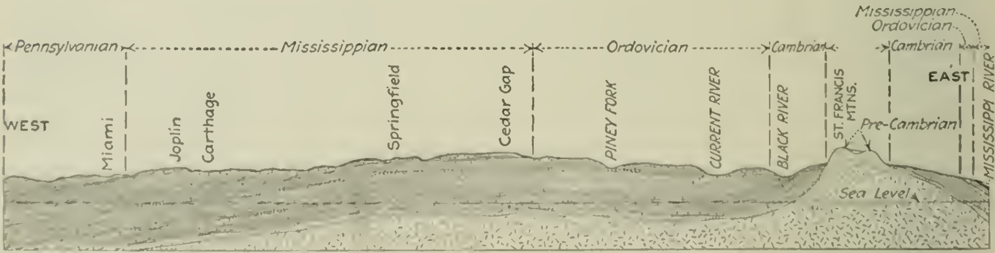

FIG. 4. GEOLOGICAL SECTION THROUGH JOPLIN AND SOUTHEAST MISSOURI—AFTER BUCKLEY

shallow lead deposits at first and later the shallow zinc deposits. The mineral had to be free in character and amenable to hand picking, followed by hand jigging, in order to be profitable. Problems of concentration came with the exhaustion of the shallow deposits and the discovery of the deeper and lower grade orebodies. Out of all this the present milling practice was evolved, and its low cost of operation has made profitable the mining of ores producing as low as 2% of zinc concentrates. At present, however, many of the lower grade mines have been forced to close owing to the marked increase in wages and cost of supplies and the absence of a corresponding advance in the price of ores. This condition has stimulated prospecting in the newer fields of Oklahoma and Kansas, where ores of higher grade can be made to yield a better profit on the present market.

The earliest mining in the Southeast Missouri district proper was at Mine à Joe in 1801. These were shallow lead deposits in the tract later known as the Bogy Lead and Mining Co. and in 1887 purchased by the Desloge interests. Operations at the Pratt mine, in the vicinity of Bonne Terre, started as early as 1820, but the disseminated ores were not discovered until 1864. Four years later the St. Joseph Lead Co. was organized and diamond drilling started in the Bonne Terre section. The company purchased the land from Anthony La Grave, a property previously owned by the Valle and Aubuchon families. The Doe Run company started in 1887, but has recently been merged with the St. Joseph Lead Co. The Federal Lead Co. began operations in the Flat River district in 1902, later acquiring the properties of the Irondale, Derby, Central and Field companies. The St. Louis Smelting and Refining Co. commenced in 1898 by purchasing the holdings of the Flat River Lead Company.

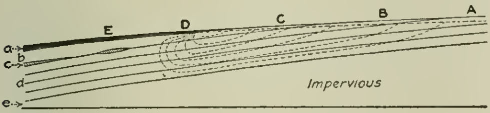

FIG. 5. DIAGRAM SHOWING OZARK ARTESIAN CIRCULATION—AFTER SIEBENTHAL

The region is well served by railroads connecting the productive districts with the smelting and marketing centers. West of the Mississippi the Kansas Southern Ry. runs from Kansas City to Port Arthur, Tex. It is the short line from Kansas City to the southeastern Kansas coal field and the Joplin zinc-lead district and traverses the coal-producing section of eastern Oklahoma and western Arkansas. The Missouri Pacific R.R. connects St. Louis and Kansas City, serving the coal fields of northwestern Missouri, passing through Barton County, Mo., Crawford and Cherokee counties, Kan., the Joplin-Webb City zinc-lead territory, and the oil and smelting districts of Kansas and Oklahoma. It also reaches through subsidiary lines the coal mines of Arkansas and the southeast Missouri lead district. The St. Louis-San Francisco Ry., known as the Frisco Lines, runs from St. Louis and Kansas City to the heart of the Pittsburgh, Kan., coal fields and the Joplin-Miami lead district, passing to the Tulsa and Glenn Poole, Okla., oil and gas country, and with four district lines to Texas handles a large mineral tonnage. The Frisco Lines also serve most of the smelteries.

In 1916 there was produced from the smelteries in the lower Mississippi Valley 512,000 tons of spelter, or 75% of the total production of the United States. Of this amount Kansas and Missouri smelteries produced 34%, Illinois 28%, Oklahoma 31% and Arkansas 7%. Natural gas in Kansas and Oklahoma has made this section desirable for the location of smelting plants of which there are 17 and 14 respectively. In Illinois there are 11 plants, in Missouri three, in Arkansas three and in Indiana one. Although the zinc content of the ores smelted varies considerably, the average production per retort per annum would probably be about four tons. One of the byproducts of zinc smelting is the manufacture of sulphuric acid from the waste fumes.

The lead smelteries of the region are situated close to the lead-producing districts and in 1916 yielded 236,000 tons of lead.[4] The principal smelteries for the southeast Missouri district are those of the St. Louis Smelting and Refining Co., at Collinsville, Ill.; the Federal Lead Co., at Federal, Ill.; the St. Joseph Lead Co., at Herculaneum, Mo., and the Desloge Consolidated Lead Co., at Desloge, Mo. The Eagle-Picher Lead Co., one of the largest pigment manufacturers in America, has plants at Joplin and Webb City, Missouri.

(To be continued)

Zinc Sulphide Made Phosphorescent Through Heat

Pure zinc sulphide prepared in various ways can be obtained in a phosphorescent condition by the use of heat, according to E. MacDougall, A. W. Stewart and R. Wright in *Chem. Soc. Trans.*, 1917, (abst. *Journ. Soc. Chem. Ind.*). Ordinary precipitated zinc sulphide shows no trace of phosphorescence. The addition of certain impurities has a marked effect in most cases, either inhibiting the phosphorescence, as in the case of iron, or altering the tint, as in the case of manganese. The presence of a chloride, either of zinc or other element, increases the phosphorescence. The factor which has the greatest influence, however, is the temperature to which the zinc sulphide is heated, and this may be varied within limits. A sample heated for a very short time to a high temperature has been found to give effects similar to those observed in another sample heated for a longer time at a lower temperature, provided that the latter is not lower than about 750° C. Washing, rubbing, or disturbance of the final product in any way tends to diminish its phosphorescent power.

The amorphous sulphide does not phosphoresce, nor does the purely crystalline sulphide show such good phosphorescence phenomena as samples which contain semi-crystalline material. Specimens made from zinc salts free from chlorides do not show such brilliant phosphorescence as those produced in the presence of chlorides. It is suggested that when the impure sulphide is heated, a surface film of zinc chloride is produced; and this film, on cooling, may contract and procure a strained condition of the material within the film. When manganese is present, however, it is difficult to avoid the conclusion that some chemical phenomenon must be concerned.

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[4] "The Mineral Industry," 1916.

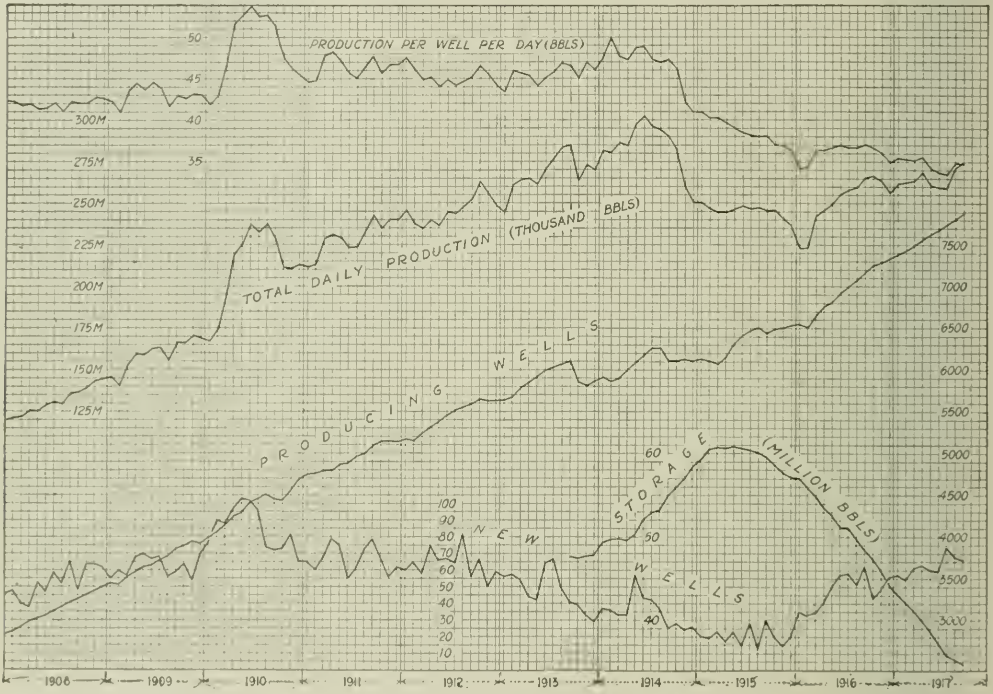
Chart of California Oil Production

By Lewis H. Eddy[*]

The extraordinary movements in the production of the California oil fields from the year 1908 to 1917, inclusive, and the critical storage movement from September, 1913, to September, 1917, inclusive, are indicated in the chart presented herewith, which was compiled by the oil and gas department of the State Mining Bureau from data furnished by the Standard Oil Co. The original chart carries the record back to 1903. The four important features of production are: (*a*) the number of producing wells; (*b*) new wells completed; (*c*) total daily production; (*d*) production per well per day. There was a general advance movement of all features with some sharp changes during the period embraced in the years 1903 to 1907 inclusive; but no noteworthy variation except a considerable advance in production per well per day in 1903 and 1905.

The accompanying chart embraces the gusher period of 1910, when the increase in producing wells remained normal, and the number of new wells completed, the total daily production, and that per well per day showed phenomenal increase. From January, 1903, to September, 1917, there was a total advance in the number of producing wells from 2300 to 7900 and an increase in total daily production of more than 230,000 bbl. The highest point of daily production per well was reached in June, 1910. The increase in daily per-well production has not been constant, but the total increase to September, 1917, is approximately 14 bbl. per well per day. The lowest number of new wells completed in one month was five, in March, 1905, and the highest was 103, in May, and 102, in June, 1910, the only months when the record reached the 100-point mark.

The storage record begins with September, 1913. It is interesting to note the close relation between the increased daily production and increased storage in the last quarter of 1913 and the first half of 1914, and the similar relation in decline of both features in the last half of 1915, compared to the sharp, steady and almost constant shrinkage in storage from January, 1916, to September, 1917, and general increase in daily production during the latter period. In the early days of the war the marketing of oil was seriously threatened and fear of overproduction followed a decline in prices at the well of approximately 10c. per bbl. in the last half of 1914. The increased production in 1916 and 1917 has been unequal to the increased demand of the market, so the storage stocks continue to decline, while the Government withholds oil lands that should be reopened to development and production to avoid a famine in fuel oil and the products of the refineries.



GRAPHIC CHART OF CALIFORNIA OIL PRODUCTION FROM 1908 TO 1917

Manganese Deposits in West Africa of the Fanti Mines, Ltd., and on the extension of the deposits on Dagwin Trust have been worked this year as energetically as shipping conditions would permit, according to the report of Consolidated Gold Fields of South Africa, the controlling company. Up to the end of August about 22,000 tons had been exported.

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[*] Associate editor, Engineering and Mining Journal, San Francisco, Calif.

Considerations in the Selection and Use of Hoisting Ropes

Contributory factors of stress on hoisting ropes are numerous and complicated, and little actual data have been obtained. To the ordinary stress from the load there must be considered the number of bends over sheaves and drums, the compression of the inner layers on a drum and the periods of stress and relief. Various types of rope are in use and the selection should be made with the coöperation of rope manufacturers.

AT THE recent congress of the National Safety Council in New York hoisting ropes were the subject of considerable discussion at the meeting of the mining section of that organization; the presence of a number of prominent mining and manufacturing engineers brought forth comments of technical importance regarding the selection of ropes for hoisting. H. C. Behr,[1] whose experience on the Rand and whose writings have made him an authority on the subject, contributed some notes of interest in which he said:

The question of stresses in hoisting ropes is always important and M. H. Sigafoos merits our approval for bringing up the subject in his paper[2]. The bending stress referred to by Mr. Sigafoos is determined by the ordinary formula for the stress in a bar bent to the curvature of the drum and is directly proportional to the diameter of the wire and inversely proportional to that of the drum or sheave. This ratio is multiplied by the proper modulus of elasticity. If the ordinary modulus for tension is used, the formula becomes a safe one to adopt and gives a stress outside of what probably is that actually straining the material of the rope.

Determination of Bending Stress

The lasting qualities of wire ropes indicate that a smaller value of the modulus should be used for determining the stress due to bending. Professor Hrabak in his treatise on wire ropes "Die Drahtseile" (which I think has not been translated from the German) has brought out this point strongly and Professor Bach, to whom Hrabak also refers, deals with the subject in the eighth edition of his "Maschinen Elemente." Bach comes to the conclusion, in view of the endurance of ropes in practice, that the modulus of elasticity, and therefore the stress in the wires in a rope due to bending, cannot be nearly as high as the modulus for tension in a loaded straight rope. By arguments based on general practice and its results he arrives at a modulus about ⅜ of that for tension. He admits the lack of sufficient logical ground for his deduction, but calls attention to experiments which he made on the tension modulus of elasticity of a loaded straight rope, which modulus he states happens to be approximately the same as that resulting from his calculation. He submits the arguments merely for want of a more logical explanation. Among other things, he points out a minor inconsistency in the ordinary method of calculating the stress due to bending over a drum in that such method does not take account of what must obviously be a gradual transition from the uniformly distributed stress in the wire just before winding on the drum and where it is still straight, to the condition in the immediately adjacent section where the unequal distribution of stress due to curvature is supposed to exist. To assume a sudden jump in the stress would obviously be unreasonable. Bach, however, seems to forget that the wire is not curved suddenly to the diameter where it winds on, but curves in a gradually increasing manner over a transition curve tangent at one end to the straight wire and at the other to the circle of the drum, and in such a manner the stresses obviously vary in a gradual manner over the length of the transition curve. The question of bending stresses on the wires of a rope has not yet been answered in a satisfactory manner by assuming a lower modulus of elasticity for the wire based upon elongation tests of the rope. Records of such tests give a modulus of only a fraction of the 28,000,000 generally assumed for the wire.

Professor Hrabak takes Bach's value of ⅜ E. Hrabak, who I believe was also director of the mines at Pribram, Bohemia, contends, however, that this value applies only in the case of new ropes and that it increases with the age of the rope as the elasticity decreases and states that it will be about double the initial value, or ¾ E, toward the end of the life of the rope. Hrabak's arguments seem to me inconclusive, but so far no one has supplied proof theoretical or experimental to show to what extent the bending stress in wires composing a rope is reduced below that in a single wire simply curved to the radius of the drum, and to be on the safe side I have therefore always figured my bending stress with the ordinary modulus for tension.

Question of Rope Stress Complicated

An interesting point in connection with the question of the stress in a rope where it is wound on a drum is that the first layer of rope compresses the drum slightly and reduces its diameter. The next coil will compress it more and gradually the preceding layers are relieved of the tensional stress that was on the rope originally. The bending stress would still remain, so that the rope that is actually wound on the drum endures less stress than it had when it was just winding on, and the maximum stress would occur practically only for an instant. In addition to this there is the friction of the rope on the drum, which also affects the stress. The whole question of determining the stresses of the rope is complicated and we have to acknowledge that we know little about it. I do not know whether or not experiments in this field would give useful results, but at any rate, the subject is worthy of the attention of engineers generally, and should be further investigated.

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[1] Consulting mechanical engineer, 2 Rector St., New York

[2] "History of Wire Hoisting Ropes with Notes on Factors of Safety," "Eng. and Min. Journ.," Nov. 10, 1917.

Practical experience with ropes often induces surprise and wonder that a certain rope has given way, and sometimes equal surprise that a rope did not give way sooner under the bending stresses supposed to be brought on the wire by a small diameter of the sheave or drum. Take, for example, the case of some ropes that have been in general use, like the so-called patent strand type, the flat wide core wire of which must be subject to considerably greater stresses, due to bending, than the ordinary round wire. I have heard that some of these ropes have lasted well, although I have never used any of them. The lock-coil ropes, also, have wires of considerably larger dimensions and the stresses on the outer fibers must be considerably greater than in the ordinary construction of rope, like those with 6 x 19 wire strands. The results of observations with that kind of rope would be of value. The problem of rope stresses is a difficult one and it is difficult to get comparative results, as there are so many factors which enter to influence the life of a rope.

FACTOR OF SAFETY SIX IN THE TRANSVAAL

Mr. Sigafoos mentioned the factor of safety of five on wire ropes, based merely on the standard load which the rope is expected to carry. That is probably suitable for most cases. I have used ropes with such factors for hoisting rock from a depth of 4200 feet and in some cases they lasted 22 months. The mining law of the Transvaal, however, demands that ropes shall not be used for hoisting men when the factor of safety shall have become less than six. Ropes must initially have a much greater safety factor, because of the inevitable deterioration. Most ropes used for hoisting rock are used frequently for handling men, being also used for hoisting timbers. One never knows what the load is, and it may be excessive. The worst load is usually a load of drill steel.

The Transvaal law states that the load of men, assuming a man to weigh 150 lb. (which is generally accepted as the official weight) should never exceed 85% of the maximum load the cable will be subjected to in operation for other purposes. That law was found to be a great hardship. It unnecessarily limited the number of men per trip in the case of a depth of 4200 ft. One of our shafts extended to that depth and if the law had been enforced we could not have hoisted men on apparatus that we used for the handling of material.

FREQUENT INSPECTION IMPERATIVE

We had one serious accident with a flat rope in one of our mines. Flat ropes are not generally used in the Transvaal, and it was a case of neglect by the resident engineer of the mine in not examining the rope carefully. In this case the shaft was about 2100 ft. deep and the rope broke at about one-third, or 600 or 700 ft. from the end. About 40 natives and one white man were precipitated to the bottom and killed. The accident made a great stir and was really the start of more vigorous government legislation by the new authorities—the British had not long before taken hold at that time—on safety devices and ropes.

This rope had been worn through by the back slipping of the rope on the sheave, the engine driver having been in the habit of hoisting fast close up to the surface so that the brakes had to be used excessively to bring the engines to a stop at the proper point. The sheaves were large in diameter, so that the bending stresses were slight. The construction of the sheaves was also partly responsible for the wear on the rope, as they were made with unnecessarily heavy rims. If the arms had been made heavier so as to support a lighter rim, the moment of inertia would have been less and there would thus have been less tendency for spinning when retarding by the brake. In some cases a smaller sheave may be advisable to obtain a smaller moment of inertia.

Proper inspection would have disclosed the wear of the rope and its cause. This, however, was neglected. The government was lenient, however, and did not press the matter.

The accident led to a close investigation of the old laws. The British government did not want to show hostility to the industry, and consulted a large number of engineers before advocating the various laws that were finally enacted. One excellent regulation specified that at every mine there should be kept a special rope book in which everything in the life history of the rope had to be entered, the book being required to be open to the government inspector at all times.

The regulations prescribed the periods of capping ropes, and how much should be capped. A daily inspection was required—it was usually a cursory one, of course, but it might show additional broken wires, and thus keep the mine rope inspector in touch with the condition of the rope from day to day. There was a more rigorous weekly inspection, if I remember rightly, and a thorough monthly inspection.

DETERIORATIVE EFFECTS OF MOUNTING FROM LAYER TO LAYER

Local deterioration has been found to occur where ropes mount from the first to the second layer. We tried to eliminate this by a construction of drum described in the report of the Transvaal Government Commission on ropes and safety catches. The suggestion was my own, but I must say that the result was not satisfactory; the plan adopted did not seem to reduce the shock on the rope when mounting it from the first layer to the second by the groove being raised. The matter of mounting the rope from a first to a second, or from a second to a third layer is, however, a problem worthy of serious consideration by the mining section of the National Safety Council. It is today still very much of a problem.

One other point was brought out by the government inspector of machinery. He came to the conclusion that long ropes might be allowed to have a considerably lower factor of safety than short ropes; that is, for the upper end of the rope, where it winds on the drum. His theoretical investigation is much in line with the later findings of German authorities. The reports on ropes for the Dortmund district show that with moderate depth most accidents to ropes occur about ¼ up the length of the rope from the point of its attachment to the cage or skip.

On the Rand, we had a deep winding problem, and in order to get a sufficient safety factor to meet the views of the government for the handling of men we had to adopt tapered ropes. Tapered ropes have been in use, I think, for 40 years in the mines of Bohemia. A number of such ropes have been constructed more recently for collieries in Belgium. We found no difficulty with these ropes; they behaved just like ordinary ropes, and, for great depths, their use makes possible economy in the construction of the hoist; hence this may be smaller. A smaller rope requires less space, less storage on the drum. Also, weight is less and the cost lower because there is considerably less weight of rope for the same strength than when a rope of uniform cylindrical shape is used.

Selecting ropes for great depths is always a serious problem, and my way of treating the matter has been to discuss the situation with a number of rope manufacturers before making out the specifications. Ropes for great depths, cylindrical or otherwise, cannot be handed down from the shelf or kept in storage. The material and size of the wires must be thoroughly considered. I have frequently sent out a preliminary specification to obtain comment from manufacturers and get their views. For ordinary ropes and smaller ropes it is generally possible to secure ample margins, and the selection, even by the resident engineer at the mine, presents no great difficulty. Coöperation between the makers and users of ropes is most important in this respect, because they can supplement one anothers' experience, and it will certainly lead to a better understanding of the question and of elements of safety, which is the thing desired in this connection. I have been studying wire ropes for a long time, but the more I see of them the less I feel that I know about them. I would like to get the views of others on a great many points, and I hope the discussion will lead to a better understanding of the wire-rope problem.

Galvanizing on Ropes Does Not Last

I have never used galvanized ropes, but in upcast shafts, where there is acid vapor or acid water dropping from the timber, they have been used by some companies. I do not know to what extent galvanizing affects the strength of a rope. Sherardizing with zinc dust has been employed on ropes, but whether it has led to any better results than the ordinary galvanizing I do not know. I would also like to know whether lock-coil ropes have been used for hoisting in this country, and what is the greatest ultimate strength of the material that has been used in the strands of flat rope. For stitching of these a mild material must be employed. I have seen some flat ropes in which the strands lasted a long time, but stitching had to be carried on almost continuously. One rope would be taken off and restitched and another was put on, and it kept a crew of rope men constantly at work. At the old Mexican Union shaft on the Comstock, about the year 1880, before it closed down, ropes about ¾-in. thick for a depth of about 3000 ft. were in use, two spare ropes being always undergoing resewing. The mine water was acid. The wear of the stitching occurs particularly at the outer edges.

On the question of Lang's lay and ordinary lay, there are a great many different opinions. The ordinary lay is claimed by many to be too lively and likely to kink. Some of our ropes on the Rand were of peculiar construction, being made of 18 strands of 7 wires each and the strands were laid up 12 around six around one hemp core. They were good ropes, but had a tendency to kink and had to be handled cautiously when they were first wound on the drum.

As to the ultimate strength of steel used in ropes, we have generally, for long ropes, not hesitated to specify 120 long tons—most British manufacturers list their ropes in long tons—to the square inch, but we have had ropes submitted to us of material having an ultimate strength of 140 long tons.

In making specifications for a rope it is obviously proper to state as many as possible of the conditions under which the rope is to operate in the mine—the sizes of the drums and sheaves, the number of bends, the lateral deviation, the conditions making for corrosion, what treatment the rope may be subject to and whether it is a vertical or inclined rope. The hoisting speed will have a considerable influence on strains that are thrown on the rope. The method of fastening to the cages or skips forms a subject almost in itself.

Revival of the Zinc Industry in Russian Poland

According to the *Berliner Börsen Zeitung* of Sept. 1, in an article translated in a U. S. Consular Report, the zinc mines of Olkusz, Poland, which for a long time have been under water, are now in a condition to commence producing. The zinc-ore deposits at Trias, not far from Olkusz, which are well known to the zinc industry, made it possible for the zinc smelteries of Bendzin and Dombrowa to be established.

The zinc mines at Boleslaw, near Sosnowice, which belong to the Sosnowice Mining and Smelting Co., before the war produced an annual average of about 10,000 tons of calamine and over 2000 tons of calamine with galena. The Ulysses zinc mines at Tlukienka near Dombrowa, which belong to the Franco-Russian Company, are now being managed by the Germans. These mines have an average annual production of 40,000 tons of calamine and 12,000 tons of calamine with galena. Altogether before the war the Polish zinc mines produced 50,000 tons of calamine and 14,000 tons of calamine with galena per year.

The zinc mines of Poland have been connected by rail with the railroad at Bukowno. This branch line is about two miles in length. The zinc ore is smelted in the various plants near and in Dombrowa, particularly the Paulinen smeltery near Zagorze, which belongs to the Sosnowice Mining and Smelting Co.; the Konstantin, near Dombrowa, which formerly belonged to the Franco-Russian Company, and the Bendzin smeltery, near the town of that name, which formerly belonged to the Société Minière of Dombrowa. The number of workmen now employed in the Paulinen smeltery is over 450; the Konstantin employs about 200 and the Bendzin over 200 men.

Before the war a total of about 9000 tons of spelter was produced in Poland each year on the average. The present production, which is far below this figure, is exported for the most part to Austria. The market for zinc is satisfactory, which is fortunate in view of the increased cost of operating the mines and smelteries.

Arizona Mines Pay 57% of the Taxes in that state, according to the report of the Arizona chapter of the American Mining Congress. This figure is exclusive of the taxes paid on their stores and other property. In addition the industry is paying enormous total tribute in the form of taxes levied by the Federal Government for the conduct of the war.

Development of Reverberatory Practice at Copper Cliff, Ont.

By CHARLES F. MASON*

A history of the development of side-wall feeding of the Canadian Copper Co.'s reverberatory matting furnace, with some details of the changes in the furnace construction that have not been previously brought out.

IN VIEW of the widespread adoption in the last few years of side-wall feeding in conjunction with coal-dust firing of reverberatory matting furnaces, some additional details of the development of that method at the Canadian Copper Co.'s plant at Copper Cliff, Ont., should be of interest. At the time this plant was started none of the men in charge had had previous experience with the system, and they may therefore claim to be pioneers in this economical practice.

Slight Alterations in Standard Furnaces

Two reverberatory furnaces were built in 1910-11, and one was started in December, 1911. They were intended to smelt several years' accumulation of blast-furnace flue dust, current flue dust and the excess of green-ore fines over that which was used in bed roasting for the blast furnaces. One furnace has sufficed for this work since the fall of 1913, so a description of the changes in that one only is necessary. It was 112 x 19 ft. and of conventional design, with the exception of the bottom, which was an inverted arch of 9-in. magnesite brick laid on concrete with a foundation of poured slag, and the "bridge wall" (the name still clings), which was solid, except for five 8-in. round openings about 2 ft. above the bath line. These openings were for the powdered-coal burners, which could deliver up to 100 tons of pulverized coal in 24 hours. The flue continued in a straight line with the center of the furnace, having only a slight rise at the throat—designed to eliminate as far as possible corners for coal ash to deposit in. It has not been altered except for a slight enlargement at the throat increasing the cross-sectional area from 32 to 40 sq.ft. Skimming was, and still is, done at a point 15 ft. from the throat, on either side, and the tapholes were 25 ft. from the burner end.

The first serious trouble to develop was the choking of the throat by accumulation of coal ash, which was semi-liquid when deposited and consequently difficult to remove. The congestion became so bad that the furnace had to be shut down for a continually lengthening period every day, in order to cool the clinker to a point where it could be broken off by hand. It must have been a student of homeopathy who suggested that this frequent cooling was doing the harm, for when it was decided to keep on firing regardless of the flue, the accumulation dwindled away gradually to a point where it was easily controlled by a little work each day without cooling the furnace. Recently coal containing ash as high as 18% has been successfully used.

The side walls were found to have eaten away badly after only a few days of smelting, and various fettling materials were tried. Crushed magnesite bats, quartz and sand in turn were applied in the old way by throwing across the furnace, but none of them withstood the action of the basic slag and terrific heat (as high as 1650° C) for more than a few hours. Holes were made in the arch, along the side walls and bridge wall, through which sand and, later, siliceous ores were dropped. This method of fettling was an improvement, but was still regarded as "fettling" and not as "charging," as only sufficient material to cover the walls a few inches above the bath was used, and the charges were still dropped through the arch from six charge hoppers over the back of the furnace.

The arches, also, wore away rapidly, especially around the charge holes, and in October, 1913, the furnace was entirely rebuilt, in order to incorporate in it all the new features which experience had shown to be desirable. For 30 ft. from the burner end the arch was raised 2½ ft., sloping thence to the old level, which was reached 42 ft. from the burner end. Cast-iron skewbacks were used for the raised part of the arch and 12-in. box beams every 5 ft. formed buckstaves in place of single 12-in. I-beams at more frequent intervals. The magnesite bottom, having proved unsatisfactory—large patches had heaved up and floated out—was replaced by 24 to 30 in. of silica sand, tamped in place and sloped toward the tapholes in the approved style.

Finding the Proper Place for the Taphole

Tapping had always been difficult, and it became more so when it was found necessary to keep the walls covered with fettling. A taphole was opened about 6 ft. from the burner end and worked well until the wall became so thin at the slag line that it was necessary to fettle there, when it went the way of all previous tapholes. I might mention that the method of opening tapholes with oxygen, described on page 704 of the *Engineering and Mining Journal* of Oct. 20, 1917, was introduced at the Canadian Copper Co.'s works by the late D. H. Browne, who had seen it in use in Norway. Not until the taphole was placed immediately beside the skimming door did it work satisfactorily—since then a "freeze-up" has been a rare occurrence, even when starting the furnace after a shutdown of several days.

The new furnace bade fair to become a "world beater," although several patches of the sand bottom were floated soon after smelting was begun. The difficulty of providing a sufficient amount of siliceous ore for fettling soon arose. Flue dust was tried, but it smelted away too quickly and was therefore unsatisfactory.

From "fettling" a small amount to "charging" a large amount of ore along the walls was only a question of time—and competition between the two shifts for record runs—and in 1915 the charge holes in the arch were eliminated, as it developed that by piling the fettling up high on the side walls and thereby exposing more of it to the flame, more ore was smelted than by the fettle-and-charge practice, and also the arch lasted longer. Under present conditions there is only a narrow liquid bath in the center of the furnace, which widens out to the full width of the furnace at the skimming door and is deepest at that point, forming a sort of settler from which the matte is tapped as soon as it has settled. Continuous skimming has been tried and could be successfully practiced if furnace construction permitted.

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*Reverberatory foreman, Canadian Copper Co., Copper Cliff, Ont., Can.

The bridge wall has been opened around the burners from time to time, until at present the combined area of the openings is nearly equal to that of the throat of the furnace. Of course all side-door openings are covered with ore and have been bricked up long since. The fettling pipes which connect the hoppers with the holes in the arch are covered with small pieces of plate with handles attached. These plates are in turn covered with ore (they have superseded the old slide-gates, and are more satisfactory as well as less expensive), so there is no air taken into the furnace except that required for combustion. Radiation from the side walls is practically nil, on account of the large body of ore against them. In ordinary practice the throat temperature is maintained at 1000° to 1100° C, with a draft at that point of $\frac{3}{4}$ to 1 in. of water. The arch is made of silica brick and is 20 in. thick as far as the bottom of the "incline" and 15 in. thick from there to the end of the furnace. Side and bridge walls are also of silica brick—unnecessary in the former, as they have not been repaired for three years and are still as good as new. All openings in the bridge wall are lined with firebrick, to prevent cracking and spalling.

At present this furnace is smelting about 500 tons of charge and burning 96 tons of coal per 24 hours. The charge consists of 65% of hot calcines, 2% cold Wedge furnace flue dust, 15% cold blast-furnace flue dust and 18% green-ore fines carrying 2% to 5 or 6% moisture.

Fuel Economy in Brass Furnaces

The over-all heating efficiencies obtained in present brass-melting practice are compared by L. C. Harvey, (Institute of Metals, September, 1917, abst. *Journ. Soc. Chem. Ind.*) on the basis of the estimated output for 1916, namely, 2,000,000 tons of the 70:30 alloy melted and superheated to 10% above its melting point. The following ratios of total fuel consumed to that usefully employed are given, those for coke- and gas-fired furnaces being in terms of coal: Coke-fired pit and tilting furnaces, 27:1 and 9:1, respectively; tilting furnaces using powdered coal, 6:1; single crucible pit or tilting furnaces using town gas, 13:1; multiple-crucible pit furnaces or single-crucible tilting furnaces using producer-gas, 12:1; oil-fired pit and tilting furnaces, 19:1 and 7:1 respectively.

Notwithstanding the greater economy of the tilting furnace, pit furnaces employing smaller crucibles are still largely used on account of the better quality of metal produced. Suggestions are made for increasing the efficiency of coke- and oil-fired pit furnaces by improving the present designs, and drawings are given of a multiple-crucible furnace for oil, gas, or powdered coal, which has proved satisfactory, and of a special form of grate pan for economizing solid fuel in tilting furnaces.

Manganese Mining in Arkansas

By Tom Shiras*

The extraordinary demand for domestic manganese ore that has developed during the last two years has put new life into the Batesville field, in Independence and Izard counties, Ark. Spasmodic activity and almost negligible production marked the operation of Arkansas manganese mines from 1850 until the great war, but now about 2000 tons a month of hand-cobbed and fine-washed ore are being produced. Seven fairly large operations are in progress and many small operators are working either on their own lands or through leases and selling their ore to the larger interests.

The ores are in the form of various oxides in a residual clay derived from the decay of a bed of overlying limestone. Distribution of the ore in the clay is irregular. The pockets vary greatly in character. Sometimes they are comparatively solid bodies separated only by thin seams of clay, containing from 50 to 500 tons of ore, and, again, they consist of large and small masses of ore imbedded in greater or lesser quantities in certain places in the clay, and the ore has been found also in the form of small nodules or grains, disseminated throughout the clay. Most of these pockets of "wash dirt" contain from 5 to 25% of manganese ore. Some ore has also been found in its original form in broken limestone boulders that have not yet disintegrated.

MANGANESE ORE READY FOR SHIPMENT AT PENTERS BLUFF, ARK., BATESVILLE DISTRICT

Mining is carried on by openpits of all sizes, and by shafts and drifts. The deepest of these shafts is not more than 100 ft., and the underground work is not extensive, owing to the soft clay formation, which necessitates timbering. With the exception of one mine, the Polk-Southard, all the work is done by pick and shovel. At this property, however, one small steam shovel is in operation. By far the greatest part of the production of the field comes out of the ground ready for shipment, in chunks from the size of a man's fist to boulders that weigh several hundred pounds. The fine ore is recovered by screening and washing.

The seven larger operators in the field are Walter Dennison, R. S. Hanford, Independence Mining Co., Cleveland Mining Co., and Eureka Mining Co., all of Cushman, Ark., and N. A. Adler, and the Ozark Mining Co., of Batesville. Only four of these operators are using washing plants. The Eureka and Independence companies are using the regular log washers, which handle approximately 100 tons of dirt a day, and N. A. Adler and the Ozark company are using revolving screens, 10 x 2½ ft., which handle about 60 tons of dirt a day. Besides the operators named, there are many smaller ones, working on contracts for the larger interests; on leases, or on their own lands. The larger operators buy from the smaller in lots from a few pounds up, Walter Dennison acting as sales manager.

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*Mountain Home, Ark.

The ore is classified by the producers into two grades. The high-grade ore runs from 40 to 58%, and the low-grade scales down from 40 to 17%. Some has been shipped that assayed as low as 12%, but the production of this low-grade ore is not profitable. The bulk of the ore now moving is going to Birmingham, Alabama.

The proven area of the field is about 20 miles east and west and 15 miles north and south, in the northwest part of Independence County and the southeast part of Izard. Some outcrops have been found outside this area but they have developed no producing properties as yet. It is obvious that the field is capable of producing many times its present tonnage, the limit of production being governed by the number of men employed.

Owing to the fact that the ore lies in shallow beds, mining is carried on at a minimum expense, and but little initial capital is needed with which to start operations. Development is proceeding with many small units, and owing to the nature of the ore deposits will in all probability continue in this manner. At present more washing plants could be installed at a profit, as a great deal of the fine ore is thrown over the dumps.

John C. Branner, former state geologist, in his report of 1890 gives the following early history of the field: Col. Matthew Martin operated in the field from 1850 to 1852, making a few small shipments by boat, down the White River. The first shipment for the manufacture of steel was made by William Einstein, of St. Louis, and went to the Junita Iron Works, Pittsburgh, Penn., in 1868. From 1881 to 1887, the Ferro-Manganese Co. shipped 5000 tons. From 1885 to 1890, the Keystone Iron and Manganese Co. shipped 18,111 tons. During the same years the St. Louis Manganese Co. shipped 1700 tons, and the Missouri Furnace Co., 500 tons. With these and other sundry smaller shipments Mr. Branner puts the total production of the field from 1850 to 1890 at 35,000 tons.

Manganese in West-Central Arkansas

Besides the activity in the Batesville manganese district in northern Arkansas, the little-exploited deposits in the west-central part of the state are now receiving some attention. These deposits, which have lately been described[1] by H. D. Miser, of the U. S. Geological Survey, occur at intervals in a belt four to 12 miles wide. The belt extends west-southwest from Pulaski County, at the center of the state, to Polk County, on its western border. The recent exploitation is confined almost entirely to the mountainous districts in the northern parts of the Caddo Gap and De Queen quadrangles, in western Arkansas. The deposits have been worked only in a small way and have produced but a few hundred tons of marketed ore.

STEAM SHOVEL STRIPPING THE POLK-SOUTHARD MANGANESE MINE, NEAR CUSHMAN, ARK.

The manganese ores consist of the four oxides, psilomelane, pyrolusite, manganite, and wad, the first three forming the larger part of the ores. Although these minerals may be found separately, two or more are generally intimately mixed in the same deposit, and at some places they are associated with iron oxides and manganiferous iron ores. The manganese ores occur as nodules, pockets, and short irregular veins from a fraction of an inch to 4 ft. thick, though veins 4 ft. thick are rare. The orebodies are scattered through the hard Arkansas novaculite and can doubtless be found on every mountain where the novaculite is exposed. They occupy bedding planes or joint cracks or form a cement in a novaculite breccia in which the rock fragments range in diameter from a fraction of an inch to over a foot. Most of the ores contain too much phosphorus for use in the manufacture of ferromanganese and too much iron for use in chemical industries and electric batteries, and where the quality is suitable for these purposes the quantity is generally too small for profitable mining.

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[1] Bull. 660-C, U. S. Geol. Surv., Washington, D. C

Activities of the U. S. Bureau of Mines for the Year Ended June 30, 1917

War conditions and the necessities arising therefrom created many new problems demanding consideration by the Bureau of Mines, but its routine work in diverse fields was in no measure neglected, as is disclosed by the appended record.

THE vital importance of the mining industry to the United States and its allies in the great war made the fiscal year ended June 30, 1917, a period of intensified activity for the U. S. Bureau of Mines. In addition to many technical investigations, much work was done on problems relative to national preparedness and defense. The Bureau's achievements in 1917 are summarized as follows in its annual report to the Secretary of the Interior:

More than 4800 miners in 23 states were trained in mine-rescue and first-aid methods. On June 30, 1917, a total of 46,873 miners had been trained by the Bureau since organization.

Representatives of the Bureau investigated 63 accidents or disasters throughout the United States, of which 57 were at mines. At the mines 103 men were rescued through the efforts of volunteer miners, company officials, state mine inspectors, and company rescue crews. At 19 of the 63 accidents investigated breathing apparatus was worn.

MANY MINERS TRAINED IN RESCUE WORK

Twenty-two rescue and first-aid contests or field meets attended by Bureau members were held throughout the country. Some of these contests were arranged and supervised by Bureau men. More than 39,000 miners attended lectures on first-aid and rescue methods given at the Bureau's mine safety stations and cars.

Tests made during the year indicate that lime, which is considerably cheaper than caustic soda, can be used in the regenerators of oxygen breathing apparatus to replace caustic soda. Some further improvements were made in the Gibbs oxygen breathing apparatus, developed by the Bureau. First-aid methods and materials, as well as mine-rescue methods, were revised and standardized.

Investigations of the explosibility of coal dust under mine conditions have given valuable data for the determination of the relative hazard of dust explosions in coal mines throughout the country.

Tests of spreading rock dust in coal mines as a means of arresting or preventing coal-dust explosions have shown how the cost of protecting mines in this way can be decidedly reduced.

In coöperation with the Illinois Geological Survey and the department of mining engineering of the University of Illinois, the Bureau began a comprehensive investigation of the subsidence of the ground over coal mines.

The use of permissible explosives instead of black powder in the coal mines of Oklahoma, a change advocated by the Bureau, has continued to lessen the risk of explosions in those mines.

Studies of the explosives used for blasting in mines were continued with the aim of reducing the dangers that attend the use of explosives in mining.

Ten more explosives were tested and approved as permissible for use in dusty or gaseous coal mines. At the end of the year 151 explosives were on the permissible list.

Tests at the experimental mine of the Bureau have demonstrated that it is possible to determine whether black powder or a high explosive was used in a blown-out shot such as sometimes causes a disastrous mine explosion, and that it is easy to ascertain whether the high explosive detonated or merely burned.

Propylene-glycol was studied to determine the probable use of this substance in explosives, because of its cheapness and desirable properties, it is being substituted for glycerin in the manufacture of high explosives.

Investigations of mine fires at Butte, Mont., have shown the great loss caused by these fires, the difficulty of preventing them, and the need of further study.

Safety investigations made in coöperation with state officials have resulted in greatly reducing the danger from accidents in California mines.

Further progress was made in methods of eliminating from smelter smoke the fumes that cause injury to animals and crops and substantial advances were achieved in methods for utilizing the sulphur in the sulphur gases from smelteries.

Methods for treating the low-grade and complex ores of copper, lead and zinc have been further developed and are being tried on a commercial scale. These methods are expected to render available vast quantities of ore that now cannot be worked at a profit.

EXTENDED INVESTIGATION OF FLOTATION

Investigations of the flotation process for concentrating ores have shown how the use of this process may be extended and made more efficient.

A report on the methods of making salt in the United States was transmitted for publication.

Methods of mining and calcining gypsum and of preparing gypsum products were described in a report now in press.

An investigation of the methods used in quarrying cement rock is showing what are the most effective quarrying methods and types of equipment and the most effective ways of preventing accidents.

Clay-refining investigations have made vast quantities of domestic kaolin available for the use of American potters who formerly depended on foreign clays.

As a result of investigations that have been carried on in coöperation with the Bureau, one large copper company is expending $1,600,000 for equipment to recover dust and fume from the smoke of its smeltery.

Decided advances have been made in plans for utilizing locally the sulphuric acid that can be obtained from smelter smoke; these plans include the manufacture of superphosphate for fertilizer and high-grade phosphoric acid, and the improvement of alkaline soils by direct application of acid.

A method of leaching oxidized ores of lead with an acid solution of common salt has been worked out that promises to be of wide value.

Further progress was made in applying a volatilization process (chloridizing roast) to the treatment of oxidized lead ores containing gold, silver, or copper.

Encouraging results have been obtained in the further development of a leaching process for low-grade zinc ores.

Reports discussing health conditions at iron and steel plants and the methods by which injuries and fatalities can be greatly lessened were revised and are now in press.

Further investigation of the viscosity of blast-furnace slags is yielding information that should be of great benefit to furnacemen and should facilitate the changes in practice necessary to smelt the lean and complex ores that will be used as high-grade ores become scarcer.

Material was collected for a comprehensive report on the hydrometallurgy of gold and silver and a popular report on the present condition of the cyanide process.

Experiments to Promote Economical Burning of Fuel in Power and Domestic Furnaces

Experiments with steam boilers have yielded reliable data for the design of boilers that will absorb a higher proportion of the heat from the furnace fires.

A study of the fuel-burning equipment and the conditions under which fuel is burned at more than 30 Indian schools and agencies throughout the country has shown how decided economies in the use of fuel at many of these institutions can be had.

The comparative values of different fuels, as coal and wood, for use in heating boilers for houses have been determined through an extensive series of experiments.

A bulletin showing the extent to which Illinois coals have been used in making coke and the possibility of extending such use was transmitted for publication.

An investigation aimed to increase the use of Illinois coal in the manufacture of illuminating gas was undertaken.

Investigations of methods of utilizing lignite have yielded additional facts of value to residents of the regions in which lignite abounds.

An improved electric furnace for melting brass has been devised and is being tested on a commercial scale; by its use it is hoped that the losses of metal in brass melting, which amount to millions of dollars annually, can be greatly reduced.

A comprehensive investigation of the fire clays of Maryland was undertaken.

Special consideration has been given the utilization of coal at Government plants throughout the country, and recommendations have been made looking to an annual saving of fully $800,000 in the Government's coal bill.

Studies of the combustion of coal in furnaces have brought out facts of great value to engineers in designing furnaces to burn different kinds of coal with greater efficiency and tests with boiler furnaces have shown how coal can be utilized more efficiently in heating dwellings.

Rules published by the Bureau for the purpose of setting a higher standard of safety in the electrical equipment of bituminous coal mines have been formally approved for trial by the American Institute of Electrical Engineers.

A flash lamp permissible for use in gaseous mines has been developed. Two new models of portable electric lamps were approved as permissible for use in coal mines. As a result of the investigations begun by the Bureau four years ago, more than 100,000 approved portable electric lamps are now in use in the mines of this country.

Further progress was made in the development of explosion-proof motors for use in gaseous mines.

An accurate, sensitive, and convenient electrical device for detecting gas (methane) has been developed. A satisfactory lamp for use in rescue and recovery work in mines after disasters has been completed.

Rare-Metal Investigation

Investigations of radium have resulted in improving the methods used in recovering radium from carnotite ores and pitchblende, and the treatment of carnotite concentrates has been facilitated. Through its radium investigations the Bureau has acquired more than a gram of radium element, valued at more than $100,000, which is to be used for scientific and medical research.

Investigations of methods of extracting molybdenum and vanadium, metals needed in the manufacture of special steels, are yielding important results.

From the uranium oxide obtained as a byproduct in the recovery of radium a high-grade ferrouranium has been prepared that promises to be of much value in the manufacture of uranium steel.

A pyrometer devised for measuring the melting point of brass and other nonferrous alloys should be of decided value to the brass industry.

The use of mud-laden fluid to save underground supplies of oil and gas and prevent wastes in well drilling has been greatly extended. Through coöperative work in various states improved drilling methods are being more widely used.

An investigation of methods for increasing the recovery of oil from oil sands has shown the enormous quantities of oil left underground in many oil fields and has suggested methods of preventing such waste in future.

A bulletin on "Cost Accounting for Oil Producers," believed to be the simplest and most comprehensive treatise on this subject, has been prepared for publication.

Cementing methods of excluding water from the productive sands penetrated by oil or gas wells, thus preventing great loss of oil and gas, the decline of oil wells and the ultimate production of oil lands, were investigated.

Methods of storing petroleum in tanks or reservoirs were described in detail in a report submitted for publication and methods by which the proportion of gasoline obtainable from natural gas is being greatly increased were described in a bulletin on the absorption process for recovering gasoline.

Compression plants for recovering gasoline from natural gas and many details of plant practice were described in a bulletin submitted for publication. Experimentation with what are known as topping plants for separating the higher hydrocarbons from crude oil has shown how much waste of gasoline at such plants may be prevented.

An investigation of the fires that annually cause great losses in the oil fields of this country disclosed the need of using preventive measures in advance of present practice.

A comprehensive report on the Diesel engine has been prepared for publication as a bulletin.

An investigation of the use of gas traps at oil wells has shown what are the best types of traps and that great quantities of gasoline have been wasted at oil wells through failure to use these devices.

Commercial types of gasoline sold throughout the United States were examined and methods for making satisfactory laboratory tests were published.

The characteristics of different types of gasoline and their relative merits as motor fuel were determined.

Further work was done in the commercial development of the vapor-phase process for obtaining gasoline from heavier petroleum products.

Investigations of the oil shales in Colorado and Utah demonstrated that it is now feasible to work these shales as a source of petroleum in competition with oil from oil wells.

Methods for determining the fusibility of coal ash and the consequent liability of coal to clinker were improved.

Further progress was made in the investigations of mine gases.

American Trona Corporation

At the meeting in London of the Consolidated Gold Fields of South Africa, the predominating interest in the American Trona Corporation, Lord Harris, the chairman, spoke on Nov. 15 of the prospects of potash production from its Searles Lake plant at Trona, Calif., as follows:

"Now, as regards American Trona Corporation, you will, I am sure, be anxious to hear the latest news of that venture. It has taken a longer time than we originally anticipated to reach the producing stage. We were unlucky in our first production plant, which failed to come up to expectations. I am happy to say that the second effort has been successful—I think I may say very successful. The producing stage was reached at the end of October last year, since when the plant at Searles Lake has been in continuous operation. Owing to the fact that the mixed salts produced are required in ever-increasing quantities for fertilizing purposes, and command a satisfactory price, it was decided not to press on with the completion of the refinery at San Pedro, which, consequently, will not be in operation till early in the coming year, by which time the second unit of plant at Searles Lake should be completed. All chemical difficulties have been overcome and the Grimwood process has proved its ability to solve the problem of separating all the constituent salts of the brine.

"Up to now, however, we have suffered considerable disappointment as regards the output of mixed salts. on which at present the Trona Corporation depends for the greater part of its income. For the seven months ended Aug. 31, the output of these salts has amounted to 8348 tons, or an average of a little over 34 tons per day, as against the 70 tons which we were informed might be anticipated. This reduced output is in some measure due to the abnormal heat prevailing in the desert from May to September inclusive, which retards the crystallization of the salts. With the return of cooler weather, we may expect a considerably increased production, and, after certain supplementary plant now on order has been installed, the daily output of the first unit will, it is estimated, amount to at least 70 tons. The most recent telegram as regards production shows that in October we had got up to 43½ tons, and had also sold 55 tons of high-grade potash for the chemical trade. You will be interested to know that the profits for the month of October amounted to $133,000; that was on an output of about a quarter of what we anticipate it will be when the second unit at Searles Lake and the refinery at San Pedro are complete, which we hope will be the case next April.

"The difficulty of obtaining and forwarding structural steel has greatly delayed the erection of the second unit, and has involved a serious increase of capital expenditure, which, however, is compensated for by the abnormal price of potash now ruling and likely to rule for some time to come. The approaching completion of the second unit and of the refinery will result not only in a largely increased production of the mixed salts required for fertilizing purposes, but will also enable the corporation to produce a considerable amount of practically pure potash required by the chemical trade, as well as to segregate and market the borax, which is the most important of the corporation's byproducts.

"The title question is still undecided. The hearing of the corporation's application for patent took place at Washington at the end of September, and we are informed that our representatives await the decision of the commissioners with complete confidence. The corporation has done good work in helping to allay the potash famine in the United States which the war has caused, and we feel justified in believing that the Government of that allied country will not fail to show some recognition of this fact in its treatment of the corporation. Of course, we have to anticipate a falling off in the price of potash after the war, when its exportation from other parts of the world recommences, but that will be compensated for by the production of byproducts, which we believe has been satisfactorily proved at the San Pedro refinery."

Liability of Mine Managers

By A. L. H. Street*

Persons managing a mining company's property may be held personally liable if they deliberately trespass upon the land of another, to his injury, according to the decision rendered by the Missouri Supreme Court in the recent case of Robinson vs. Moark-Nemo Consolidated Mining Co. et al., 196 Southwestern Reporter, 1131. In this case the plaintiff complained that his land, which adjoined that used by the company in the operations of mining and cleaning zinc ore, had been used, in spite of his protests, for depositing refuse and tailings from the mine, whereby it became covered to a depth of 100 feet.

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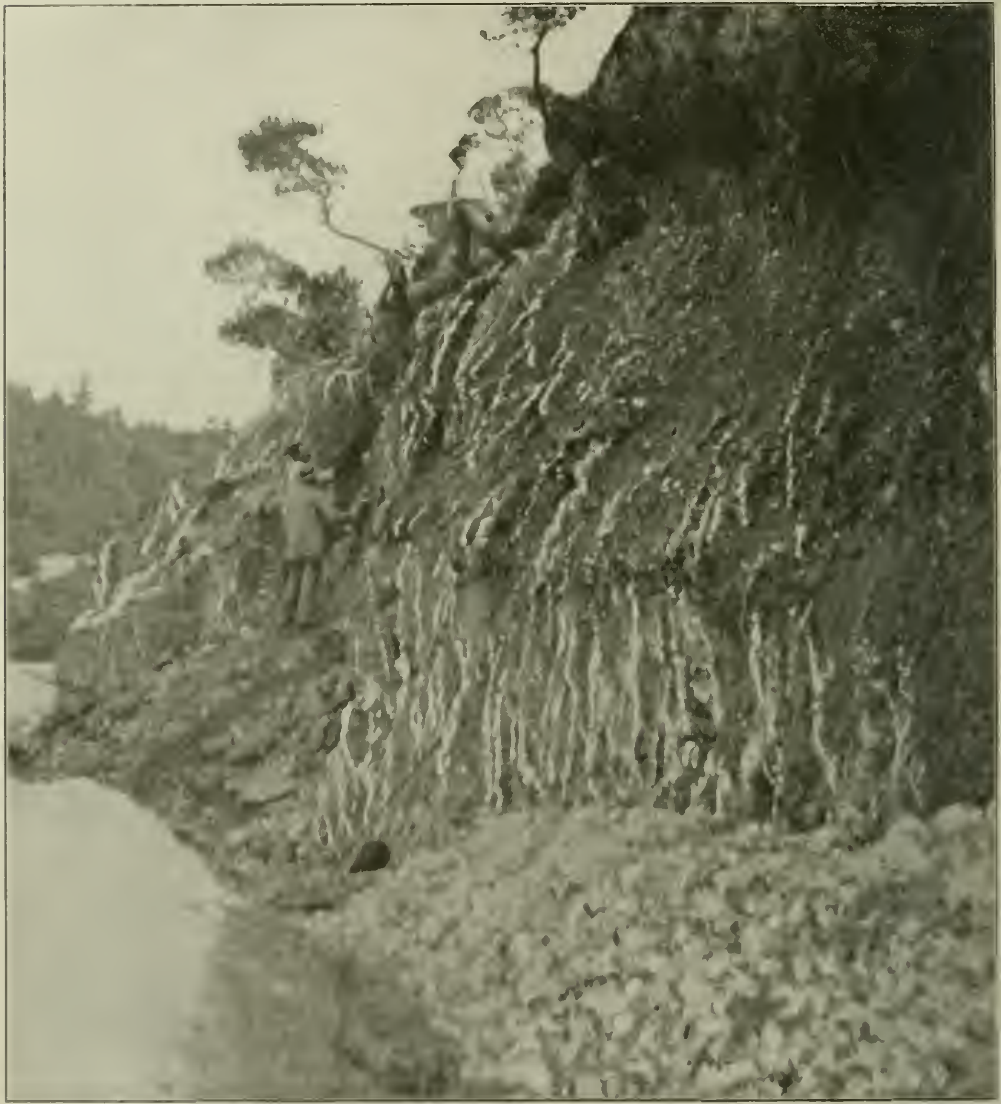
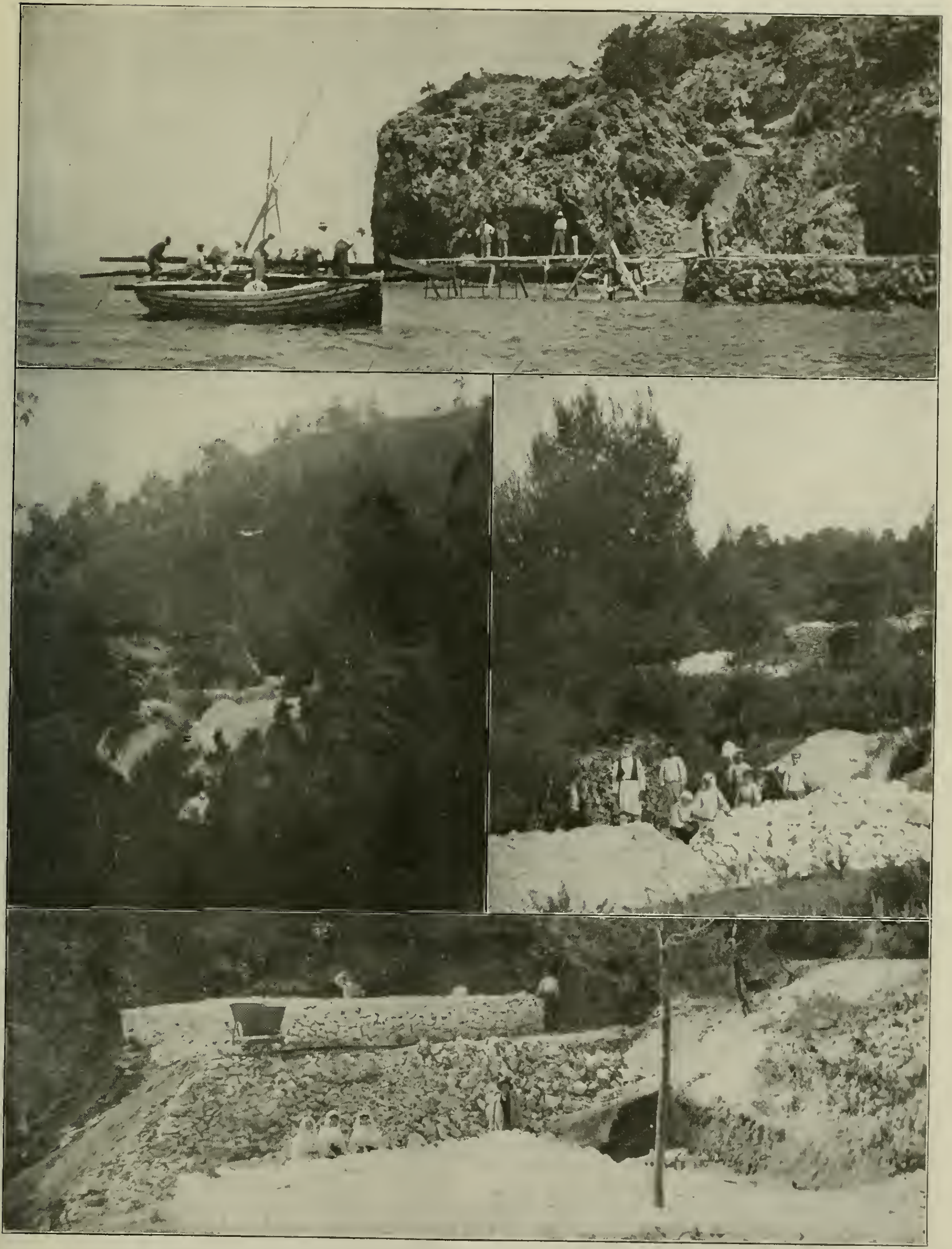
Magnesite Mining on Euboa Island, Greece



OPENCUT IN NORTHEASTERN PART OF EUBOA ISLAND, SHOWING MAGNESITE OUTCROPPING AS VEINLETS IN SERPENTINE

This property, consisting of three claims, is operated by the General Magnesite and Magnesia Co., of Philadelphia, and produces a sorted ore that has averaged as high as 96.5% magnesium carbonate. The deposits are of fine-grained massive type, occurring as veins and are associated with altered basic intrusive magnesian rock.



EUBOA ISLAND, GREECE, WHERE MAGNESITE DEPOSITS OF UNUSUAL PURITY OCCUR

Materials are unloaded from steamships into small boats and are taken directly to the opencuts of the magnesite mines that outcrop on the coast of Xycupotamo Bay. Euboa Island is well covered with forest and undergrowth. Peasant girls of the Aghia-Anna village, Euboa, sort the magnesite from the serpentinous rock in which it occurs, arranging it in stockpiles on the mine dump

California Mineral Production in 1916

The mineral output in California during 1916, according to Bull. 74, issued by the California State Mining Bureau, was valued at $127,901,610. Of the 58 counties in the state all but one contributed some mineral product. The net increase in the grand total value over 1915 is $31,238,241 and it is the first time in the history of California that the total mineral yield for a year had passed the $100,000,000 mark. The production of the different minerals and metals is shown in the table.

CALIFORNIA MINERAL PRODUCTION IN 1916

Antimony ore, tons	1,015
Asbestos, tons	145
Barytes, tons	1,606
Bituminous rock, tons	19,449
Borax, tons	103,523
Brick and tile, M	206,960
Cement, bbl	5,299,507
Chromite, tons	48,943
Clay, tons	134,636
Coal, tons	4,037
Copper, lb	55,809,019
Dolomite, tons	13,313
Feldspar, tons	2,630
Fullers earth, tons	110
Gems	$4,752
Gold	$21,410,741
Granite	$535,339
Graphite, lb	29,190
Gypsum, tons	33,384
Infusorial earth, tons	15,322
Iron ore, tons	3,000
Lead, tons	6,196
Lime, lb	493,635
Limestone, tons	187,521
Lithia, tons	71
Magnesite, tons	154,052
Magnesium chloride, tons	851
Manganese ore, tons	13,404
Marble, cu ft	25,954
Mineral paint, tons	643
Mineral water, gal	2,273,817
Molybdenum ore, tons	8
Natural gas, M cu ft	28,134,365
Petroleum, bbl	90,262,557
Platinum, oz	886
Potash, tons	17,908
Pumice and volcanic ash, tons	1,246
Pyrite, tons	120,525
Quicksilver, flasks	21,427
Salt, tons	186,148
Sandstone, cu.ft	17,270
Silica (sand and quartz), tons	20,880
Silver	$1,687,345
Soapstone and talc, tons	1,703
Soda, tons	10,593
Stone, miscellaneous *	$4,171,519
Strontium, tons	57
Tungsten concentrates, tons	2,270
Zinc, lb	15,950,565

* Includes macadam, ballast, rubble, riprap, paving blocks, sand, gravel, and grinding mill pebbles.

California is the most important producer of borax and until recently, was the sole domestic source of chromite and magnesite. About 75% of the quicksilver of the United States is produced in California. Motor trucks have been instrumental in opening mineral properties at formerly unprofitable distances from railroads and this has induced the building of better roads everywhere, to the benefit of the miner and farmer.

Strike Results in Arizona

The report of the secretary of the Arizona Chapter of the American Mining Congress, presented at the annual meeting of the congress at Phoenix, Ariz., Dec. 3, 1917, submitted the following statement as to the effects of strikes on copper production, and it was ordered that these matters be brought to the attention of the National Industrial Conference Board:

Strikes in Arizona this year were confined to the mining industry, with the exception of a few days' trouble on the Arizona Eastern R.R. and some minor differences in the cotton fields and among building contractors. Metal producers' total loss of copper output to Jan. 1 will probably reach 120,000,000 lb. Unless there are new disturbances, not now in prospect, January will witness a return to nearly normal output. Reorganization of forces and reëstablishment of operating efficiency of plants prevent earlier regaining of normal output.

Strikes became effective in Jerome in May, participated in by I. W. W. and Western Federation and lasted two weeks before being settled through Federal mediator. Reoccurrence under a call of the I. W. W. partly closed mines for several days in June. The trouble was terminated by deportation of the I. W. W. leaders. Due to access of mines to exceptionally rich ores and some stocks ahead at smelteries, output of metal made stronger recovery in October.

The Globe and Miami mines were closed entirely by strike calls of I. W. W. and Western Federation on July 1. Two months total loss of production of copper has been conservatively estimated at 40,000,000 lb. Slow resumption of operations in September and stronger recovery in October was attended by loss in these two months of 25,000,000 lb. from normal, with at least 10,000,000 more pounds loss to be counted between October and January.

Clifton and Morenci mines closed down entirely July 1, remaining idle until the strike was ordered off by President's mediation commission at the end of October. Loss of copper output in four months was 32,000,000 lb. At least 8,000,000 lb. more will be lost between now and possible attainment of normal by January.

Bisbee district strike entailed probably not more than 5,000,000 lb. loss from normal copper output, due to large advance stocks of ore bedded at smelteries by all companies except Shattuck-Arizona. Strike called by I. W. W. June 27, ended by deportation of I. W. W. members July 12.

Loss in wages attendant on strikes in the state has been estimated at over $5,000,000. A total of 25,000 men were affected by the strikes.

Fatalities in Mineral Industry in 1916

A summarized statement of fatalities in the mineral industry of the United States for the year 1916 shows a gratifying decrease, according to statistics compiled by Albert H. Fay, of the U. S. Bureau of Mines, in the fatalities that occurred in coal mines, metal mines, metallurgical works and byproduct coke ovens. The number of men employed in 1916 was 1,128,257, as compared with 1,067,929 in 1915, and the total number of fatalities in 1916 was 3224, as compared with 3076 in the previous year. The principal increase in the number of men employed occurred in metal mines and metallurgical works, while there was a slight decrease in the coal mines and quarries. Fatality rate per 1000 men employed for the industry as a whole was 2.86, as compared with 2.88 in 1915, while the same figure, equated to a 300-day basis, was 3.37, comparing with 3.74 for 1915. The principal decreases, based on the 300-day basis, are as follows: Coal mines in 1916, 3.93 per thousand 300-day workers, as compared with 4.44 in 1915; metal mines, 3.62, as compared with 3.89; ore-dressing plants, 1.41, as compared with 1.57; smelteries, excluding iron-blast furnaces, 0.73, as compared with 1.05; byproduct coke ovens, 1.35, as compared with 1.75. Quarries and beehive coke ovens show slight increases.

FATALITIES IN U. S. MINES AND WORKS IN 1916

	Number of Men Employed	Equivalent Number 300-Day Workers	Number Killed	Fatality Rate Per 1,000 Employed	Fatality Rate Per 1,000 300-Day Workers
Coal mines	720,971	565,766	2,226	3.09	3.93
Metal mines	204,685	192,455	697	3.41	3.62
Quarries (inside)	60,944	49,077	114	1.87	2.32
Quarries (outside)*a*	29,853	27,380	59	1.98	2.15
Metallurgical works:					
Ore-dressing plants	22,365	23,470	33	1.48	1.41
Smelteries	43,829	49,363	36	0.82	0.73
Auxiliary works *b*	14,007	15,763	14	1.00	0.89
Coke ovens:					
Beehive	18,570	18,591	24	1.29	1.29
Byproduct	13,033	15,528	21	1.61	1.35
Total 1916	1,128,257	957,393	3,224	2.86	3.37
Total 1915	1,067,929	822,827	3,076	2.88	3.74

a Includes rock crushers, rock-dressing plants, etc.
b Includes shops, yards, construction, etc

Correspondence and Discussion

Formation of Quicklime in Roasting

I have read with interest the article by W. S. Palmer, in the *Journal* of Sept. 22, entitled the "Formation of Quicklime in Roasting Ores from Manhattan, Nev.," and the discussion of it by M. W. von Bernewitz in the *Journal* of Nov. 17. Mr. Palmer states that most of the trouble encountered in subsequent cyanidation was due to excess lime. While I realize that excess lime causes a great amount of "grief," from a mechanical source, I wonder whether some of the trouble was not due to the formation of calcium sulphate, as stated by Mr. von Bernewitz. In the autumn of 1913, while developing a process to extract the silver and gold from ores of the Ophir mine, at Butte, Mont., I made the following tests: The sample assayed 11.96 oz. of silver and $0.80 in gold per ton. It was ground to pass through a 200-mesh screen. In test *A* some of the ore was washed with a sulphuric-acid solution containing 5 lb. of sulphuric acid per ton of solution. After filtering off the acid wash a milk of lime was poured over the ore to neutralize the acid and to act as a lime charge for subsequent cyanidation. The lime was added without using a water wash after the sulphuric-acid treatment. Some of this treated ore was then placed in a bottle with twice the amount of a cyanide solution having a strength of 10 lb. of cyanide per ton. It was figured that there was in this charge the equivalent of 10 lb. of lime per ton of ore. One pound of litharge per ton of ore was added. The mass was shaken in the bottle intermittently and the test allowed to run for 30 hours.

Another portion of the original ore was placed in a bottle with the same amount of chemicals as used in test *A*. In the latter test, or test *B*, the acid treatment and lime wash were omitted. This was allowed to run 30 hours. The percentages of extraction of the gold and silver in test *A* were 13% and 14.7% respectively, and in test *B* the corresponding figures were 95% and 56.5%. The cyanide consumption per ton of ore in *A* was 0.6 lb. and in *B* 4.2 lbs. I concluded that the difference in results was due to the formation of calcium sulphate in test *A*, which either made a film around the metal particles or caused a state of electrolytic equilibrium so that the cyanide could not act, as the consumption of the latter was so slight.

I next took a sample of the same ore, gave it an acid treatment and then washed out all traces of the acid with water before adding the lime solution. Upon subsequent cyanidation of this sample, I obtained results a little better than those in test *B* with a slightly smaller cyanide consumption. All of my tests were run in cold solution.

Mr. von Bernewitz states that the gypsum troubles at Kalgoorlie were remedied by adding solution to the hot ore as it came from the roaster. This is practically equivalent to adding very hot solution. If the calcium sulphate merely formed a coat over the metallic particles, it is possible that the hot solution permeated this coat as it does in some of the silver ores of Mexico and Tonopah. If the calcium sulphate acted chemically, it is possible that some of it was dissolved in ammonium-sulphate solution, as I believe that cyanide solution poured over hot ore will readily give up some ammonium radicals, which for the moment may combine with sulphate in the ore and the $CaSO_4$ giving the salt $[Ca(SO_4)_2](NH_4)_2$. This case is rather far fetched but it is a possibility.

From what has been written it would seem that where roasting is required, it should be done at a fairly low temperature, followed by adding the equivalent of very hot solution to cyanide ores containing calcite and sulphides. However, the addition of ammonium or ammonium salts, when the solution meets the ore, might give surprising results. CARL J. TRAUERMAN.

Butte, Mont., Nov. 20, 1917.

Hookworm in California Mines

On page 848 of the *Journal* of Nov. 10, 1917, under the general heading "Industrial News from Washington," there appears a short article on "Hookworm in California Mines," in which the following statement is made: "Inasmuch as 50 to 80% of the men working in the mines are infected, drastic recommendations for eradicating the disease have been drawn up."

It is evident that this reference to hookworm in California mines was prompted by the recent issuance of Bull. 139 of the Bureau of Mines, entitled, "Control of Hookworm Infection at the Deep Gold Mines of the Mother Lode, California," by Dr. J. G. Cumming and Joseph H. White. This bulletin treats of the work done by Dr. Cumming and Mr. White during the spring and early fall of 1916, although this fact is not set forth in the text. At the top of page 6, under the conclusions of Dr. Herbert Gunn, it is stated that "from 50 to 80% of those working in these mines are infected." On the preceding page, however, it is shown that these conclusions were reached by Dr. Gunn as a result of an investigation conducted in 1909.

During the last year or two articles have appeared from time to time in various technical and other publications relating to hookworm on the Mother Lode. In some of these it was indicated that conditions were extremely serious; none has referred to recent progress in combating the disease. While it is true that conditions have been rather grave and that much remains to be done in order to eliminate the cause of infection, it is believed that opinion somewhat unjust and harmful to the mines of the Mother Lode has been created. In view of the fact that miners recently coming from other metal-mining districts were found to have hookworm, it is not improbable that investigation will establish the fact that there are other sources of infection, especially the hot mines of districts in states other than California. There is evidence in hand which makes it fairly certain that infection comes continually into the mining districts of California and other states with miners from the south of Europe, especially from the Balkan States. A large element of the labor in the Mother Lode at present is derived from these sources.

Advances in Sanitary Conditions and Treatment of Infected Cases Have Improved Situation

On page 9 of Bull. 139, above referred to, it is shown that, out of a total of 1096 men examined in eight mines, 337, or approximately 31%, were found to have hookworm infection. The lowest ratio of infection was 16% in one mine, the highest being 54%. On page 8, referring to conditions in 1916, the following statement appears: "The conditions of the Mother Lode mines and how they compare with conditions in other mining districts of the United States are discussed in some detail on pages 9 to 35, but in general it may be said that the sanitary conditions are believed to be above the average." Since this investigation was made and Bull. 139 published, many miners who had hookworm infection have been given treatment and pronounced cured. Advance has also been made in sanitary conditions at some of the mines referred to, particularly in connection with the use of sanitary latrines.

Dr. R. W. Nauss, state sanitary officer, central district, California State Board of Health, who spent the winter of 1916-17 on the Mother Lode diagnosing and treating cases of hookworm, brought out many interesting and valuable facts. Without submitting actual percentages, Dr. Nauss makes the following statement bearing upon the prevalence of the disease: "My resurvey for diagnosis indicates a very appreciable reduction in percentages as compared to those given by Messrs. Cumming and White in their report. Upon leaving the Mother Lode in April the percentages of infections at mines where treatment was carried out showed marked reduction. Those who have taken treatment faithfully and persistently testify to their improved condition. Officials also on numerous occasions have noted the benefit derived in the way of increased efficiency among their men."

Examinations by the Culture Method Are 50% More Effective Than Microscopic Examinations

Within the last three months the control of hookworm infection in the district has been placed in the hands of Dr. C. A. Kofoid, consulting biologist of the state board of health. Sufficient funds have been appropriated, and the state board of health has determined to continue its work until the infection is entirely under control. Through the courtesy of Dr. Kofoid I am able to submit some facts bearing on the present situation. The recent work in the examination of miners has not progressed far enough to submit extensive figures. During September and October, 1917, 304 men were examined in six mines, and 97, or approximately 32%, were found to have hookworm infection. The lowest ratio was 11% in one mine and the highest 60%. Four out of the six mines showed a ratio of infection of 24% or less. The examinations for hookworm are now being made by the culture method. Stools of miners are cultured in incubators, and if any infection whatever is present it can be detected within 10 days. This method is approximately 50% more effective than the customary microscopic examination heretofore employed in hookworm work in California, which is an important consideration in comparing recent infection percentages with results obtained previously.

The statement that the mines of the Mother Lode show an infection of hookworm of from 50 to 80% may have been correct for certain mines in the past, but it is certain that it is not now and probably never has been true of the mines as a whole in the Mother Lode, for the reason that in certain mines sanitary measures have been rigidly enforced for years. Other mines are comparatively dry. Hookworm spreads and miners become infected in warm, moist mines in which sanitary measures are not enforced. The dry climate of the mining district, the fact that many of its mines are relatively dry, and that improved methods of ventilation which reduce heat are being introduced all favor the suppression of the disease and will facilitate the speedy control and reduction of hookworm infection to a minimum.

Edwin Higgins,
Safety and efficiency engineer,
California Metal Producers' Association.
San Francisco, Calif., Dec. 3, 1917.

Oregon Nitrate Promotions

With reference to Northwestern nitrate promotions, now being advertised in some Oregon papers, I believe that money so invested will be practically a total loss. As I understand that some Western men are trying to interest capital for the development of such deposits, the experience of the American Nitrate Co. should be given publicity.

The American Nitrate Co., in which I was interested, spent about $140,000 in prospecting four or five nitrate deposits in southeastern Oregon that had been selected as the most promising among many similar discoveries. The exploration work was in charge of Harry Wilson, who was assisted by various chemists. In canyons deposits were found assaying all the way from 2% up to 10% in potassium and sodium nitrates. These were usually in crevices, although not always, and in some cases the nitrates were in the rock itself, the latter being of a somewhat porous character. Under the microscope it was found that the nitrates were deposited by ascending solution, which gave color to the supposition that there existed possibly a large underground supply. A good many tunnels were driven into the canyon walls for from 5 to 30 ft.; in other places drilling was done, as occasionally clay beds would be found carrying from 1% to even as high as 4% of nitrate. In the case of the clays, the richest findings were on the surface and for but a few inches down. With depth the percentages became almost negligible. In the canyon walls the rich deposits seldom extended more than two to five feet.

As to the origin of the deposits I shall not speak further, but the exploration work of the American Nitrate Co. covering a two-year period on five properties which were selected as the best to be found in southeastern Oregon convinces me and my associates that the nitrates do not exist in commercial quantities.

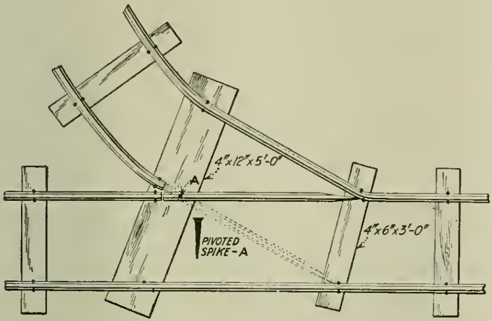
C. R. Cole,
President, Industrial Securities Co.
Chicago, Ill., Nov. 30, 1917.

Details of Practical Mining

Frogless One-Point Switch

By H. M. Wirtz*

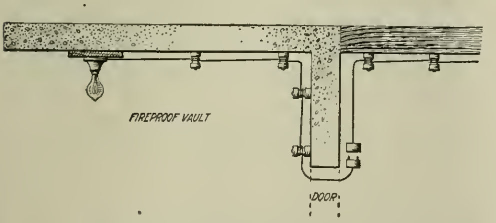
A frogless switch, adaptable for mine use and one that may be installed quickly and cheaply, is shown in the accompanying sketch. It consists of a single-rail drawn to a point at one end with the opposite end drilled so that a small spike may be driven through, fastening the rail to the tie and serving as a pivot on which it acts. The rail may then be moved in either direction laterally and performs the same duty as a frog switch. A number of these switch points are kept on hand so that they may be installed on short notice.



A ONE-POINT SWITCH FOR MINES

Electric Light for Vault

The accompanying sketch shows a system of wiring by means of which it is possible to have electric light in a vault where valuable maps and records are stored and at the same time comply with the insurance laws regarding permanent lights in vaults. The connection is broken at the Hubbell plug switch when the occupant leaves the vault, allowing no opportunity for short-circuiting or grounding. All the wiring is according to standard practice.



A CONVENIENT VAULT LIGHT THAT AVOIDS SHORT-CIRCUITING

Hoisting Plant at United Eastern Mine

The headframe of the United Eastern Mining Co., at Oatman, Ariz., is 32 x 36 ft. 6 in. at the base and 76 ft. from collar to sheave center and stands over a three-compartment shaft, each compartment being 5 x 5 ft. in the clear. The hoisting sheaves are 7 ft. in diameter, with 4 7/16-in. bore, and carry a 1-in. rope. The manway sheave is 2 ft. 6 in. in diameter, with 2 15/16-in. bore, carrying a ½-in. rope. Construction cost of this headframe is given in the accompanying table.

COST OF UNITED EASTERN HEADFRAME

	Labor	Material	Miscellaneous	Total
Excavation	$387 84	$33 25	. . .	$421 09
Concrete	72 12	42 17	. . .	114 29
Machinery, f.o.b. Oatman		331 07	. . . .	231 07
Machinery, erection	8 38		. . .	8 38
Building lumber		1,760 09		1,760 09
Lumber framing and erection	1,107 41	248 32	$33 75	1,389 48
Electric wiring, f.o.b. Oatman		65 10		65 10
Electric wiring, erection	51 60			51 60
Engineering, field	25 00			25 00
Painting	35 00			35 00
Total	$1,687 35	$2,480 00	$33 75	$4,201 10

On the opposite side of the shaft from the headframe, the mine-run bin is built up above a fill through which concrete walls, 12 in. thick, are placed on 7-ft. centers at right angles to the contours of the hill. The bin is designed to discharge 100 tons by gravity through a gate near one side in the bottom on a steel apron feeder. The ore is hoisted in two 2-ton, specially designed Kimberly-type, self-dumping skips working in balance. The skips are loaded from pockets, at the various levels, having chutes swinging on vertical axes. Each skip is built integral with a cage above it which is used to hoist waste to the shaft collar in cars, as well as for men and mine supplies. One skip and cage together weigh 4860 lb. The total starting load on the hoist under maximum conditions, that is, operating out of balance and having 2 tons of ore in the skip, 1 ton of waste in the cage and ¾ ton of cable, totals about 4¼ tons; and under ordinary conditions of operating in balance the starting load is about 2¾ tons.

The hoist- and compressor-house equipment includes an Allis-Chalmers double-drum electric hoist, with parallel-motion post brakes, connected through herringbone gears with a 150-hp. motor, rope speed being 800 ft. per min. The hoist is equipped with an automatic accelerator, an electric overwinding device operating a solenoid brake on the motor shaft and further protected by a push-button cutout at the operator's hand. The drums are mounted with clutches so that either drum may be run independently. A 19 x 12 x 16-in. belt-driven Ingersoll-Rand compressor furnishes 888 cu.ft. of free air at 100-lb. pressure. This is driven by a 150-hp. Allis-Chalmer motor, operating at 695 r.p.m. and having a 24 x 20-in. pulley.

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*Bisbee, Ariz.

*Excerpt from a paper by Otto Wartenweller entitled "United Eastern Mining and Milling Plant," to be presented at the New York meeting of the American Institute of Mining Engineers in February, 1918.

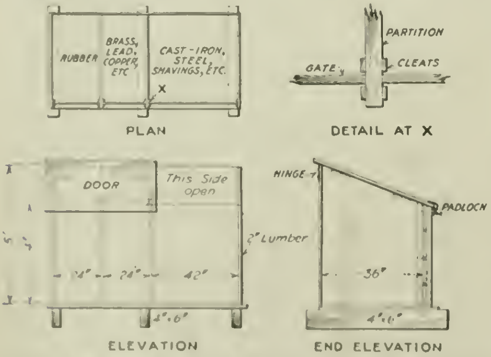
The primary-crushing department, situated beside the headframe, consists of a No. 6 Telsmith crusher belted to a 50-hp. motor and is automatically fed by a 42-in. steel apron feeder moving 1½ ft. per min. and delivering 25 tons per hour on an 18-in. wide 20° inclined beit conveyor passing over a Merrick weightometer, the conveyor discharging into a 24 x 24-ft. circular wooden tank bin. The cost of this department was: Labor $2456.50; material $9504.81; miscellaneous $14.06; total $11,975.37. The sum of $1916.27 was spent on the coarse ore bins, including $953.97 for labor and $962.30 for material.

CONSTRUCTION COSTS OF COMPRESSOR-AND-HOIST HOUSE

	Labor	Material	Total
Excavation	$965 21	$785 95	$1,751 16
Concrete	16 25	60 22	76 47
Hoist:			
Machinery, f.o.b. Oatman		8,434 02	8,434 02
Machinery, erection	245 00	96 48	341 48
Compressor:			
Machinery, f.o.b. Oatman		3,991 21	3,991 21
Machinery, erection	283 07	67 14	350 21
Building lumber		572 17	572 17
Lumber framing and erection	568 51	80 21	648 72
Building covering in place	47 50	324 02	371 52
Doors and windows in place	6 50	2 57	9 07
Piping, f.o.b. Oatman		108 79	108.79
Electric wiring, f.o.b. Oatman		1,505 60	1,505 60
Electric wiring, erection	295 93		295 93
Engineering, field	181 65		181 65
Painting	1 88	22 72	24 60
Installing equipment	1,292 74	3,679 32	4,972 06
Total compressor-and-hoist house	$3,904 24	$19,730 42	$23,634 66

Storing Scrap Material

War-time prices on all raw material consumed or required in mining and manufacturing industries are high, and furthermore, the supply of many materials, especially in finished products, such as machinery, is difficult to obtain on short delivery. The third factor, and the one of greatest importance in the present crisis, is the necessity for conserving all materials whether it be commercially profitable or otherwise—this in the interest of the present endeavor to concentrate all our resources on winning the war. The time-honored scrap heap, with its miscellaneous assortment of discarded tools, appliances, machine parts and waste products of manufacture, cannot be of profit to any but the dealer in junk—a speculator or broker with whom we may profitably dispense. If all material when discarded could be at this time classified and segregated, and either baled or stored in special bins, an accumulation of junk could be evaluated to a degree of accuracy impossible under former conditions, and that which could not be utilized at the plant could be disposed of on more equitable terms as a result of more accurate appraisement. Such practice would not require the services of an additional attendant. Those employees who have occasion to add to the scrap heap may be instructed as to where each class of scrap should be relegated. The men would get the habit, and as the common cause has brought the appeal for conservation to all classes, the point would become a personal matter and coöperation should not be difficult to obtain.



PLAN

DETAIL AT X

ELEVATION

END ELEVATION

FIG. 1. BIN FOR STORING SMALL BUT VALUABLE SCRAP

In the illustration, Fig. 1 shows a three-compartment box suitable for the storage of brass, copper, rubber, babbitt, or other small pieces that ordinarily accumulate about a shop. The box is cheaply constructed, and a sufficient number of such containers should be distributed throughout the plant at convenient points, and labeled "Scrap Material" or "Waste." The two compartments for rubber scrap and higher-priced metals have a hinged cover provided with a lock, the key to which should be retained by the foreman of each department. For the heavier scrap material, no housing is necessary. Fig. 2 shows how a plot of ground may be staked off so that segregation can be made with convenience and an inventory taken when desired. This storage yard preferably should be near the railroad station at the plant. Each section is separated on four sides from the adjacent sections by avenues, and a double-faced sign, designating the character of material, should be placed in the center of each group. This sign is mounted on a pole of a height sufficient to prevent concealment after a large amount of scrap has accumulated. When individual piles of scrap have accumulated to the full capacity of the storage space, a shipment can be made, and disposal by sale can be given a fair valuation.

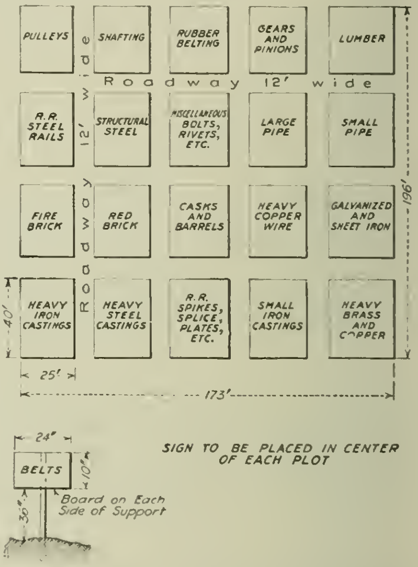


FIG. 2. ARRANGEMENT AND DETAILS FOR A SCRAP YARD

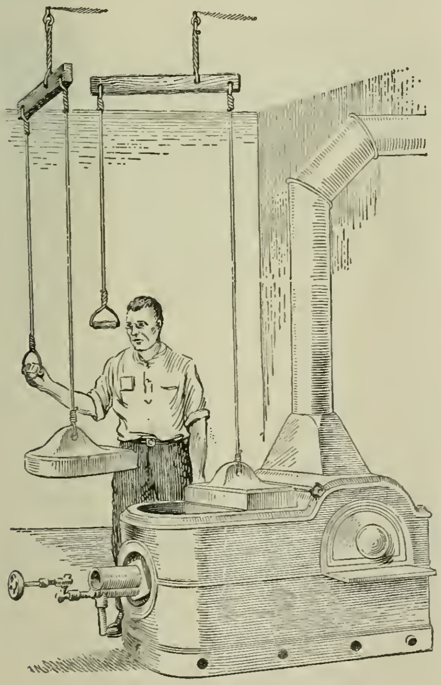
The Assayer and Chemist

Device for Lifting Furnace Covers

By S. H. Brockunier*

In the usual combination assay furnace the lids or covers of the crucible section supplied by the manufacturers are often frail and of short life. When they burn through, they can be profitably replaced by large slabs of soapstone or fireclay, which can usually be obtained at the nearest hardware store. These are durable and conserve the heat. The difficulty with them is that they are so heavy that they are not easily handled. I solved this difficulty in my own practice by rigging up a lever.

This consists simply of a piece of board 1 x 4 in. by 2 ft., bored with three holes as shown in the accompanying sketch. Baling or other wire is used for suspending it from the ceiling and for attaching it to the furnace cover. The holes should be so placed in the board that the center one will be 1 in. from the upper edge and the other two 1 in. from the lower edge. The longitudinal position of the central hole will depend on the weight of the cover; it must be sufficiently near the wire attached to the latter to make a gentle pull all that is necessary to lift the cover. The board should be hung a little to one side so that the slab will swing gently away when raised and rest on one edge of the furnace. With the handle in one hand, the tongs in the other will easily guide the slab in any direction. The wire may be attached to the cover by means of a bail, which acts like a pair of ice tongs. It is made of ½-in. iron, the ends pointed to fit in holes cut in the edge of the slab above the center, so as to give better poise. They should be chipped out carefully just deep enough to hold; do not try to drill, but chip them out carefully with a nail and light hammer.



DEVICE FOR LIFTING FURNACE COVERS

Colorimetric Determination of Bismuth

By Harry A. B. Motherwell*

No originality is claimed for the following method of estimating bismuth in refined copper, but it is submitted as a contribution that may be of interest to chemists. I am prompted to give it by the fact that after many years in different countries I have found it in use in only two places. Over 12 years ago it was employed at Wallaroo, South Australia, where possibly the process was worked out. A method employing the same principle but differing in detail was in use at the laboratory of the Tharsis company, in Glasgow, a number of years ago. Beringer, in his "Text Book of Assaying," gives a colorimetric method for bismuth, in which the solutions to be matched for shade are of a clear brown color. Health, in his "Analyses of Copper," refers to this method, but makes no mention of one using lead iodide. A method employing lead salts in the final solution has never been described in print to my knowledge. Matching light shades of yellow-brown in a clear solution is an operation of extreme delicacy; and it is a much easier matter to see a tint of brown against the pure yellow of lead iodide.

For this determination the following solutions are of convenient strength: Potassium iodide, 17 grams per liter of water; lead nitrate, 13.5 grams per liter of water; bismuth standard, 0.2324 gram bismuth nitrate, $Bi(NO_3)_3 5H_2O$, per liter. One cubic centimeter of the latter equals 0.0001 gram bismuth, so that if 10 grams of copper is taken for assay, each cubic centimeter required will equal 0.001% bismuth. The bismuth must be obtained in a solution free from copper, arsenic and iron and with a known amount of lead present. As the method is used for small quantities only, it is well to have a clear idea of the amount of bismuth present in the copper, so as to be able to weigh up a suitable quantity.

With this done, dissolve it in HNO_3, dilute and cool. Add Na_2CO_3 to precipitate a small quantity of copper, in the cold, and stir occasionally for six hours. Filter off the precipitate of copper, which will carry all the bismuth. Dissolve in hydrochloric acid and precipitate with H_2S. Filter and wash well to free completely from iron. Dissolve the sulphide precipitate in HNO_3 and add 5 c.c. of the lead-nitrate solution. Precipitate by adding ammonia until solution is almost neutralized; then add an excess of ammonium carbonate. Boil, cool somewhat, add more carbonate and decant through filter. Dissolve in HNO_3 and repeat the precipitation. If the color due to copper is strong, add weak cyanide solution slowly until the blue has almost faded. Filter and wash free of copper. Wash the precipitate from the paper into a beaker and dissolve in the least quantity of weak HNO_3 by running the acid over the paper on the funnel and draining into the beaker with the precipitate.

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*Mining engineer, Nevada City, Calif.

*Trail, B. C.

Carefully evaporate to a syrupy state so that, on removing from the hot plate, the contents will crystallize. Cool, add three drops of HNO_3 and 5 c.c. of water, warm sufficiently to dissolve all crystals. Cool and pour into a Nessler tube up to the 25-c.c. mark. Add potassium iodide solution up to the 50-c.c. mark. Compare the shade with that obtained with the standard bismuth solution in the presence of 5 c.c. of the lead solution and an amount of HNO_3 similar to that in the beaker after evaporation. As the color darkens on standing, it is necessary to have several tubes of standards of different strengths prepared so that all shall be treated the same length of time. A good plan is to have the Nessler tubes in line and measure into each 5 c.c. of lead-nitrate solution and three drops of nitric acid; then into four of them put four different quantities of the bismuth standard solution.

TO DETERMINE BISMUTH IN CATHODE COPPER

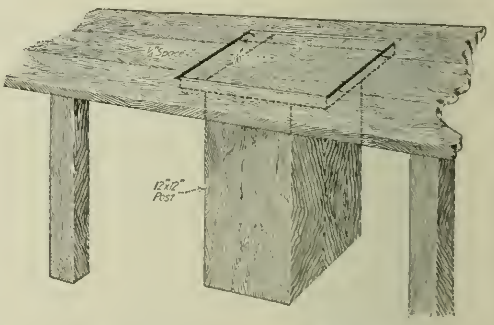
If cathode copper carrying about 0.001% of bismuth is being analyzed and a 10-gram sample has been taken, measure 0.6 c.c. of bismuth standard solution into No. 1 tube, 0.8 c.c. into No. 2, 1 c.c. into No. 3 and 1.2 c.c. into No. 4. Make all up to the 25-c.c. mark and then with the potassium iodide solution fill to the 50-c.c. mark at the same time that the tube containing the test assay is being filled. The color nearest to that of the test assay may be quickly picked out, the two tubes given a swirling motion and the color judged by looking down into them. As lead salts with potassium iodide give a pure yellow precipitate and bismuth salts alone give a brown coloration, it is essential to have the same amount of lead present in each tube; otherwise, for the same amount of bismuth, the one with most lead will appear lighter in shade. Warmer temperatures give lighter colors, apparently indicating lower results. Presence of HCl and NH_4Cl destroys the color.

If the HNO_3 solution is baked dry and then taken up with water only, the bismuth will not go into solution and on addition of potassium iodide a pure yellow will be obtained. If much antimony is present, it is rendered insoluble on evaporation to dryness with the HNO_3 thereby causing retention of some bismuth giving low results. If much arsenic, copper, or iron is present, it will tend to liberate iodine, causing high results, but if the solution is cool and no more acid used than recommended, small amounts will not interfere noticeably. An excess of HNO_3 or other oxidizing agent present will liberate iodine. It has been suggested to add sodium sulphite. This must be done carefully, as too much will produce a white precipitate and destroy the color of lead iodide, giving a lighter shade by dilution of brown with white and by deficiency of yellow.

The method is useful for detecting bismuth deposited with the copper in electrolytic determinations. The following has been found satisfactory: Treat the sample of cathode copper with HNO_3 and boil the solution. Dilute to about 300 c.c. Add 10 c.c. of the lead-nitrate solution and precipitate out the carbonate as described. Dissolve in HNO_3 and proceed as before.

Table for Assay Balance

Care is always taken in an assay office, or should be, to place the balance on a table or support so constructed as to be free from vibration. The special construction usually consists of heavy posts or columns supporting the table top and passing through the floor without touching it. This prevents vibration of the table due to any jarring of the floor, but unless the table is one of massive construction, as, for example, a slate slab on brick pillars, vibration or movement of the balance will be caused by touching or leaning on the table. To prevent absolutely all movement of the balance stand, and yet secure cheapness in construction, the table shown in the illustration was built. It consists simply of a small table top, 20 x 16 in., supported on a 12 x 12-in. post passing down through the floor with the lower end buried deeply in the ground. The hole in the floor is slightly larger than the post. Around this small table is built a larger one which is supported independently. Its size may be varied to suit conditions or requirements, and that of the small table top may be made to conform to the size of the balance used. This method of supporting is easily adapted to any number of balances in the weighing room and is more effective than the sign "Please do not lean on this table."



BALANCE TABLE SECURE FROM VIBRATION

Lithium Hydrate added to caustic-potash solution in alkaline storage batteries increases both the available capacity of the battery and its internal resistance, according to L. C. Turnock, in a paper presented at the recent meeting of the American Electrochemical Society at Pittsburgh. Comparative tests of Edison storage batteries with 0, 10, 20, 30, 40 and 50 grams per liter of lithium hydrate added to the usual 21% caustic-potash electrolyte showed increased capacity up to 12% with the largest amount of lithium hydrate, in spite of a 21% increase in the electrical resistance of the electrolyte.

Events and Economics of the War

The Senate inquiry into the conduct of the war has begun; General Crozier, chief of ordnance, testified that delay in supplying equipment was due to the necessity of reorganization to equip a much larger army than that for which the department had been preparing; also in part to the need of supplying the Allies, and partly to the slowness of Secretary Baker in making certain important decisions. The Webb Export and Shields Dam bills have passed the Senate, the former going to conference and the latter to the House. The Senate resolution submitting to the states the constitutional amendment for nation-wide prohibition was adopted by the House. Austrians have been excused from registering as enemy aliens by the President's proclamation. Registration of men subject to draft began on Dec. 15. Steps have been taken by the Government to regulate prices as well as exports and imports of wool. Freight congestion and lack of coal east of the Mississippi have brought the question of road operation to a head; the President is expected to appoint a national traffic manager.

Abroad, German raiders sank one British destroyer and 13 merchantmen, aggregating 8000 tons, in the North Sea. Small gains have been by the Germans on the British front at Cambrai and Ypres. The Austrians also have advanced slightly against the Italian left. Cossacks and the Bolsheviki continue fighting in Russia, neither side having mastered the other. A state of war between Cuba and Austria-Hungary has been declared to exist by the Cuban Congress. The Canadian people on Dec. 17 reëlected the Union Government under Sir Robert Borden and voted for conscription; Quebec province was opposed to both.

Tax Burden Heavier in Civil War Than It Is Today

Despite the tremendous demands of war upon the United States, taxation is proportionately less today than in 1866, according to J. Rattray, of the war- and income-tax department of the Guaranty Trust Co. During the last year of the Civil War $1,800,000,000 was raised without resort to a foreign loan. This was hailed as an unparalleled triumph of financial strength.

"At that time," said Mr. Rattray, "the estimated wealth of the United States was about $25,000,000,000, compared with $250,000,000,000 in 1917, so that if we multiply these figures by 10 we should obtain an amount comparable to present conditions. On a similar basis the cost to us of the present war for six years would be about $40,000,000,000, and taxation would amount to about $5,500,000,000 per annum. Including loans to the Allies, our total indebtedness is now about $10,000,000,000, and additional taxes provided for in the War Revenue Act of Oct. 3, 1917, amount to approximately $3,000,000,000, in addition to about $1,000,000,000 formerly raised under our revenue acts.

"In addition to meeting some of the current expenses of the war, taxation must provide for interest charges on and amortization of our indebtedness. Additional taxes provided for would be sufficient to liquidate in 10 years the principal and interest of about $20,000,000,000 of indebtedness. As our expenditures in the first year of the war amount to about half this sum, it appears that for each year we are at war we must be prepared to support extraordinary taxation for a period of five years. A comparison with figures of 1866 will show that in proportion to our resources we are putting forth less of our maximum effort now than we did then."

Griesheim Chemical Works Destroyed

Griesheim Electron, near Frankfurt-am-Main, one of the largest chemical works in Germany, was reported destroyed by an explosion on Nov. 22. The plant covered 54 acres and produced a huge quantity of many different manufactures, including aniline dyes, nitric, sulphuric and other acids, phosphorus, alkali, liquid chlorine, oxygen and hydrogen. It supplied much of the electrolytic hydrogen used for inflating Zeppelins. It also played a leading part in the production of synthetic nitrates and in production of poisonous and asphyxiating gases, etc., it was one of the pillars of *schrecklichkeit.* Its output of poisonous gases was said to have reached in 1916 almost 600,000 cu.ft. per day.

The dispatches state that it was of first importance in its output of explosives and their ingredients and was said to be the only producer of saltpeter for making black powder, turning it out at the rate of 1000 tons per day. It supplied five nitroglycerine factories and two powder plants with all of the sodium nitrate and sulphuric acid that they used. Tonite, produced from picric acid, was one of its important products.

It was this company that produced the fused magnetite anodes originally used at the Chuquicamata plant of the Chile Exploration Co. It is understood that since the beginning of the war Duriron anodes have been used by the Chile company with success in place of those of magnetite. So important was the plant that its loss must inevitably be felt throughout Germany. The seriousness of the disaster is evidenced by the great care taken by the German government to suppress the facts.

Immigrant Influx Not Stopped by War

Labor conscription to prevent interference with war work is regarded as unnecessary by the Secretary of Labor, in his annual report to Congress. The extent of industrial unrest throughout the country since the beginning of the war is reflected in the amount of conciliation work done by the Department of Labor. From Apr. 6 to June 30, 1917, according to the report, such work affected 228,123 workmen directly and 178,376 indirectly; from July 1 to Oct. 25, 1917, the number was 343,906 workmen, directly affected, and 202,578 indirectly. The statistics also show that the stream of immigration from Europe has not been entirely cut off by the war. During the year, 295,403 immigrant aliens were admitted, a decrease of 3423 compared with the previous year. Against this is recorded the departure of 66,277 emigrant aliens, a decrease compared with the year preceding of 63,488. The year closed, therefore, with a net gain of 229,126 in the number of immigrant aliens in the country.

Needs of the Railroads

There is some misconception as to the immediate requirements of the railroads in their present situation, according to Fairfax Harrison, chairman of the Railroads' War Board. The roads do not ask one billion dollars from the Government, declares Mr. Harrison. This amount is what ought to be spent annually for several years on railroad plant to bring it up to capacity for efficient operation. They do not consider necessary the repeal of anti-trust and anti-pooling laws to secure unified operation. They believe that the present system of voluntary unification is adequate for obtaining maximum efficiency.

The roads, on the other hand, do ask the immediate appointment of a traffic officer to represent all important Government departments in transportation matters, with whom the roads can deal, so as to secure Government coöperation and to avoid the excessive use of preference orders, which congest instead of facilitating traffic. The roads want priority orders issued to make possible the prompt delivery of new rolling stock still on order and greatly needed. They want Federal aid in securing for them, on their own individual credit, the capital necessary for enlarging their plant and for renewing maturing obligations. They want immediate increases in rates. Finally, they wish that drafted railroad men be enrolled and assigned to railroad work until actually needed for military service.

Poorer Coal Produced This Year, Though Tonnage Is Greater

In discussing the general need of fuel conservation in boiler rooms, Van H. Manning, Director of the U. S. Bureau of Mines, said that although it has been stated that 650,000,000 tons of coal will be mined in 1917, as compared with 600,000,000 tons in 1916, the coal produced this year may be less effective, because of higher ash, than last year's output—to such an extent, perhaps, that the apparently increased tonnage in 1917 may really represent an actual decrease in effective coal of 30 million tons below the 1916 production. Coal this year, according to Mr. Manning, has not been prepared as well as last year, and many cases have come to the Bureau's attention where coal normally 6-8% in ash is running 12 to 18%. Complaint about poor preparation, says Mr. Manning, is general, and it is not improbable that the 1917 production is 5% higher in ash than in former years. This being true, 32,500,000 tons of the estimated output of 650,000,000 tons represents nothing but increased ash.

In addition to this, Mr. Manning states, Government experiments have shown that for every 1% increase in the ash content the efficiency of coal drops 1½%. The extra 5% ash, mentioned above, represents, then, a reduction of 7½% in the efficiency of the remaining good coal, which, added to the 5% useless ash, makes a total reduction in effectiveness of 12½%. Figured thus, the 650,000,000 tons produced in 1917 is equivalent in fuel value to only 570,000,000 tons, a decrease of 30,000,000 tons below the 1916 production. This, added to our estimated increased needs of 100,000,000 tons, gives a deficiency of 130,000,000 tons to be made up by good engineering and more efficient fuel conservation in the boiler room.

In connection with Mr. Manning's statement, it is interesting to read the speech of David Moffat Myers on "Preventable Waste of Coal in the U. S." delivered at the recent New York convention of the American Society of Mechanical Engineers. Mr. Myers said in part:

> The saving or wasting of one-fourth of the coal consumption of any industrial plant depends entirely upon the efficiency of its operating management. . . . Under present conditions a plant which carelessly operates at an efficiency of 40 to 50% receives from the Government the same consideration in the delivery of coal as the one whose efficiency is 70 to 75%. This is obviously unfair as well as wasteful. . . . Six hundred million tons of coal were mined in the United States in 1916. If we assume only one-half of this to have been used for our industrial boiler plants, then a quarter of the coal used under boilers amounts to 75,000,000 tons per year. It is worth while to save this fuel by preventing its waste. It represents the use of 1,500,000 fifty-ton freight cars.

Strikes Hamper Airplane Work in Great Britain

The 50,000 British airplane workers at Coventry who recently struck have resumed work. They appointed a committee to settle questions in regard to shop stewards and the war bonus. It is estimated that the strike resulted in the loss of a million and a quarter working hours. The strike wave in the country appears to have amounted almost to insanity, according to the *Sun's* London correspondent. A number of metal workers, engaged in the manufacture of radiators, struck in sympathy with other members of the union who were striking for an increase in the wages of solderers and tinmen. The radiator workers, who were getting twice the sum, still are holding out. This fact means that the completion of many airplanes is delayed. Shop hands numbering 150,000 in the Birmingham and Midland districts demanded recognition of their shop stewards or said they would strike immediately. The majority of the shops are working on munitions. The Ministry of Labor is attempting to bring about a settlement, and negotiations are proceeding.

Miners' Wages in Germany

"While in upper Silesia the demands of the miners for increased pay may be considered to have been satisfied," says *Soziale Praxis* of Aug. 16 (translated by *Labor Gazette*, London, September, 1917), "in lower Silesia, Saxony, and upper Bavaria fresh demands have recently been put forward. In lower Silesia hewers were granted a wage of $1.68, and the workmen did not press for more, as the administration proved that the mines did not pay. In the Oelsnitz-Lugau district the rate per shift was increased by more than 12c., and a new war bonus of 14c. was also granted. At upper Bavarian mines (Penzberg, Hausham Marienstein and Peissenberg) a hewer's rate of $1.54 was demanded, the rates of other work people to be increased in proportion. Besides war bonuses, a supplement of 30% on overtime and an increase of 50% on the Sunday-shift rate were also demanded. The employers refuse to grant the last named, as they consider this would encourage the practice of not working on Monday. The miners, however, still persist in all their demands.

"A large meeting of miners at Essen held recently showed that besides obtaining better conditions for their members, the trade unions have to bring about the recognition of the principle of negotiation. Herr Hue, a member of the *Reichstag*, and a local official of the Christian Trade-Unions, acting in concert, called upon the employers to abate their claim to be 'masters in their own houses.' They also directed attention to the increased number of shifts worked, and to the necessity of providing sufficient stores of food, especially of potatoes. At the same time the meeting declared its intention of increasing the existing output to such extent as may be possible."

Signs of Unrest Among Workers on War Orders

There is more unrest in factories working on direct war orders, the Department of Labor asserts, than in plants otherwise engaged, owing to the conviction of organized labor that the direct-war-order firms are taking excess profits. A statement to this effect is made by the department in a report on its two-months investigation into labor conditions in 37 cities in New York State. The war-order firms are employing 168,446 persons, of which 23,048, or 14%, are considered definitely necessary to the war industry. One firm requests the exemption of 13,323 men.

In the last two months 128 New York firms have asked for more help. The airplane industries' requests cover 57% of all the labor asked by these firms. Nearly two-thirds of the workers requested in the state are for skilled male labor; one fifth is for unskilled male labor and one-eighth is for women. In most cases where women have replaced men it was found that the former are given a piece rating, while the men are working for a fixed wage. The reports indicate that industries hard hit by the war are pleasure automobile parts, carpets, fine kid gloves, fancy sweaters, brooms and brushes, typewriters and high-grade woodwork. It is noted that workmen who are being laid off by these factories are readily finding employment in similar work.

Preparing for Next Liberty Loan

To perfect and coördinate the working of the various Liberty Loan organizations throughout the country for the period of the war a conference was held in Washington on Dec. 10 of representatives of Liberty Loan Committees from all over the country. Governors of the Federal Reserve Banks were invited to attend. Secretary McAdoo has announced that another loan will not be issued until some time after Feb. 1, but it is believed essential that educational work in preparation for future loans be kept up and the people of the country thoroughly informed of and impressed with the merit of Government securities, the individual advantages of thrift and economy, and the financial needs of America in the war against Germany and Austria.

Austrians Not Compelled To Register

The Department of Justice has abandoned its plan to register Austrians along with Germans because of the immensity of the task and the Administration's determination to minimize embarrassment to Austrians, thousands of whom have demonstrated their loyalty to this country by enlisting in the army and navy. In the proclamation on Dec. 12 declaring a state of war with Austria-Hungary, President Wilson specified that un-naturalized Austro-Hungarians, unlike the Germans in this country, shall be free to live and travel anywhere, except that they may not enter or leave the United States without permission, and those suspected of enemy activity may be interned. They need not register with police or post-office officials, as Germans soon will be required to do, are not barred from the 100-yd. zone about piers, docks, and warehouses closed to Germans, and are not required to leave the District of Columbia.

Webb Export Bill Passes Senate

The Webb export bill, to legalize combinations of American exporters in promoting their foreign commerce, was passed by the Sénate, 51 to 11, on Dec. 12. President Wilson in his recent address to Congress urged enactment of the measure, which was passed in June by the House, and is now in conference. Business organizations have strongly supported the bill. Opposition in the Senate, led by Senators Cummins and Reed, was based principally on the argument that virtually it would repeal provisions of the anti-trust laws as to foreign commerce. The House previously passed similar legislation twice, but it failed in the Senate.

Technical Students Affected by Draft Ruling

The Provost Marshal General has sent the following telegram to the governors of all states:

> Section 151, Selective Service Regulations, is amended by the addition of subparagraph D, as follows:
>
> "Under such regulations as the Chief of Engineers may prescribe, a proportion of the students, as named by the school faculty, pursuing an engineering course in one of the approved technical engineering schools listed in the War Department may enlist in the Enlisted Reserve Corps of the Engineer Department, and thereafter, upon presentation by the registrant to his local board of a certificate of enlistment, such certificate shall be filed with the questionnaire and the registrant shall be placed in Class 5 on the ground that he is in the military service of the United States."

Ferrochrome may be used only in connection with high-speed, crucible carbon steel and alloy steel, according to an order issued by the British Government to manufacturers of steel in Great Britain. In alloy steel it may be used only when a priority certificate or other permit has been obtained warranting its manufacture.

Industrial News from Washington

By Paul Wooton, Special Correspondent

Production of War Minerals Lags

In speeding up production of war minerals, the pace has not yet been reached that the country's natural resources and its engineering genius would seem to justify in time of emergency. This conclusion is reached by George Otis Smith, director of the U. S. Geological Survey, in his annual report. Dr. Smith said further:

> Whoever studies the mineral resources of the United States and the industries built thereon must realize that in a time of need like the present year, production rather than price is the matter of prime importance; that a high price may both stimulate production and increase available reserves; that home production will result in transportation savings that are in reality a national benefit of practical value comparable with the theoretical advantage of industrial independence; and that expansion of productive capacity is possible under war conditions only as both consumer and producer can adjust their projects to the conditions that will prevail after the war, as well as to the needs of the present emergency.
>
> The economy of domestic production wherever possible may be shown in the present manganese situation. The Virginia miner who loads on the cars 4500 tons of high-grade manganese ore this year is not only contributing to the steel industry that tonnage and receiving therefor compensation at the market price, but he thereby relieves the country's shipping shortage to the extent of one ship for 38 days, not including the necessary time for loading and unloading the cargo of Brazilian ore.
>
> Opening pyrite mines must be based upon an assured supply of ore in the ground and an assured demand for the product for a period long enough and at prices high enough to justify the development. It is not enough for the geologist to point out the ore; the acid manufacturer needs to contract both to buy the pyrite and to sell the acid. New development must rest upon a basis of something more than risk, lest expansion of productive capacity involve after-the-war losses that will swallow up war profits. To make America industrially independent is an aim perhaps even more desirable now than three years ago, and possibly also even more of a problem than was then realized.

Mineral Import Committees Appointed

Committees representative of importers of all commodities requiring an import license are being designated. They will have no authority to grant or to refuse licenses. Their function will be to gather such information as the War Trade Board may direct; to act as consignee of the various imports requiring licenses; to release these commodities as directed by the War Trade Board; to obtain from importers such guarantees and agreements as the board may require; to keep informed as to the use and disposition of the imports within their jurisdiction, and to keep complete records of all importations of the various commodities requiring license. The American Iron and Steel Institute will act for the importers of tin, tin chloride and tin ore. Graphite importations will be supervised by a committee from the Plumbago-Graphite Association. Other minerals for which import licenses are required and for which committees are to be appointed in the near future are: Antimony, asbestos, chrome, cobalt, all ferroalloys, iridium, manganese ore, molybdenum, emery, nickel, sodium, potassium and calcium nitrates, platinum, pyrites, titanium, tungsten and vanadium.

One Hundred War Service Committees Must Be Formed

The work of the Council of National Defense and of the War Industries Board is being retarded by the difficulty in reaching industries as a whole. This situation, however, will be met to a large extent by the formation, through the agency of the National Chamber of Commerce, of war-service committees that will be representative of the industries. A few have been approved by the chamber's central committee. The lumber industry, represented in Washington by five bureaus, will continue to coöperate with the Government. S. T. Henry, of the Allied Machinery Co. of America, is coöperating with the chamber in an effort to form a committee representative of all manufacturers of machinery. In all, nearly 100 committees must be formed. Owing to the difficulty of securing men whose circumstances are such as to make it possible for them to assume the duties involved, and who will be acceptable to the various industries, it will be some time before the work is done.

Broaden Work of Urbana Station of U. S. Bureau of Mines

The experiment station at Urbana, Ill., of the U. S. Bureau of Mines, will hereafter be headquarters for the work carried on in both coal and metal mining, and in the metallurgical industries in the general Middle West district, including Illinois and surrounding states. The present work of the station relating to the improvement of safety conditions and practices in mining will be continued and studies of technologic problems in both coal and metal mining and in the metallurgical industries of the region will be pursued. The existing coöperative agreement with the University of Illinois, through its mining department, and with the Illinois Geological Survey, has been renewed. New work concerning mining practice and utilization of the Middle-West coals in coke and gas manufacture is under way.

Cyanide Outlook Brighter

An adequate supply of ammonia having been assured them, producers of cyanide expect to manufacture enough to meet the normal demands of the United States and Mexico. The limiting factor in cyanide manufacture has been the ammonia supply. The demands made by the munitions, textile and refrigeration industries have been heavy enough to reduce considerably the amount of ammonia available for other industries requiring it in their work.

Oil Land Leasing Bill has been placed before the Senate by Senator Pittman, of Nevada. During the various sessions at which this measure has been considered, it has never been brought before the body so early before. Thus a vote on the bill is assured.

Editorials

Fixed Prices and Short Supplies

THE coal crisis is here, and the efforts of Doctor Garfield to explain it are pathetic. He is not responsible for it and he cannot do much to ameliorate it. The responsibility lies deeper. It is to be found in the policy that has starved the railways and the more recent meddling with the laws of economics. Washington has been obsessed with its ideas of price-fixing and annulment of the law of supply and demand. It has not annulled that law and cannot do so, any more than it can abolish the law of gravitation; but it can supersede the principle of *laissez faire*, as it has done. A corrollary of *laissez faire* is survival of the fittest. Now, we admit the teachings respecting modified *laissez faire* as compared with the unlimited, and recognize that in the present world-wide confusion there is necessarily more control than in normal times. With shortage of foodstuffs *laissez faire* would mean starvation of the weak and poor and survival of the rich and strong, a condition that ought not to be permitted, and is not.

The exercise of control of commodities is a different thing. Deprivation of any one of them is not such a vital matter as in the case of food that people must have from day to day, else die. But nobody suffers directly if the price for lead soars to 12c. per lb. People simply cease painting their houses and curtail their expenditure of shot in gunning. The market dictates who shall have things and who shall not, swiftly, quietly, automatically, and according to the consumers' own wishes. The market in myriads of commodities is in balance.

Artificial control of those myriads of commodities is beyond comprehension. The exercise of control in a few of them unbalances the whole structure and inevitably produces trouble. The United States has been trying the experiment for only a few months, and in only a few things. There is a curious significance that in those very things—copper and coal especially—there has been shortage of supply. There is no particular good in having a restricted price for coal and not having coal enough. Everybody would be happier and our progress in warfare would be speeded if we had more coal, even if we had to pay more for it.

The Position of the Gold Mines

THE communication of J. Parke Channing in the *Journal* of Dec. 8 on the subject "Is Gold Mining Necessary During the War?" has excited a good deal of discussion. Mr. Channing took the position that we do not need any more gold, and therefore the continued operation of gold mines simply uses labor and material that ought to be employed for more essential things. Anyhow, he argues that Congress should frown upon the movement to assist gold mining in the present juncture by abating war taxes in so far as the gold mines are concerned.

We do not hold with Mr. Channing. If it had not been for the great gold reserves of Great Britain and the United States, we fear that the Huns would already have been overrunning our shores. The British have recognized the importance of maintaining their financial basis, and have done everything possible to stimulate the gold production of the Witwatersrand. Otherwise the statements of the Bank of England would look very different today. Even now the bankers of both Great Britain and the United States are distinctly averse to releasing any of their gold. The Director of the Mint has just stated officially that it is desired to encourage the production of both silver and gold.

The production of silver may be stimulated by letting the price rise further, but the price for gold does not rise. On the contrary, as the prices for other commodities rise, the value of gold depreciates, i. e., it will buy less of other things. For this reason gold mining is now on the wane. The cost of production has so increased that in many cases inability to operate any longer at a profit is immediately threatened. The more favorably situated concerns are confronted by heavy war taxes. They have not enjoyed any war profits. On the contrary, they have suffered war losses. It is certain that if maintenance of gold production be desired, something must be done to ameliorate the conditions under which gold producers are operating.

Negotiations Respecting Silver

THERE has been considerable talk in the newspapers lately about fixing the price of silver, etc. None of the reports printed has been correct. Negotiations are being carried on, in which the Western silver producers are represented by a committee headed by Governor Boyle of Nevada, but no conclusion has yet been reached. Meanwhile, the old specter of bimetallism has appeared, and Senator Shafroth, of Colorado, has introduced in Congress a resolution that is reminiscent of 1893. The confusion in regard to the matter induced the Director of the Mint to make the following official statement on Dec. 15:

> Reports recently have been circulated that negotiations of the Government in relation to silver are designed to revive a discussion of the issues involving bimetallism and the free and unlimited coinage of silver.
>
> I desire to state emphatically that the sole purpose of the Government is to insure an adequate supply of silver at a price which will be fair to the small producer as well as to the large operator, which will stimulate the production of silver and gold and other metals yielding silver as a by-product, which will stabilize the American silver market, which during the last two years has been subject to fluctuations, and which will render foreign exchanges more stable. The negotiations afford no opening for a revival of economic issues and should be regarded purely as an effort to secure an adequate supply and to place American silver production and manufacture on a more satisfactory and scientific basis.

The Director of the Mint has outlined what is in mind. The project that is contemplated does not in any way savor of bimetallism.

Government Railway Control

BEFORE this page is printed some system of Government control of the railways of the United States will perhaps have been announced. Once introduced, we shall never return to the present system of private operation, although the war-time plan is likely to be modified with the return of peace. Thus we are about to see the end of the long contest over the railways and the beginning of a new era in their operation. It is regrettable that the breakdown of the railways, which is the direct result of their starvation by politicians, had to come in this crisis. Yet otherwise the contest might have been protracted so much longer that perhaps it is best to have it ended.

Governmental control will be advantageous in many ways. There will no longer be trouble in financing. Freight and passenger traffic will be routed in the most economical way. There will be an enormous saving in accounting. The abolition of the expense of dealing with the Interstate Commerce Commission will be no mean saving in itself. Yet it does not follow that the public will get cheaper transportation, not even after the war. The brotherhoods, the *imperium in imperio*, will have something to say about that. And it is all but certain that the public will not get the conveniences that resulted from competition.

During the war Government operation of the railways will surely be efficient, for it will be left practically in the hands of the present managers. After the war we shall fear the hand of politics and the incompetence that characterizes the operation of the great Government monopoly—the post office. But it may be that after the war we shall have a different breed of politicians. Their present contact with the dollar-a-year men ought to have some effect.

The Situation in Washington

LAST Thursday there was in Washington a second editorial conference of the business papers of the country. Like the first one, last May, the purpose of this was to give the editors an opportunity to learn directly from department heads and bureau chiefs what is being done and to give those heads and chiefs a chance to communicate to the most intelligent class of readers information concerning the things in which public coöperation is needed. The several addresses at this meeting were of a high order of interest, and all attending thought the conference well worth while.

We ourselves came away, however, with a certain feeling of depression, reflecting probably ideas of the chaos that still exists in the administration of war affairs. Without doubt a great deal of work has been done, and most valuable work, but there is, alas! much evidence of absence of coördination, lack of team-work. It is, for example, a shock to hear expression of the opinion that more of a costly, bulky class of machinery is being manufactured than we shall probably ever be able to transport to France; and then to hear from another speaker complaint of the shortage of coal, iron and labor. The idea occurred to us that if all of the heads and chiefs had been required to attend such a conference as we did, and to remain there, hearing each other speak, it would have been a good thing.

Privately we learn of important matters stalled in the departments; of documents pigeon-holed; of vital actions ordered without learning how other branches are affected; of ignorance to what quarter important things should be referred, and so on. The revelations of General Crozier to Congress with respect to the rifle and machine-gun supplies are spectacularly illustrative. Somebody else has aptly remarked that the most lingering impression that an outsider gets after visiting the several Governmental departments is the absence of a real manager in each.

Lead Not To Be "Regulated"

The decision of the War Industries Board, after the conference with the lead producers on Dec. 17, not to undertake any regulatory action affecting their industry at this time exhibits commonsense. Lead is at present in rather a depressed condition, and the market for it will undoubtedly behave in a natural way if it be let alone. The experience of the Government in fixing the prices for copper and coal, with the immediate results of shortage of supplies, and in the case of coal great suffering to the people and crippling of war work, ought to be a lesson to Washington, even to the highest quarters therein, that attempts to baffle a law of nature are bound to incur a penalty.

The showing of the men of the United Eastern gold mine at Oatman, Ariz., in subscribing to the recent War Loan was commented upon in the report of the Arizona chapter of the American Mining Congress. Out of 205 employees 107 subscribed to the loan, which is said to be a record percentage for any Arizona mine of the first grade. General Superintendent J. A. Burgess of the United Eastern naturally felt pride in the subscriptions of his men and the loyalty expressed, and did not fail to give them the satisfaction of knowing that their attitude was appreciated. Besides making record of the names of all the subscribing employees for future reference as an honor list, he sent each a letter of personal thanks. "The subscriptions show," says the letter, "that the men of Oatman fully understand their responsibility to support the Government and the soldiers in this grievous war. Before it is over we shall doubtless be called upon to do many unusual things and make many sacrifices, among which will be the investment of our savings in bonds, and the conservation of food. Let us respond as whole-heartedly to each appeal as we did to the recent loan."

Each operator, from the "big boss" down, can increase his initiative and his ability by getting in touch with what the other fellow is doing. Mining, like everything else, is not made up of one idea—it's the combination of a number of them. We all have our own way of doing things. Sometimes that way is a good one and sometimes another fellow has a better method—if we only knew it. But the main thing is the interchange of ideas and the proper medium. No finer expression of good will can be made to your responsible men than to present them with a year's subscription to the paper that is published to help them to improved and economical results in their work. And what gives more assurance to a chap than to know that the company for which he works is interested in him? Most holiday gifts are outworn and forgotten in a few months; but here is one that lives and grows with each week. We have prepared an appropriate card to announce that the *Engineering and Mining Journal* will be mailed to the recipient in 1918, with the compliments of an appreciative superintendent or manager. The time is growing short —let use have your list without delay.

BY THE WAY

The *South African Journal of Industries* is the title of a new publication issued from Pretoria under the direction of the Hon. F. S. Malan, Minister of Mines and Industries. It contains a number of interesting and authentic articles concerning the industrial and mining development of this great empire. Unfortunately, as we commented a few weeks ago, the mineral production is reported in terms of value, after the manner of some state mining bureaus, which permits no intelligent comparison with previous years.

"Liberty bonds"—so-called—are being sold by the I. W. W. members to various radical and labor organizations throughout the country, according to the *Tribune*. The object is to raise sufficient funds to bail those I. W. W. members who have been placed in jails for alleged conspiracies and sabotage activities. A defence committee has been organized for this purpose and special efforts are being made to help the 166 members and sympathizers of the I. W. W. who are now under indictment at Chicago. The committee in charge is called the General Defence Committee, and has offices in Chicago.

The mining regiment, the 27th Engineers, wishes to enlist some first-class cooks and assistants—what are usually referred to in the diggings as "bull cooks" and "cookees." If it were possible to use Chinamen, we would recommend the Silver King crew *en masse*. At least we would if the same crew is presiding over the destinies of the inner man as was the case at this Park City mine 10 years ago. At that time it had a mess unexcelled at any mine in this country and equaled by few. It was a privilege to work at the Silver King in those days, and we hope that "Coalition" has made no difference in this respect. However, to get back to cooks for the mining regiment, "Who has a good cook?" And enough patriotism to give him up? See advertisement on page 47. But they should be good cooks. We want the boys in the mining regiment to be cheerful, and, aside from hard work, there is nothing like good cooks to make the boys take a real interest in dinner. And we suppose these cooks should be able to make good pasties, for we understand there will be some Michigan boys in that regiment, and they will want to be reminded of home occasionally. Well, if you can't send your cook, you might join the Comfort Club and help to keep the boys in Peerless and other comforts.

He brought home the bacon. "In boxes, carried as luggage, F. W. Draper, an American mining engineer, arrived at a Pacific port from Russia with nearly $2,000,000 worth of platinum," says an Associated Press dispatch. "The metal, amounting to about 21,000 oz., was consigned to the Secretary of Commerce and is urgently needed for war purposes. Draper traveled across Siberia alone and unarmed. At Vladivostok he took ship for America, arriving safely last week with his precious luggage." From subsequent dispatches we glean that American engineers in Russia have not been idle since their country entered the war. "Realizing the necessity of obtaining platinum if American war preparations were not to be hindered, negotiations were entered into for securing a large supply of platinum from Russia, the principal source of this metal. Lieut. Norman C. Stines, a well-known placer engineer, formerly associated with Herbert C. Hoover, and more recently attached to the military staff of the American Embassy at Petrograd, began quietly to obtain control of supplies of platinum with the financial assistance of the Russian-English Bank of Petrograd. This platinum was offered to the United States Government at cost and consigned to the Secretary of Commerce with the understanding that it was to be used solely for Government needs." What other engineers assisted in the collection and forwarding of this precious consignment the dispatches do not state, but we are confident that every American engineer in Russia has been doing his utmost in aiding the cause of real democracy.

A presumptious exponent of "freedom" on the Russian front, says an Associated Press correspondent, was recently disposed of by Klondike methods as exemplified by Lieut. Col. John W. Boyle, Jr., of the Canadian militia, who was sent by the American Committee in London to aid in restoring the Russian transportation system. Lieut. Col. Boyle, who was formerly assistant general manager of the Canadian-Klondyke Mining Co., has been engaged for four months in improving the transport conditions along the Russian and Rumanian fronts. At a certain point the chairman of a soldiers' commission, to whom Boyle was referred for necessary information, met him in an uncivil mood, and impertinently answered one question with another calculated to rouse the Canadian's temper. "Were you sent here because you were the best man they could find on the French front?" queried the nagging committeeman through an interpreter. "Possibly so," was the reply. "Now, answer me this: Are you the best man in your committee?" "I am." "What is your rank?" "I am a soldier." "It is unbecoming in me to start an argument with a soldier," said Boyle, who saw that he must either subdue his antagonist or fail in his quest. "But this is what I propose to you. I take off my uniform," proceeding in the meantime to lay aside his cap, 'harness,' and uniform coat, "and meet you man to man. Now you name any job that you think you can do better than I can, from lifting or jumping to fighting, and I will take you on." The interpreter conveyed this information to the soldier-committeeman. "Tell this chap," continued Boyle, "that if he fails to best me in whatever he chooses, he must go away from here and not interfere in my affairs, or I shall give him the best beating he has had since he was a child." The bully held a brief conference with his fellows and went away. He may have had an inkling, continues the Associated Press story, that Boyle was once the heavyweight boxing champion of the Canadian Northwest.

Metal Exports in October

WASHINGTON CORRESPONDENCE

Sulphuric-acid exports in October were 4,492,200 lb., an increase of more than 1,000,000 lb. over exports in October, 1916. The exports of sulphuric acid for the first 10 months of 1917, which were 53,487,786 lb., were approximately 4,000,000 lb. behind those of the corresponding period of 1916. These and the following figures are taken from the returns to the Bureau of Foreign and Domestic Commerce.

Exports of refined copper are outstripping those of 1916. In October, 1917, 81,316,000 lb. of refined copper was exported. In the corresponding month of 1916 exports were 55,303,187 lb. For the first 10 months of this year, exports were 870,746,395 lb. During the first 10 months of last year, exports of refined copper were 610,971,657 lb. Exports of copper ore in October, 1917, were 435,700 lb., as compared with 1,005,764 lb. in October, 1916. Copper ore exported during the first 10 months of 1917 aggregated 4,100,576 lb., as compared with 3,975,778 lb. during the same period of 1916.

Owing to a demand for a more detailed classification of zinc exports, the statistics of the Bureau of Foreign and Domestic Commerce are now being compiled so as to show exports of zinc ore, zinc dross, spelter obtained from domestic ores, spelter obtained from foreign ores, zinc sheets, other manufactures of zinc and all other articles of zinc. The change in classification has caused delay in the preparation of comparative figures with the exports of last year. Exports of zinc ore were negligible. Zinc dross to the extent of 2,462,085 lb. was exported in October, and for the first 10 months of this year the exports were 20,530,634 pounds.

Lead exports increased decidedly in October, 1917, as compared with that month of 1916, but the movement abroad for the first 10 months of 1917 is far behind that of the same period last year. Exports produced from domestic ores in October, 1917, were 21,039,360 lb. From foreign ores the total was 5,329,408 lb. For the corresponding month of last year the figures were 18,792,429 lb. and 1,097,672 lb. For the 10 months of 1917 total exports from domestic ores were 82,535,280 lb. and from foreign ores 33,489,641 lb. The extent of the falling off is shown by the fact that the exports from domestic ores for the first 10 months of 1916 were 176,393,359 lb. Exports produced from foreign ores showed an increase over those exported in the first 10 months of 1916, when 16,244,637 lb. was forwarded. Imports of lead from Mexico during October were 3,941,213 lb., which is only a slight increase over the imports of October, 1916. The imports for the first 10 months of 1917, however, were 78,783,437 lb., which is more than double the Mexican imports for the corresponding period of 1916.

Manganese imports continue to run well ahead of those of 1916. In October, 1917, shipments from other countries totaled 60,649 tons. The total amount of imports for the year up to the first of November was 555,282 tons. At the corresponding time in 1916, 495,300 tons had been brought in.

Importation of pyrite is falling behind the average of 1916. At the end of October, 1916, the monthly average was slightly more than 100,000 tons. During the first 10 months of 1917, the monthly average was 78,567 tons. That average was exceeded in October, 1917, however, when the total imports were 94,119 tons.

Imports of tin are slightly in excess of those of 1916, due largely to the heavy imports in October, when 10,628,102 lb. was brought in. Imports for the 10 months ended Oct. 31, 1917, were 126,125,792 lb. For the corresponding period of 1916 imports were 121,048,537 pounds.

Who Dictated the Coal Shortage?

(New York Sun)

It is nonsense to try to explain away the coal shortage, and the peril to human life occasioned by that shortage, by alleging either military necessity or economic conditions, or, again, the act of God.

As is always the case when human authority undertakes not merely to supplement but to supplant the natural laws of supply and demand, the responsibility for a great failure, murderous in its possibilities, is personal and individual. It goes back directly to the incapacity or the lunkheadedness of somebody, somewhere—some individual or individuals.

The plainest and most urgent duty of an investigating Congress is to discover the somebody, to locate the somewhere. The Senate Committee on Manufactures, which is already concerning itself with the achievements and deficiencies of food and coal dictatorship, cannot address itself too promptly or too vigorously to this immediate task.

Turn on the light, first of all, on the blunderers who are capable of turning off the heat, in blizzard or near blizzard weather, from a city of five millions of people! Let there be no chance of a repetition of Saturday's and Sunday's experience.

Turn on the light, first of all, on the origin and creation of a coal famine throughout a country blessed with coal to burn for hundreds or thousands of years to come.

Merrill Regulating Arsenic Industry

WASHINGTON CORRESPONDENCE

The arsenic industry was placed under the direction of the Food Administration on Nov. 15, since which time efforts have been made to collect statistics regarding the metal, exact information of this nature being scarce. With the matter practically settled of determining reasonable profits for producers and others engaged in the arsenic trade, C. W. Merrill, head of the chemical division of the Food Administration, is now turning his attention to those industries which may be called upon to lessen their consumption of arsenic.

To provide sufficient arsenic for all necessary uses of insecticides and to maintain a stock adequate to protect crops against the sudden coming of any insect plague, some curtailment will probably be necessary in its consumption for less essential purposes. It is believed, however, that such reduction can be made without seriously disturbing any industry. This is particularly true in glass making which consumes one-third of the arsenic production. An increasing drain on the scant supply of arsenic is caused by its use in making poisonous gas for military purposes. Control of the arsenic situation has been simplified by licensing wholesalers and jobbers and by the securing of priority movement of the metal from points of production. At the request of Mr. Merrill, mining companies, both in the United States and in Mexico, are endeavoring to make a greater saving of this substance.

Foreign Trade in Lead and Zinc

Imports of lead and zinc during August, September and the first nine months of 1917 are reported by the Department of Commerce as follows:

Articles and Countries	August Contents, Lb.	September Contents, Lb.	Jan.-Sept. Contents, Lb.
Lead Ore:			
Canada		21,795	7,994,322
Salvador			3,117
Mexico	748,462	937,633	12,300,847
Chile			1,194,749
Peru			348,072
Italy			46,719
England			8,609,804
German Africa			4,405,145
France			120,102
Panama			6,084
Others			2,491
Totals	748,462	959,428	35,031,452
Lead—Base Bullion and Bullion:			
Dutch East Indies	505,064	229,090	837,028
Peru		14,058	64,443
Canada		139,033	1,304,964
Mexico	13,046,929	10,076,266	62,541,377
Totals	13,551,993	10,458,447	64,747,812
Lead—Pigs, Bars, etc.:			
Panama	14.688	938	61,076
Barbados			2,814
Colombia			3,155
Haiti	211	420	39,133
Canada	2,632		330,414
Guatemala			52,400
England			80,188
Mexico	1,221,930	1,555,533	5,065,272
Peru	8,936		18,948
France			89,086
Chile			8,769
British West Indies	13,867		27,313
Others		2,305	9,391
Totals	1,262,264	1,559,196	5,787,959

The gross weight of lead ore imported in September was 3032 long tons.

The actual tonnage of zinc ore imported in September amounted to 9749 long tons. The countries of origin and the metal contents were as follows:

Countries:	August Contents, Lb.	September Contents, Lb.	Jan.-Sept. Contents, Lb.
Canada	1,672,827	964,000	7,390,789
Australia			23,427,162
Mexico	8,343,275	6,924,290	79,001,950
Spain			12,166,840
French Africa			1,245,000
Italy	2,000,000		4,822,400
	12,016,102	7,888,290	128,054,141
Zinc in Blocks, Pigs, etc.:			
Costa Rica		312	7,315
Panama	4,281	19,956	48,730
Cuba	12,817	8,787	255,539
Mexico			3,318
Ecuador			7,580
Canada	14,619		31,805
Brazil			5,513
Colombia			6,000
Jamaica			2,165
Others	2,273		4,035
	33,990	29,055	372,000

Exports of lead and zinc were as follows:

Lead:	August Contents, Lb.	September Contents, Lb.	Jan.-Sept. Contents, Lb.
Pigs, bars, etc., produced from domestic ore	3,810,021	8,692,397	77,205,872
Pigs, bars, etc., produced from foreign ore	178,301	207,322	12,450,281
Zinc:			
Pigs, etc., produced from domestic ore	18,322,974	13,619,619	222,570,009
Pigs, etc., produced from foreign ore	1,515,071	39,249,110	106,021,194
Sheets, etc	4,242,651	3,878,504	23,319,504

Legislation looking to the stimulation of domestic mineral production is being considered by the House Committee on Mines and Mining. A bill to this end probably will be introduced by Representative Foster upon the reconvening of Congress after the holiday recess.

Comfort Fund for the 27th Engineers Climbing Rapidly

The Comfort Club fund for the 27th Engineers has passed the $4600 mark. This is a good beginning and encourages us to hope that a great success will crown the effort to raise a fund for the mining regiment. The list of contributions to date is as follows:

CONTRIBUTIONS TO THE COMFORT CLUB

"Engineering and Mining Journal"	$1000.00
New York Engineering Co	1000.00
A Friend, Nov. 23	5.00
H H.	5.00
D. E Charlton	5.00
H. W. Hardinge	1000.00
Frank N. Spencer	5.00
W. L. Coursen	5.00
J. H. Polhemus	5.00
J. H. Janeway	10.00
Albert D. Beers	10.00
J. E. Hayes	10.00
J. A. Van Mater	25.00
L. Vogelstein & Co	100.00
"Cuprite"	10.00
R. H. Bassett (Hanna Ore Mining Co.)	10.00
A Friend, Dec. 10	10.00
P. A. Mosman	10.00
American Zinc, Lead and Smelting Co	100.00
J. G. H.	5.00
A Friend, Dec. 13	50.00
Daniel Guggenheim	100.00
Willard S. Morse	25.00
August Heckscher	100.00
Anaconda Copper Mining Co	1000.00
Total	$4605.00

The mining regiment and the Comfort Club are both new to the mining industry. The war has produced the unusual in many forms. We are being asked daily to do things unheard of a few years ago. That we would ever engage in a European war itself seemed unthinkable and the possibility that American miners would be called on for service abroad was never dreamed of. There have been other wars and other volunteers before now in our history, but this war is unique in the specialization it demands. So it is that we have railway regiments, lumberjack regiments and, newest of all, the mining regiment, the 27th Engineers. Men are pouring into Camp Meade, in Maryland, from hundreds of scattered camps to form this regiment, and soon it will be on its way to the front. The men have left their homes behind, but the home worries will go with them across the water. What are we going to do about it? What are *you* going to do about it?

The Comfort Club exists to make life as comfortable as possible for these men. To achieve this we must do more than furnish tobacco, cigarettes, etc. We must make the men feel that all is well with their families back home; that there are those who have a friendly interest in them and are ready to help quickly in any way that may be needed. Otherwise the morale of the men may weaken. The extent to which such service may be rendered will depend on the size of the fund available. All can help—all should help. The Twenty-Seventh is peculiarly your own regiment, made up of friends, acquaintances and recent fellow-workers.

Mr. Manager, after you and your company have subscribed to the Comfort Fund, keep the ball rolling. Interest your men in it. Keep it fresh in their minds. The Fund has no limit. There can be no limit. It must be continually replenished as fast as it is spent. The officers of the regiment, headed by Maj. O. B. Perry, will aid in administering it. Make your checks or orders payable to the *Engineering and Mining Journal* and watch the next issue to see them acknowledged. Remember the men in the Twenty-Seventh.

Personals

Leighton Stewart is examining mining properties in British Columbia and will be gone approximately one month.

A. J. Eveland, of New York, sailed last week for South America, where he will be engaged in field work for several months.

S. H. Hamilton, of Philadelphia, is directing the mining and milling operations of the Carolina Chrome Co., of Waynesville, North Carolina.

D. C. Jackling has been appointed by Secretary Baker to take charge of the construction work of Government explosives plants, involving an expenditure of $90,000,000 or more.

P. G. Beckett, general manager of the Old Dominion Co. at Globe, Ariz., has been appointed an assistant to the president of the Phelps Dodge Corporation. He will make his headquarters at New York.

Morril B. Spaulding, who has been associated with the U. S. Shipping Board Emergency Fleet Corporation, at Washington, D. C., is now assistant engineer with Chester Shipbuilding Co., Ltd., at Philadelphia, Pennsylvania.

E. M. Dunn, who has been for several years in the laboratory of the Washoe smeltery of the Anaconda Copper Mining Co., at Anaconda, Mont., has accepted a position with the U. S. Bureau of Mines and left Anaconda, Dec. 11, to assume his new duties.

W. H. Armstrong, of Vancouver, B. C., government director of coal operations, has been appointed a commissioner to investigate the labor dispute between the Consolidated Mining and Smelting Co. of Canada, at Trail, B. C., and its employees, which had resulted in the stoppage of the metallurgical operations.

Charles T. Bragg will take the position of works manager of the Detroit plant of the Michigan Smelting and Refining Co. on Jan. 1, 1918. Mr. Bragg is a past president of the Detroit section of the American Chemical Society. He has been chemical engineer of the Ohio Brass Co. for six years and was for over four years technical director of Berry Bros., of Detroit.

Charles A. Piez, president of the Link-Belt Co., who was recently made vice-president of the Emergency Fleet Corporation in charge of shipbuilding, has been appointed general manager of the latter corporation, succeeding Admiral Frederick R. Harris, resigned. Since his graduation from the Columbia School of Mines in 1889, Mr. Piez has been connected with the Link-Belt Company.

Robert K. Tomlin, Jr., managing editor of "Engineering News-Record," sailed recently for France to serve that and the other papers of the McGraw-Hill Publishing Co., Inc., as special correspondent at the front. Mr. Tomlin was graduated from Harvard University in 1907. After graduation he entered the employ of the Pennsylvania R.R. on the tunnel work in connection with the Pennsylvania Station in New York. He left this work to go to the New York Board of Water Supply, and was stationed with the northern aqueduct department at Poughkeepsie, N. Y. His journalistic experience dates from March, 1909, when he became assistant to the editor of the "Engineering Record." He was subsequently made associate editor, in charge of the municipal and sanitary field, and in 1913 was promoted to managing editor. When "Engineering News-Record" was formed last April by the consolidation of "Engineering News" and the "Engineering Record," Mr. Tomlin was made managing editor.

Obituary

James Sheakley, the first Governor of the Territory of Alaska, died at his home in Greenville, Penn., on Dec. 10, aged 90 years. He was one of the pioneer oil men of the Western Pennsylvania field. In 1874 he was elected to Congress and two years later was one of the leaders in the Hayes-Tilden Presidential election contest. After serving for several years on the Alaskan Commission he was appointed Governor of Alaska in 1893 by President Cleveland.

Lieut. Benjamin Walcott, son of Charles D. Walcott, secretary of the Smithsonian Institution at Washington, D. C., and formerly Director of the U. S. Geological Survey, has been reported killed in France. Lieut. Walcott, who was an American aviator, successfully brought down his adversary in his first encounter. While returning, however, he was attacked by three German machines; his airplane was seen to fall. He was 21 years old and was graduated from Princeton last spring.

Societies

Montana Society of Engineers held its December meeting in Butte on Dec. 10, at the Society's rooms. A paper was presented by Theodore Simons, entitled: "A Coöperative System of Engineering Education." An informal report on copper mining in the Belgian Congo was made by Robert M. Johnson, an engineer in the employ of the Katanga mines.

Northwest Mining Association—Frank C. Bailey, secretary of the association, has commenced active work for the annual convention which will be held the week of Feb. 11 to 19, 1918. He has opened correspondence with mining men and prospectors all over the Northwest, urging them to send samples of ore to be placed on exhibition. Arrangements have been made to have the samples shipped without freight charges.

Colorado Chapter, American Mining Congress, has elected the following officers: Bulkeley Wells, governor; J. F. Welborn, first vice governor; R. S. Ellison, second vice governor; S. D. Nicholson, third vice governor; Irving T. Snyder, treasurer; and M. B. Tomblin, secretary. A committee composed of George L. Nye, W. B. Hodges, A. E. Humphreys, John T. Barnett and L. L. Aitkin has been sent to Washington, D. C., to confer with the executive branch of the Government on the subjects of the excess war-profits tax and the fixation of the price of silver.

Advisory Council of Scientific and Industrial Research of Canada has appointed a subcommittee on chemistry, including the following members: Dr. R. F. Ruttan, McGill University; Prof. J. W. Bain, University of Toronto; Dr. John Bates, superintendent Forest Products Laboratory of Canada, Montreal; Dr. F. J. Berchard, Dominion Grain Laboratory, Winnipeg; Prof. Adam Cameron, University of New Brunswick; Dr. W. H. Ellis, Dean of the Faculty of Applied Science, Toronto University; Dr. W. L. Goodwin, director School of Mines, Kingston; Dr. Milton L. Hersey, Montreal; Dr. F. M. G. Johnson, Dragon, Que.; Prof. A. F. L. Lehmann, University of Alberta; Dr. E. A. Lesueur, Ottawa; Prof. E. Mackay, Dalhousie University; L. C. Mackie, chief chemist Dominion Steel Corporation; Prof. D. McIntosh, University of British Columbia; Prof. R. D. McLaurin, University of Saskatchewan; H. W. Mathewson, Shawinigan, Que.; Prof. M. A. Parker, University of Manitoba; T. H. Wardleworth, Montreal.

Arizona Chapter, American Mining Congress, was organized as follows for the year 1917-18 at the annual meeting at Phoenix, Ariz., on Dec. 3-4: Officers: Joseph P. Hodgson, Bisbee, governor; L. S. Cates, Ray, first vice president; Robert E. Tally, Jerome, second vice president; Norman Carmichael, Clifton, third vice-president; Joseph E. Curry, Bisbee, secretary; H. J. McClung, Phoenix, treasurer. Directors: J. P. Hodgson, Bisbee; B. Britton Gottsberger, Miami; W. B. Gohring, Warren; George Kingdon, Jerome; J. C. Goodwin, Tempe; Norman Carmichael, Clifton; L. S. Cates, Ray; G. H. Dowell, Douglas; Robert E. Tally, Jerome; J. A. Burgess, Oatman; J. Kruttschnitt, Jr., Tucson; G. M. Colvocoresses, Humboldt; W. C. Browning, Superior; and W. G. McBride, Globe. The meeting appointed the following committee to acquire data on present costs of production, and on the number of leasing and other small operations that will be forced to cease in the event of reduction in copper price: Norman Carmichael, Clifton-Morenci; G. M. Colvocoresses, Humboldt; J. Kruttschnitt, Jr., Tucson-Hayden; W. C. Browning, Superior; Joseph E. Curry and G. H. Dowell, Bisbee-Douglas; R. H. Boyd, Globe; L. O. Howard, Miami; Robert E. Tally, Jerome.

Industrial News

Wellman-Seaver-Morgan Co., Cleveland, has taken an order from the Chile Copper Co. for a 12-ton ore bridge for use in connection with leaching vats.

Sullivan Machinery Co. announces that its Salt Lake City office has been moved to the Walker Bank Bldg., Room 1606. Burt B. Brewster is manager of the office.

Sullivan Machinery Co. has appointed Joseph H. Brown, hitherto assistant manager of its New York office, to be district sales manager at Chicago to succeed William P. J. Dinsmoor, who has resigned to engage in business in Denver, Colorado.

Hardinge Conical Mill Co. has received an order from the Homestake Gold Mining Co., of South Dakota, for an 8-ft. conical ball mill to work in competition and conjunction with the stamps of that company, which now has over 1000 stamps in daily operation. The Hardinge company believes that this mill, occupying the space of 10 stamps, will do the work of between 80 and 100 stamps.

Walworth Manufacturing Co., of Boston, Mass., makers of iron pipe fittings, valves, etc., announces that J. C. Bannister has been made a vice president of the company. Mr. Bannister has been connected with the manufacture of product for 26 years, starting with the Haxtun Steam Heater Co., at Kewanee, Ill., where he rose to be chief engineer. He was superintendent of the Kewanee Boiler Co. when the National Tube Co. took over the Western Tube Co. at Kewanee and was made manager of the plant, which was purchased by the Walworth Manufacturing Co. in August, 1917. Mr. Bannister will continue as manager of the plant at Kewanee.

New Patents

United States patent specifications listed below may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

Aluminum—Process for Producing Aluminum Compounds. Frank Langford, Eureka, Calif. (U. S. No. 1,249,125; Dec. 4, 1917.)

Concentrators, Attachment for. Francis R. Hardie, Salt Lake City, Utah. (U. S. No. 1,249,078; Dec. 4, 1917.)

Conveyor. Fred Reed and Sam L. Inge, Bisbee, Ariz. (U. S. No. 1,248,714; Dec. 4, 1917.)

Dump Car. Herbert R. Keithley, Michigan City, Ind. (U. S. No. 1,248,666; Dec. 4, 1917.)

Dust Collector for Drills. Clayton F. Greene, Lead City, S. D., assignor of one-half to John Sandhoff, Lead City, S. D. (U. S. No. 1,249,070; Dec. 4, 1917.)

Fluid-Operated Drill. Louis W. Greve, Cleveland, Ohio, assignor by mesne assignments to the Cleveland Rock Drill Co. (U. S. No. 1,248,481; Dec. 4, 1917.)

Grab Bucket. William H. Botten, Cleveland, Ohio, assignor to the Owen Bucket Co., Cleveland, Ohio. (U. S. No. 1,248,605; Dec. 4, 1917.)

Hoisting and Conveying Apparatus. Walter Zetzman, Cornelius, Ore. (U. S. No. 1,248,980; Dec. 4, 1917.)

Hoisting and Dumping Apparatus. Charles E. Bathrick, Chicago, Ill., assignor to Frederick C. Austin, Chicago, Ill. (U. S. No. 1,248,600; Dec. 4, 1917.)

Metal Alloy Containing Gold, Silver and Osmium. Hugh S. Cooper, Cleveland, Ohio, assignor to the Electro Metals Products Co., Cleveland, Ohio. (U. S. No. 1,248,621; Dec. 4, 1917.)

Mine Cars, Keeper For. Albert William Spaht and George R. Jacobs, Christopher, Ill. (U. S. No. 1,249,231; Dec. 4, 1917.)

Oil Wells, Method of Shooting. James E. McAvoy, Foxburg, Penn. (U. S. No. 1,248,689; Dec. 4, 1917.)

Refractory and Process of Making Same. James O. Handy and Robert M. Isham, Pittsburgh, Penn., assignors, by mesne assignments, to Allen S. Davison Co., Pittsburgh, Penn. (U. S. No. 1,248,486; Dec. 4, 1917.)

Spelter, Process for Producing. Charles H. Fulton, St. Louis, Mo., assignor by mesne assignments, to Metallurgical Laboratories, Incorporated, Chicago, Ill. (U. S. No. 1,249,061; Dec. 4, 1917.)

Segregating Minerals, Method of and Apparatus For. Hiram E. Taylor, North Adams, Mass., assignor to National Metals Co., Phoenix, Ariz. (U. S. No. 1,248,948; Dec. 4, 1917.)

Steel—Apparatus for Heat Treatment of Steel. Thomas J. Fay, Brooklyn, N. Y., assignor by mesne assignments, to the Standard Parts Co., Cleveland, Ohio. (U. S. No. 1,249,056; Dec. 4, 1917.)

Steel—Process of Producing Steel in Side-Blown Converters. John H. Hall, New York, N. Y., assignor to Taylor Wharton Iron and Steel Co., High Bridge, N. J. (U. S. No. 1,249,075; Dec. 4, 1917.)

White-Metal Alloy. Henry K. Sandell, Chicago, Ill., assignor to Herbert S. Mills, Chicago, Ill. (U. S. No. 1,248,925; Dec. 4, 1917.)

Editorial Correspondence

SAN FRANCISCO—Dec. 15

Embargo on Gold-Mine Supplies as has been proposed caused some uneasiness in California and Nevada mining districts until the receipt of a telegram from Senator Newlands to the Nevada Mine Operators' Association and another from Albert Burch, of San Francisco, now in Washington, on behalf of the interests of the California Metal Producers' Association. Senator Newlands wire stated that the Priority Board assures him that nothing of the kind is now contemplated. Mr. Burch's dispatch stated that he was informed the rumor was without foundation. Whatever may have been intended or abandoned by the Priority Board respecting such an embargo is of less interest just now than the fact that immediately the statement or rumor was circulated in the Pacific Coast mining regions, the Nevada and the California mining men's associations got busy and were prepared to enter strong protests against any contemplated infringement on the rights of gold miners to protect their properties by continuous operation. Gold miners are not making great profits. The purchasing power of the gold they produce is prohibitive and about all the most of them can do is to keep the propertes operating, and that only by the practice of the strictest economy. Gold may not be just now an actual and active essential in the conduct of the war, but no one would be so foolish as to deny the ultimate necessity for both gold and silver. And no one in the smallest way acquainted with the operaton of gold mines will dispute the present necessity for conserving gold-mining property. An embargo on gold mines would mean the closing down of most of the properties in California and Nevada. Such an embargo would include such mines as the North Star, Empire, Brunswick and others in Nevada County and the Plymouth, Kennedy, Argonaut, Melones and others in the Mother Lode region and the Comstocks and the Goldfield Consolidated and other such properties in Nevada. Within the last five years, gold mining in these states has advanced through the adopton of improved metallurgical methods. Many old producers have been reopened and again placed in the producing class and new properties have been made productive by the application of modern methods of treatment of the ores. An embargo on gold mine supplies and commodities consumed by the labor employed would mean disaster that in many camps would amount to a calamity. Should the Priority Board at any time contemplate such embargo the mining men of the West will be ready with a protest that no intelligent body of men could ignore under the present conditions.

BUTTE—Dec. 15

Safety-First Campaign of the mining companies was advertised in large and highly interesting illustrated pages of the daily papers recently. The Anaconda Copper Mining Co., the Butte & Superior Mining Co,. the East Butte Co. and the Butte Street Railway Co. made a praiseworthy attempt to bring home to the general public the duty of protecting life and limb. Attention was called to the right way and wrong way of doing things and requesting coöperation between operating companies, workmen and the general public to bring about a decrease in avoidable accidents.

Coal Reduction of 50c. per Ton on one-ton lots and a saving of 75c. per ton on two-ton lots to the consumer has been made by the fixing of prices effective Dec. 10, by the County Fuel Committee in Silver Bow County. This was contrary to all expectations and was done over the protest of the retail dealers. Failing to have these prices modified by the local committees, the retail dealers have appealed to higher authority and have been promised a hearing before W. E. Dick, an examiner of the Federal Trade Commission, now in Montana. Whether the results will mean a return to the old prices or not is to be seen.

Decision Affecting Taxation of Minerals was handed down on Dec. 11 by the Supreme Court of Montana, denying the petition of the state for a hearing of the case of the Northern Pacific Ry. vs. Musselshell County, involving the taxation of coal reservations. Referring to the taxation of mines, after referring to net proceeds and improvements, the court holds that: "Mines are to be taxed upon their surface, (a) if bought from the United States, at the price paid therefore, unless (b) such surface is used and has a value for other than mining purposes, in which event they are taxable at such value; or (c) if not bought from the United States, then at the value of such surface consideration as real estate without reference to such mineral content below the surface."

DENVER—Dec. 15

Fluorspar Deposits in Colorado have received considerable attention during the last year. Many deposits of this mineral have been investigated and several properties are in active operation. In the Jamestown district, in Boulder County, the Emmett, Invincible, Harlow, Rattler and Terry properties have been the principal producers. Prices have ranged from $6.50 to $8.50 a ton. In the San Juan district, the Barstow mine, near Red Mountain, has been converted practically into a fluorspar mine, a 9-ft. vein of this material of good quality having been opened.

Gold Mining may be declared a nonessential industry by the Government. This possibility is giving the mining men of Colorado much concern, because shutting down the gold mines of the state will throw about 4000 men out of work, at least temporarily. The Cripple Creek district will be hard hit although many of the gold-mining companies are operating at little profit on account of the great increase in the cost of supplies. If it is shown that the Government needs the cars, which are now being used for hauling ore and gold-mining supplies, for coal and war materials, then the mining men of the state will cheerfully coöperate with the Government in the interest of establishing necessary military efficiency.

WALLACE, IDAHO—Dec. 15

Idaho School of Mines at Moscow, will conduct a short course this winter with a view to preparing substitutes for the young professional and technical men filling positions as assayers, analyists and mine surveyors who have gone to the army. "We are receiving every day calls for men to fill such positions and do not know where to turn for a single man," says Dean F. A. Thompson. "Young men not yet of draft age or those who for various causes have been exempted will do well to consider the opportunities thus afforded. While of course the training must of necessity be largely of an empirical kind, we feel that this is a time for emergency courses and for the brushing aside, if need be, of academic precedents."

Value of Hercules Mine in October, 1916, was one of the essential questions in the trial being heard by Judge Deitrich, in the Federal court at Coeur d'Alene, which is nearing a close. Also, was Mrs. Mathilde Cardoner, who sold her one-sixteenth interest to Eugene R. Day and Mrs. Eleanor Day Boyce for $312,000, being on a basis of $5,000,000 for the property, induced to sell by false representation? Although the mine had paid in round figures $10,000,000 in dividends up to the date of the sale, beginning in 1901, from ore taken from above No. 5 tunnel, and although the oreshoot had been found practically the same at a depth of 500 ft. below this level and that it was reasonably certain, based upon the development of similar veins in nearby mines, that it would be profitably mined to a depth of 1800 ft. below No. 5, Eugene R. Day contended on the witness stand that he paid a high price. He referred to his purchase of the Samuels and Reeves interests many years ago on a valuation of $4,000,000 for the mine, and advanced the further reason for this opinion that there is a steady increase of iron in the ore with depth and a decrease in silver. He denied that he had withheld any information from Mrs. Cardoner, or that he had any design to get the interest until it was offered to him by Allen, and that he finally paid the excessive price to prevent the interest falling into the hands of outsiders and to secure control for the Day family. L. W. Hutton, who is one of the Hercules owners, said he told Mrs. Cardoner about the time she made the sale that $4,000,000 was a good price for the mine, "everything considered." He said he expected the ore to run out or be unprofitable at a depth of from 500 to 700 ft., and that he had the word of the foreman that it would last only seven or eight months. Frederick Burbidge, mining engineer and general manager of the Federal company, testified as a valuation expert for the Days. He had made a personal examination of the mine 10 days ago, which, in connection with the company records, was the basis of his conclusion that at the time of the purchase of the Cardoner interest the value of the mine was $6,454,423 and that it would take 9.4 years to get that value out of it. He also stated that the investments of the Hercules in the Northport smeltery and the Pittsburgh refinery should be deducted as they would be of no value after the mine was worked out. W. Earl Greenough, mining engineer, as valuation expert for Mrs. Cardoner, estimated the value of the ore in the Hercules in October, 1916, as $10,750,000, not including ore in transit and cash on hand. He stated that the average price of lead for the period from 1906 to 1915, inclusive, was $4.55 per 100 lb., and for silver, 56c. per oz., giving the "Engineering and Mining Journal" as authority for these figures. In giving his estimate of the value of the ore in the mine he figured lead at $4.50 per 100 lb. and that the mine would be profitably worked at a depth of 1600 ft. below No 5. Harry L. Day and Jerome J. Day denied that they had anything to do with the deal; that they regarded the price paid Mrs. Cardoner as too high, and that they hesitated about taking a fourth interest subsequently at that figure. Attorneys for Mrs. Cardoner introduced an extract from the 1913 report of State Mine Inspector Robert N. Bell, in which he referred to the permanent character of the ore veins in the section in which the Hercules is situated, and described the Hercules oreshoot, 200 ft. below No. 4 tunnel, as better than ever and the longest oreshoot known in the Cœur d'Alene district.

CALUMET, MICH.—Dec. 13

Flint Blocks for Calumet & Hecla will be obtained from southern Tennessee for lining the Hardinge conical mills. Some time after the war broke out, the supply of Belgian quarried flint blocks having begun to run low, E. T. Lull, of Winona, Mich., who had formerly lived in Tennessee returned there to develop iron properties, and ran across a series of the Mississippian period, 200 ft. thick of interbedded flints, shales and limestones, the strata of the first running from 1 in. to 50 ft. in thickness. Learning that the Calumet & Hecla was looking for a supply of flint blocks in this country, he obtained options and had some blocks quarried and C. H. Benedict, metallurgist of the Calumet & Hecla, gave them a thorough trial, finding them satisfactory. The company then sent their geologist, C. D. Hohl, to Tennessee to ascertain the extent and prevailing quality of the beds, and as his report was favorable, the company ordered a supply and have been using these blocks ever since. The blocks in some minor respects are not considered so good as the Belgian, but they do the work required of them, and it is likely that improvements will be made in their selection and in the manner of getting them out so that they will closely approach the highest standards. The American Flint Co., the producing company, has its headquarters at Iron City, Tenn., which is situated a few miles north of the Alabama border.

MARQUETTE, MICH.—Dec. 13

Navigation Will Be Kept Open between upper and lower lakes as late as possible this winter. Coast guards are ordered to remain at their stations until Jan. 1 and the light houses will operate until that date. The explanation is contained in the following telegram from the general operating committee of the Railroads War Board to the vessel owners on the Great Lakes: "In view of the relief which water transportation on the Great Lakes affords to the congested railroads in the Eastern territory, your coöperation is solicited in an effort to extend the season of navigation as long as possible." On Dec. 8 the Government requisitioned the car ferry "Sault Ste. Marie," of the Duluth, South Shore & Atlantic Ry., at the Straits of Mackinac, and sent her to the channel below the locks to act as ice breaker through Hay Lake and Mud Lake. With this assistance vessels can continue long beyond the usual closing of navigation if temperatures below normal do not occur. Blizzards and "below zero" weather on Lake Superior, Dec. 8 to Dec 10, checked the ore movement, the carloads freezing solid when delayed, but the movement of coal to the head of the Lakes and grain to Lake Erie continues [Later dispatches of Dec. 15 announced the closing of navigation at midnight.—Editor]

Marquette Range Shipments of iron ore by way of the port of Marquette for the season of 1917, total 3,213,022 tons, as compared with 3,858,092 tons in 1916, a decrease of 645,070 tons. The decrease is due largely to the delay in opening navigation; an ice blockade held in place by a 40-day north wind prevented the free dispatch of ore carriers until six weeks after the usual date of opening of navigation. Slow dispatch at Lake Erie ports and scarcity of boats is slightly blamable for the reduced tonnage. At the Lake Superior & Ishpeming dock, Presque Isle Harbor, the "Peter White" cleared May 18, but with six other boats was ice bound off this port for days. The first boat to clear at the Duluth, South Shore & Atlantic docks, Marquette Harbor, was the "W. L. Brown," May 29, and this was the only boat cleared before July 1. Due to the ice, free dispatch of boats was impossible before June 15. Because of summer weather conditions in November, the Lake Superior & Ishpeming dock broke its November record with 256,048 tons, 30% in excess of 1916 November shipments. Practically all docks on Lake Superior broke their November record. The ore-shipping season at Marquette closed Dec. 10, although navigation of Lake Superior remains open. Presque Isle Harbor sent its last boat out Nov 30 and Marquette Harbor its last, Dec. 10. Shipments from the port of Marquette for 1917 follow, with the 1916 tonnages in parentheses: From the L. S. & I. dock, Presque Isle Harbor, Cleveland Cliffs Iron Co., at Republic, 167,157 tons (201,656 tons in 1916); North Lake, 157,997 (266,464); Ishpeming and Negaunee, 1,576,748 (1,447,508); Gwinn, 482,935 (500,621); Regent Iron Co., Negaunee, tonnage unreported; Lake Superior Iron Co., Ishpeming, 61,690 (111,052), E. N. Breitung & Co., Negaunee, 42,242 (41,144); Jones & Laughlin Ore Co., Negaunee, tonnage unreported; total Presque Isle Harbor tonnage was 2,488,766, compared with 2,912,702 tons in 1916; 338 boats were loaded with average cargo of 7363 tons; from Duluth, South Shore & Atlantic Dock, Marquette Harbor, shipments amounted to 724,256 tons in 1917, comparing with 945,390 tons in 1916 Shippers were: E. N Breitung & Co., Negaunee, Oliver Iron Mining Co., Ishpeming and Negaunee; American-Boston, Diorite; Republic Iron and Steel Co., Negaunee and Richmond Iron Co., Negaunee. The average cargo of 139 boats loaded was 5210 tons.

ISHPEMING, MICH.—Dec. 11

Stocking Ore commenced with the close of Lake shipping and conditions are favorable for a large winter production as stockpiles have been generally cleaned up. While all-rail shipments of considerable magnitude will be a winter innovation on the Menominee range, the Marquette range will not ship all-rail other than the usual shipments to supply the furnaces in this region Extremely favorable weather made possible a strenuous finish to a season marked by delayed dispatch.

Removal of State Constabulary from Negaunee is protested by the mayor, the marshall and mining officials as it is felt that the presence of the mounted troop and the activity of it's officers in suppressing trouble makers has had a salutatory effect on the peace of the region. Being centrally quartered at the old Jackson Mine office, the troop is able to quickly reach any point near the center of the upper peninsula and their ability to suppress incipient trouble has frightened agitators from the district. The troop furnished valuable service to the Government in rounding up slackers and objectors in Gogebic County, having made important arrests on the Marquette Range and their presence is a valuable influence for order in this section. The recent inspection of the troop by Col R. C. Vandercook and Major Phillips was quite commendatory of the discipline maintained by Captain Marsh.

DULUTH, MINN—Dec. 14

Ore Shipments from Duluth Docks were closed at the head of the Lakes on Dec. 11. All the docks with the exception of the Great Northern and the Northern Pacific have fallen short of last year's shipments which were record outputs. Following are the actual figures of the season with the tonnage for 1916 in parentheses: Duluth, Missabe & Northern, 20,567,420 tons in 1917 (21,837,849 tons in 1916); Great Northern, 11,550,917 tons (11,091,019 tons); Duluth & Iron Range, 9,990,900 tons (10,735,825); Northern Pacific, 695,021 tons (417,012); other additional shipments amounted to 1,712,965 tons; total for 1917, 44,517,221 tons comparing with 45,360,760 tons during the preceding year.

JOPLIN, MO.—Dec. 15

American Metal Co. has taken over the tract of 3500 acres, near Baxter, Kan., obtained some months ago by the Miami Zinc Syndicate, supposedly a subsidiary of the Butte & Superior Co., or at least including a number of its heaviest stockholders. The American Metal Co. has been operating in this district for some time under the name of the Chanute Spelter Co., also having an office in Joplin under the name of the American Metal Co. It has numerous leases north and northwest of Baxter already, and has been making good strikes on some of them, particularly those near Crestline, Kan. The acreage involved in the latest addition to the company's holdings was obtained for the Butte & Superior interests some months ago by Victor Rakowsky, of Joplin. The deal for the transfer to the American Metal Co. is known to have been under way for several weeks.

Relief From Car Shortage must be obtained immediately or otherwise this district is going to suffer considerable hardship and complications. Many of the mines have so much sold ore in their bins that they cannot continue operation without dumping the ore on the ground or building new bins. They also find it difficult to operate on account of financial reasons, as they are unable to collect in full for ore that the smelters have bought but cannot get delivered. Smelters also are running short of ore, and it is becoming so acute that some of them are threatened with enforced shutdowns unless more cars become avalable. It is estimated that at least 100 cars per week more than are now being received are needed for the district, and this would not give full relief. The heavy snow on Dec. 7, the heaviest the district has experienced in five years, has added to the troubles of the operators.

TORONTO—Dec. 17

Exploration of Manitoba Mineral Areas is being agitated by the Canadian Geological Survey for the base-metal ores now so much in demand in connection with the war. Hitherto prospecting in this province has been almost entirely confined to the search for gold, the prospectors as a class being unfamiliar with the appearance of other ores. In order to encourage exploration for other valuable minerals the Winnipeg "Free Press," acting in conjunction with the Geological Survey, which has furnished most of the specimens, has placed on view a large collection of minerals for the benefit of prospectors, including molybdenite, magnesite, chalcopyrite, hematite, corundum, chromite, galena, mispickle, etc. Dr. R. C. Wallace, professor of mineralogy in the University of Manitoba, in a recent lecture to the Winnipeg Geological Club, made an important proposition to the effect that such of the returned soldiers as preferred open-air vocations and the strenuous life to indoor callings should be trained as prospectors. He suggested that the work of training should be taken up by the universities with government assistance and employment assured to those found fitted. As the question of finding employment for returned soldiers is one of increasing urgency, the proposal is likely to find favorable consideration.

The Mining News

ARKANSAS

Boone County

GROUND HOG (Buffalo)—Machinery arriving for new 100-ton concentrating plant.

BEULAH (Rush)—Operated by Continental Mining Co; will start work in new shaft soon Rebuilding of mill to be completed shortly

Marion County

POLK-KENDALL (Zinc)—Opening deposit of free and milling ore Milling grade being cleaned at Jackson Mining Co's mill

BROWN LEASE (Zinc)—Operated by L. L. Brown, in Coon Hollow, opening deposit of silicate Wamath & Love, operating on old Miller land, also in body of free silicate

ARIZONA

Mohave County

OATMAN SOUTHERN (Oatman)—S R Porter, superintendent, reports shaft reached [illegible] Sinking will be continued for 200 ft

GOLD ORE (Goldroad)—Transformer station and electrical equipment completed Sinking to be much faster, shaft to be sunk to 7[illegible]-ft. depth

Pima County

MAGNATE (Tucson)—Fourth drill hole entered sulphides at 90-ft. depth. Road being constructed to new shaft site, grading being done for power plant.

Pinal County

ASH SPRINGS (Kelvin)—Harp and Odell sold molybdenum property to Tucson men.

TROY ARIZONA (Kelvin)—Shaft reached 500-ft. point; station cut, crosscutting will start at once.

SILVER DIP (Ray)—Being worked under lease. Ores running high in lead and silver from lower crosscut tunnel

CALIFORNIA

NAVAL FUEL RESERVE LANDS of California will be excluded from the provisions of the Oil Lands Leasing Bill, according to an amendment accepted by the Senate as a committee of the whole on Dec 18 A vote on the bill was deferred until Jan 7 This action makes certain the passage of the bill, which will throw open unlimited fuel resources to the public

Amador County

ORIGINAL AMADOR (Amador City)—Samuel Spaich killed Dec 7 by rock fall

Calaveras County

EASZY BIRD (Mokelumne Hill)—Shaft down 200 ft in vein matter carrying payable ore; ball mill operating regularly; 30 men employed.

FISHER (Mokelumne Hill) — Gasoline hoist being installed to be supplanted later by electricity. Shaft down 120 ft.; three 8-hr shifts employed.

GWIN MINING CO. (San Francisco)—Reported sold traction engine and 10 ore cars to sugar plantation in Mexico Situated near border of Amador County between Mokelumne Hill and Paloma. Formerly large producer, but idle for years and under water.

CALAVERAS COPPER CO (Copperopolis)—Being opened to greater depth; maintaining largest output in history Flotation satisfactory and increase in capacity contemplated. Payable ore recently developed

Inyo County

CERRO GORDO (Keeler) — Shipping zinc-silver-lead ore. New territory being developed shows high-grade ore; also high-grade ore coming from main workings In lower level, orebody showing improvement.

Kern County

RANDSBURG-ATOLIA (Randsburg)—Patrick Byrne killed Nov. 10 by fall of rock from bucket in shaft.

Los Angeles County

WESTERN CHEMICAL CO. (Long Beach)—Alex M. Schwitalla, secretary, Wilfred Schwitalla and William Rittle, a watchman, arrested and held pending investigation of cause of fire Dec. 1, which destroyed building, resulting in damages of $15,000. Company manufactures strontium nitrates for trench torches. This fire was culmination of series of small fires and explosions for last two years.

Nevada County

BLACK BEAR MINING CO. (Grass Valley)—Permit for issue and sale of stock revoked by commissioner of corporations.

Plumas County

NOBLE ELECTRIC STEEL CO. (San Francisco)—Shipping several cars of manganese ore from Crescent Mills weekly to electric smeltery at Heroult in Shasta County.

ARPS COPPER CO. (Copper City)—Making arrangements to sink main shaft 250 ft. deeper and increasing operating force. Shipping ore to Mammoth smeltery at Kennett.

ENGELS COPPER (Engelmine)—W. H. Hall killed Nov. 26 by breaking of restraining dam used to hold tailings. Slight damage done to machinery. Larger dam under construction below site of old dam.

Siskiyou County

GOLD ORE reported disclosed by prospectors on Jackass Creek near Sawyer's Bar. Vein shows free gold. Believed to be a source of enrichment of some of neighboring gravel mines.

HYDRAULIC MINERS in vicinity of Oak Bar prospecting high bedrock points in Klamath River. Christopher Jensen, of McKinney creek arranging for new high-line ditch, preparatory to piping new ground. H. J. Barton leased to Owen, Baldwin & McAllister, the Beaver Creek placer mine; open cut being driven to bedrock.

Tuolumne County

BUREAU OF MINES CAR NO. 1 at Jamestown giving instructions in first-aid work. Previously at Eagle-Shawmut mine. Will go to Oakland next.

COLORADO

Boulder County

LONGFELLOW (Jamestown) — Tunnel being driven to unwater this silver property.

GOLDEN AGE (Boulder)—Standard mill remodeled; aerial tramway repaired. Mine ore and dump will be treated.

CORKSCREW NO. 2 (Lakewood) — Tungsten property owned by Primos Chemical Co. being operated with profit by lessees.

SMUGGLER (Jamestown) — Being reopened. Part will be worked by company, and rest leased. Opened by 475-ft. shaft and extensive workings. Formerly a producer, but shut down on account of litigation. May build flotation plant to treat ore in dump, said to contain 75,000 tons.

Clear Creek County

ROBERTS (Georgetown) — Good-grade ore opened in development.

WALDORF (Georgetown)—Mill making better saving since installation of new tables. Concentrates and smelting-grade ore being shipped.

MOUNTAIN MINING AND MILLING CO. (Idaho Springs) — Leased by Denver men. Mine repaired and electric-driven compressor installed. Development to begin at once.

Gilpin County

HOMER (Central City)—Shipping gold-copper ore. Lateral development under way.

CASHIER MINING CO. (Central City)—Mill being constructed at Pittsburg mine. Meeker shaft being retimbered.

ANNEX (Central City) — Being reopened. Shaft retimbered, gasoline hoist installed, and drifting in good-grade gold-copper ore.

Gunnison County

VARIED MINERAL PRODUCTION of Pitkin district includes tungsten ore from Ida May, molybdenum ore from molybdenite mine and regular shipments of graphite-bearing rock from Ethiopian.

BON TON (Pitkin)—Eastern company has taken lease formerly held by I. L. Johnson. Boarding house being enlarged, office built, and supplies laid in for winter development.

Lake County

DUNKIN (Leadville) — This Fryer Hill property leased by Leadville men. Surface plant installed; new shaft will be sunk.

MATCHLESS NO. 2 (Leadville)—Leasing company secured block 100 ft. square, installed steam hoist, and started retimbering shaft. Shaft will be sunk to sulphide zone, estimated 100 ft. deeper.

MATCHLESS (Leadville) — Being reopened by Denver leasing company. Shaft retimbered to 250-ft. depth and several old drifts reopened, exposing zinc carbonate ore. Diamond drilling indicated large shoot good-grade silver ore. Surface plant installed; shaft sinking will be done later.

La Plata County

COLUMBUS (Durango) — Development opened vein showing high-grade ore.

San Miguel County

TELLURIDE CONCENTRATES SHIPMENTS for November; Liberty Bell, 21 cars to Durango; Smuggler-Union and Black Bear, 22 cars to Pueblo and 32 to Durango; Tomboy, 17 cars to Pueblo and 38 to Durango; Carruthers, two cars; total 132 cars. This compares with 116 cars for November, 1916.

Summit County

EXCELSIOR (Frisco) — Remodeled mill running satisfactorily.

HORN (Breckenridge)—Reopening property. Formerly silver producer.

MUTUAL COÖPERATIVE (Kokomo)—Development on new vein in lower tunnel level satisfactory. Shipping from old workings.

KING SOLOMON (Frisco)—Main tunnel, in one mile, will be driven to cut No. 12 vein. Development on No. 11 vein opened shipping-grade ore.

Teller County

GOLD DOLLAR (Cripple Creek) — Osberg lease shipping 15 cars per month of good-grade ore.

GOLD SOVEREIGN (Cripple Creek) — Operated by Hahnewald Leasing Co. Development satisfactory on 1450-ft. level.

DANTE (Cripple Creek)—Milling-grade ore developed by Big Toad Mining and Milling Co., of Denver.

CATHERINE MINING CO. (Cripple Creek)—New electric plant installed; operations started.

DRAPER AND SADIE BELL (Cripple Creek)—Operated by lessees through 15th level of Jackson shaft of Gold Sovereign company.

CRIPPLE CREEK DEEP LEASING CO. (Cripple Creek)—Working on Jerry Johnson mine; shipped eight cars ore to Golden Cycle mill in October.

CAMP BIRD (Cripple Creek)—Operating Rose Nicol mine; sinking shaft from 800- to 1000-ft. level. Stopped operating through Portland No. 2 shaft.

UNITY MINING AND LEASING CO. (Cripple Creek)—Leasing company operating on one-half Nightingale claim lying on Raven Hill. Shaft 400 ft. deep will be sunk to 800-ft. level. Claim adjoins Maggie claim of Cresson.

MODOC CONSOLIDATED (Cripple Creek)—Station at 1100-ft level of Frankenberg shaft on Ocean View claim completed; developing laterally. Raising from old incline shaft. Ground adjacent to Modoc incline shaft will be leased.

IDAHO

Shoshone County

MARSH (Burke)—Running 200-ton mill full time this month on accumulation of ore. Formerly ran only one-third of each month, the Hecla company using it two-thirds to treat zinc-lead ore.

EAST CALEDONIA (Wardner)—Shaft extended 200 ft. from 400-ft. to 600-ft. level; preparing to crosscut vein for 150 ft. Improvement of ore found in upper levels and commercial ore expected on 600-ft. level. Shaft is two-compartment one and sunk 200 ft. at rate of 100 ft. per month, with total payroll of 12 men. Believed to be record in district for development of this class.

MORNING (Mullan)—Closed down to make necessary repairs in shaft. Shaft is 1200 ft. below main working tunnel. Part in swelling ground caused trouble. Will make permanent repairs by easing ground pressure and reinforcing shaft with heavy timbers, requiring from 30 to 60 days. Employing 600 men, about half of whom have been laid off. Repairs and additions to mill and building of modern dry and change house for miners will require large number of employees. Owned by Federal Mining and Smelting Co.

YUKON GOLD (Murray) — Dredge launched several weeks ago expected to be operating in about 10 days. Electric power line of the Washington Water Power Co., for transmission of power, completed. Company has secured all ground along Prichard Creek, for 14 miles; was prospected during last year and a half, and estimated will produce over $2,000,000. Reported company is negotiating for additional ground along Eagle Creek, a tributary of Prichard; also that company plans putting on two more dredges next year.

MICHIGAN

Copper

INDIANA (Lake Mine)—Both drifts on third level in 650 ft. showing no commercial ore; prospects good.

OSCEOLA (Osceola) — November rock production will be less than 10,000 tons owing to loss of men.

FEDERAL SYNDICATE (Calumet) — Diamond drilling stopped on property, 1½ miles southeast of Phoenix. Drill removed.

HANCOCK CONSOLIDATED (Hancock) —Production for November was 22,879 tons of rock, a falling off due to labor shortage.

NORTH LAKE (Lake Mine)—Northwest drift on eighth level in 1700 ft. showing no ore; southwest drift in 1600 ft. showing no copper since that found at 765 ft.; expect to cut both lodes shortly.

MICHIGAN (Rockland)—No immediate intention of suspending operations; shaft now down 120 ft.; intend cutting loading station. Development on seventh level satisfactory in drift and crosscut on Ogimah lode.

WHITE PINE (Ontonagon)—Continuing to open up ground in spite of high costs. Recovery of copper requires special concentrating conditions. Averages 27 lb. in the two sandstone formations with intervening slate. Diamond drilling to determine dip of beds beyond fault at 1140-ft. depth.

Iron

LAKE ANGELINE (Ishpeming)—Contract for stripping orebody in east end completed; 40,000 tons of ore loaded. Much of ore is under quicksand and mining is so difficult that other methods will be tried next season.

STEPHENSON (Gwinn)—Struck large flow of water of unknown source; since Dec. 4 in spite of all available pumps in district and two bailers, water reached to fifth level. Operations suspended, men being sent to other mines of company, where night shifts have been started to take care of extra men. Miners removed in safety but mechanic installing pipe lines killed while boarding cage through misunderstanding of signals.

MINNESOTA

Mesabi Range

BENNETT (Keewatin)—Stripping operations closed down for winter on account of intense cold. Butler Bros., operators.

PEARSON (Nashwauk)—Just been reopened and washing plant constructed. Will show small shipments for 1917 because of delay in starting. Operated by Shada Mining Co.

MONROE (Chisholm)—Shaft down 300 ft. to be sunk 100 ft. farther. Original shaft lined with monolithic concrete construction; new portion will have lining composed of concrete sets and laths made at company's concrete plant at Hibbing.

LA RUE (Nashwauk)—Ore washed at concentrator, in which districts' experimental work performed. Ore mined by steam shovel, dumped into hopper at pit bottom and elevated by conveyor belt to top of washing plant. Operated by M. A. Hanna Co.

YORK (Nashwauk)—Stripped last winter by large drag-line excavator; inclined shaft built from top of washing plant to carry ore trammed from mine and hoisted to washing plant. Latter is same as that in use at other mines with addition of Richards classifiers as final method of improvement.

MISSOURI

Joplin District

SINDEN (Picher, Okla.)—Will have 300-ton mill completed in about three weeks. Situated short distance south of Picher. Owned by Tulsa men who own Admiralty. W. B. Shackelford, manager.

ADMIRALTY ZINC (Douthat, Okla.)—Moving mill from Webb City to lease on Thomas land, three miles southwest of Baxter, Kan., where recent drilling showed ore, 180 ft. thick.

MERRILL (Joplin)—Taken over Inspiration plant, northwest of Blue Mound and will operate. Mill just completed, having been moved from Duenweg. Merrill company also started new mill northeast of Quapaw, Okla.

CORTEZ (Jefferson City)—Incorporated for $140,000; stock oversubscribed by Jefferson City residents; to build mill on lease near Picher, Okla. Two drills now busy blocking out mill site, and expect to have plant in operation in four months. G. E. Haigh, president.

ST. JOE (Picher, Okla.)—Sinking mill shaft to 265 ft., encountered rich ore-bearing water course; 4-in. pump sufficient so far. Averaged 11% recovery on all ore taken out since Oct. 1, previous to that time some ore was still richer. J. W. Grounds, Jr., Joplin, superintendent.

UNITED ZINC SMELTING CORPORATION (Joplin)—Purchased Metals Mining Co. mill, just north of Golden Rod Mining and Smelting property at Picher, Okla.; changing gas equipment to steam. Temporarily closed down Coronet mine, west of Baxter, after brief operation. Reported ground is too lean at present prices.

MONTANA

Madison County

IN VIRGINIA CITY DISTRICT, John Dullenty is resuming work on gold-lode property, at head of Alder Gulch.

METALLIC MINE, operated by William Thompson, in Barton Gulch, recently made shipment of carload of ore to Washoe smeltery, at Anaconda.

IN TWIN-BRIDGES DISTRICT the first motor truck for mining purposes was put in operation, Dec. 7, by Crystal Lake Gold Mining Co. to transport ores and supplies between Dry Georgia and Goodrich gulches and railroad at Twin Bridges.

Silver Bow County

ANACONDA (Butte)—On Dec. 10, output from Butte mines was 14,173 tons of copper and 251 tons of zinc ore. Number of men employed, 9979. Tonnage and operations in general are rapidly reaching normal.

NORTH BUTTE (Butte)—Thomas Slater, administrator of estate of John Slater, brought suit against company for $10,000 damages for loss of life of John Slater, in Granite Mountain shaft fire, on June 8 last.

NEVADA

Clark County

GILLICE & McCOY (Las Vegas)—Manganese ore recently discovered, 15 miles northeast of here. Being developed under bond and lease. Ore is wad, said to average over 40% manganese. Four beds exposed, the largest averages 10 ft. in thickness, as shown by churn drilling and proved over area of one acre. Have shipped several carloads. Bad roads hampering operations.

YELLOW PINE (Goodsprings)—Producing about 1200 tons zinc concentrates and 300 tons lead concentrates monthly. Orebody recently opened in north end reported to be largest yet encountered and averages 30% zinc, 18% lead and 12 oz. silver per ton. Crosscutting from 900-ft. level to reach possible extension within 60 days. New 400-cu.ft. Chicago Pneumatic Tool Co. compressor installed, also drilling equipment.

Nye County

TONOPAH ORE PRODUCTION for week ended Dec. 8 was 10,206 tons, valued at $178,605, comparing with 10,061 tons, the previous week. Producers were: Tonopah Belmont, 2767 tons; Tonopah Mining, 3050 tons; Tonopah Extension, 2380 tons; Jim Butler, 217 tons; West End, 1099 tons, MacNamara, 511 tons, Montana, 122 tons.

UNION AMALGAMATED (Manhattan)—Resuming development from bottom of 600-ft. incline level of Bath shaft. Earl shaft enlarged and completely retimbered to 222-ft. point. Compressor foundation finished and building nearly completed.

Washoe County

NIXON NEVADA (Copperfield)—Situated 11 miles northwest of Reno. Developing copper ore and results reported favorable. Crosscutting opened three of company's four known veins, copper, gold and silver.

NEW MEXICO

Grant County

GREEN KING (Lordsburg)—Closed down, machinery will be sold. Property proved unprofitable.

Luna County

GAGE MINING CO. (Gage)—Much activity at old Victoria mine, being operated by Louisiana men; over 150 employees at Gage camp.

OREGON

ABBOTT AND WILLIAMS (Selma)—Two stamp mill erected at this gold mine on Illinois river near Selma. Ore is gold.

OSGOOD PLACER (Waldo)—I. L. Thomson made second payment on this placer property, one mile south of Waldo. Preparing for development. Reported bed rock carries platinum.

COLLARD, MOORE AND COLLARD (Kerby)—This chrome mine near Kerby making concentrates. Concentrator erected last spring. Shipped over 2500 tons and considerable tonnage in sight.

SOUTH DAKOTA

Lawrence County

GOLDEN REWARD (Deadwood)—Gilt Edge Mine, in Galena District, being prospected; oxidized ore will be shipped to company plant.

MONTEZUMA AND WHIZZERS (Deadwood)—Diamond drilling continues under direction of J. T. Milliken, who has bond on property and also purchased Oro Hondo after doing two years' development work.

Pennington County

BLUE LEAD (Hill City)—Being developed by new owners; one car copper ore shipped to smeltery.

GOLD KING (Rochford)—Headframe, shaft house, boilers, compressor and hoisting engine being installed to facilitate development.

UTAH

Juab County

CENTRAL HILL (Mammoth)—Drifting started at 385-ft. depth for vein found 100 ft. above.

EUREKA LILY (Eureka)—Blower being installed for better ventilation. Drifting on 1400-ft. level. Adjoins Tintic Standard.

LEHI-TINTIC (Eureka)—Recent strike in Empire vein at depth continues. Shipping and milling grade ore developed. Expected to begin shipments soon.

IRON BLOSSOM (Silver City)—Sinking No. 1 shaft to 2100-ft. level, where prospecting to be done on large scale. Good tonnage of low-grade ores being shipped to Tintic milling plant, and some ore of better grade also shipped.

DRAGON CONSOLIDATED (Silver City)—Continuing heavy shipments of fluxing ores as well as shipping some higher grade. Keeping up development. No. 1 shaft, down about 1500 ft., equivalent to about 2000 ft. in adjoining Iron Blossom.

CHIEF CONSOLIDATED (Eureka)—During quarter ended Sept. 30, large amount of development done, chiefly by drifts from 700-ft. level to 1800-ft. Work was in old ore channel with the exception of drifts on 1800- and 1600-ft. levels which opened new ore zone with good ore on both levels.

TINTIC DELAWARE (Eureka)—Group of 14 claims covering about 280 acres to be developed during winter. Equipment installed and road built. Auto truck and trailer purchased. Two cars of shipping ore on dump. Company recently organized to operate this property for 20 years worked on small scale by Ekker Bros., who retain an interest. W. D. Rawson, J. T. Hammond, Jr., and J. F. Rawson, interested.

Salt Lake County

BINGHAM MINES (Bingham)—Earnings for first 10 months of 1917, including both Bingham and Tintic properties were $747,500 as compared with $310,000 for 1916. October earnings were $28,000 as compared with $13,385 in September. Bingham properties—Dalton & Lark and Yosemite—earned $9000 in October as compared with $11,061 in September; Eagle & Blue Bell (Tintic) $7000, as compared with deficit of $3355 in September. Victoria (Tintic) estimated to have earned $12,000 during the month, an increase of $9346 over September.

Utah County

GLOBE (American Fork)—Working on surface strike to prospect further before winter prevents outside work; will then drive tunnel to get under outcrop; now in 100 ft., objective point about 500 ft. farther. Depth, 500 to 600 ft.

BELLEROPHON (American Fork)—Leasing company operating said to plan erection of mill to treat milling ore, of which said to be 10,000 to 12,000 tons blocked out. Ore carries silver, lead, gold and small amount of copper. Most of ore is milling grade. Sample of this character successfully run through Pacific mill.

WISCONSIN

Zinc-Lead District

UTT-THORNE (Platteville)—Purchased equipment of Wilson plant, at Potosi.

WISCONSIN ZINC CO. (Platteville)—Shipping from Skinner roaster, at New Diggings, over new spur, 1¾ miles long with 600 ft. of tunnel, connecting with C. & N. W. Ry.

VINEGAR HILL (Platteville)—Adding another Pomona power head pump at Jefferson mine, Hazel Green. Shaft sunk 45 ft. away from vein and water required only 700-gal. pump; since tapping main water flow installed 1000-gal. Pomona, 2000-gal. Prescott stationary pump, two vertical centrifugal sinking pumps of 500 and 800 gal. each and stationary centrifugal 500-gal. pump. Intend to solve water problem before extracting ore; mill equipment completed.

CANADA

British Columbia

CONSOLIDATED MINING AND SMELTING (Trail)—Closing of works by strike seriously affects Kootenay district and several properties in northern Washington. Plant closed several weeks ago when 1600 employees walked out, demanding an all-around eight-hour day, which would have affected only 350 men.

Ontario

ADANAC (Cobalt)—New oreshoot 2½ in. wide encountered on 400-ft. level.

KEORA (South Porcupine)—Two veins respectively 8 and 20 ft. wide encountered in diamond drilling.

KERR LAKE (Cobalt)—November production was 205,000 oz., a slight falling off from previous months.

SCHUMACHER (Schumacher)—New vein 5 ft. wide struck on 600-ft. level. Stated to carry about $10 ore.

GREEN MEEHAN (Cobalt)—Vein, 14-in. wide carrying high silver content stated to have been encountered in shaft at 140 ft.

BOURKE'S MINES (Bourke's Station)—Large camp buildings being erected preparatory to development during winter.

CANADIAN KIRKLAND (Kirkland Lake)—Shaft down 30 ft. on 15-ft. vein showing mineralization. Second shaft will be sunk on another vein.

GENESEE (Cobalt)—Crosscutting being done on 500-ft. level; number of small veins carrying cobalt and low silver content encountered.

GRAZELLE & HONER (Kirkland Lake)—Optioned to Temiskaming. Mining plant from North Dome, Porcupine, owned by Temiskaming, will be installed.

PARSON CLAIMS (Munro Township)—Acquired by Hill Gold Mining Co. Camp buildings put up and mining plant being installed. Shaft down 30 ft. on 18-in. quartz vein showing gold.

BURNSIDE (Kirkland Lake)—Aladdin-Cobalt acquired this property, preparing for development; will use electrically driven mining plant, installed one year ago on Sylvanite property.

TEMISKAMING (Cobalt)—Will offer shareholders half interest in a Kirkland Lake gold property, now under option to Beaver, at 10c. a share. Considerable opposition to deal, because no financial statement or report by independent engineer submitted. Ore reserves estimated at about $1,000,000 in value.

MEXICO

EXPORT TAX ON MINERALS, including iron ores, will be doubled after Jan. 1, 1918, according to statement of Rafael Nieto, under-secretary to the Mexican ministry of the Treasury. Also, the existing moratorium will be raised to the extent of providing for payment of interest on capital.

BOLIVIA

LLALLAGUA (Llallagua)—Produced during October, 20,500 quintals of 71.44% barrilla; shipped in October 19,710 quintals; stock on hand at end of October, 6293 quintals.

KOREA

SEOUL MINING CO. (Hol-Kol, Hwang-Hai)—By cable reported, milling operations on Suan concession recovered $121,335 for November.

ORIENTAL CONSOLIDATED (Unsan)—October bullion amounted to $120,152, divided as follows: Taborie mill, $32,052; Taracol, $22,010; Maibong, $14,146; Taracol cyanide plant, $50,032; Maibong tube mill, $1911. Milled in October, 26,171 tons. Still short of native labor but expect to have ample supply with advent of cold weather, as Koreans always return to mines then.

The Market Report

SILVER AND STERLING EXCHANGE

Dec.	Sterling Exchange	Silver		Dec.	Sterling Exchange	Silver	
		New York, Cents	London, Pence			New York, Cents	London, Pence
13	4 7515	85⅝	42⅞	17	4.7515	85¾	43
14	4 7515	86⅛	43⅛	18	4 7515	85⅞	43
15	4.7515	85⅞	43	19	4 7515	85⅞	43

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

DAILY PRICES OF METALS IN NEW YORK

Dec.	Copper	Tin	Lead		Zinc
	Electrolytic	Spot.	N. Y.	St. L.	St. L.
13	*23½	†88	6¼ @6⅜	6.25 @6 30	7⅜ @7½
14	*23½	†88	6¼ @6⅜	6.25 @6 30	7⅜ @7½
15	*23½	†88	6¼ @6⅜	6.25 @6.30	7⅜ @7½
17	*23½	†88	6¼ @6⅜	6 25 @6.30	7.35 @7.45
18	*23½	†88	6¼ @6⅜	6 25 @6.30	7 35 @7 40
19	*23½	†88	6¼ @6⅜	6.25	7.35 @7.40

† Nominal.

* Price fixed by agreement between American copper producers and the U. S. Government, according to official statement for publication on Friday, September 21, 1917.

The above quotations (except as to copper, the price for which has been fixed by agreement between American copper producers and the U. S. Government, wherein there is no free market) are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgement the prevailing values of the metals for the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

The quotations for electrolytic copper are for cakes, ingots and wirebars.

We quote electrolytic cathodes at 0.05 to 0.10c. below the price of wirebars, cakes and ingots.

Quotations for spelter are for ordinary Prime Western brands. We quote New York price at 17 5c. per 100 lb. above St. Louis.

Some current freight rates on metals per 100 lb. are: St. Louis-New York 17c.; St. Louis-Chicago, 6.3c.; St. Louis-Pittsburgh, 13.1 cents.

LONDON

Dec.	Copper			Tin		Lead	Zinc
	Standard		Electrolytic				
	Spot	3 Mos.		Spot	3 Mos.	Spot	Spot
13	110	110	125	300	295½	30½	54
14	110	110	125	299½	295½	30½	54
15							
17	110	110	125	304	297	30½	54
18	110	110	125	304½	297	30½	54
19	110	110	125	309	298½	30½	54

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2,240 lb. For convenience in comparison of London prices, in pounds sterling per 2,240 lb., with American prices in cents per pound the following approximate ratios are given, reckoning exchange at $4.7515. £30½ = 6.4696c.; £54 = 11.4545c.; £120 = 25.4544c.; £137 = 29.0605c.; £240 = 50.9089c. Variations, £1 = 0.2121205c.

Metal Markets

NEW YORK—Dec. 19

More business was done in copper this week than in anything else, lead and zinc being especially dull. The situation of tin was unchanged, but some people thought they could discern signs of amelioration.

Copper—The chief event of the week was the meeting of the copper producers in Washington on Dec. 14 at the invitation of the War Industries Board, which conducted a hearing having in view the terms on which the Government will buy copper after the end of January. Strong representations were made by the smaller producers, and by some of the larger producers, that the present price is not sufficiently high to develop the maximum production. The War Industries Board postponed further consideration of the matter The general feeling among producers is that the present price for copper will at least be maintained, and that the price may possibly be raised to 25c.

Another important event of the week was the increase in business with consumers for copper to be delivered after January, this business having now attained proportions that is represented by round millions of pounds. There were increased transactions this week, including individual contracts of several millions of pounds each. This business was done for February-March delivery, at a flat price of 23½c., cash. New York, without guarantee.

Copper Sheets are quoted at 31½c. per lb., f.o.b. mill, for hot rolled, and 1c. higher for cold rolled. Copper wire is quoted at 26@27c., f.o.b. mill, carload lots.

Tin—We continue to quote this market nominally at 88c. That price would be paid, but no business was reported. There were indications of more permits being issued from London which would ease the situation later on.

Lead—Lead producers, including both refiners and representatives of the mining industries of the West, met the War Industries Board, by invitation, in Washington, on Dec. 17, to discuss the matter of fixing a maximum price for lead. After considerable discussion, it was decided by the War Industries Board not to fix any minimum price, but to let this market alone.

The lead market this week was very dull, transactions being smaller than during any week for a long time. There was, perhaps, a little more inquiry for lead to be delivered in January, but this did not express itself in business, although it may do so later. Owing to freight delays, lead on the spot in New York is fetching some premium, but this pertains only to relatively trifling business.

Zinc—This market was again very dull, and was a little weaker in tone. Toward the close, common spelter was easily obtainable at 7⅜c. Brass special was also a drug on the market, metal guaranteed not to run over 0.6% lead and 0.04% iron being offered at 7⅜c. in the early part of the week. High grade intermediate could be bought at 10@10½c.

Zinc Sheets—Price of zinc sheets has not been changed. Market is still at $19 per 100 lb. f.o.b. Peru, less 8% discount.

Other Metals

Aluminum—This market continues dull, though there is slightly greater inquiry. No. 1 ingots are offered at 36@37c. per lb., New York.

Antimony—Spot was a shade weaker. We quote 15c. We quote futures at 13⅞@14⅛c., c.i.f., in bond. There are fair stocks in the market but little demand, wherefore conditions of production in China do not at present affect the market seriously.

Bismuth—Unchanged at $3.50 per pound.

Cadmium—This metal is quoted at $1.50@1.75 per lb., depending on the quantity.

Nickel—Steady at 50c. per lb., premium of 5c. per lb. for electrolytic.

Quicksilver—The major market continues at $115, which we quote, though sales of small lots of spot were reported as high as $122@125. Spot stocks in this market were practically exhausted. San Francisco reports, by telegraph, $112.

Gold, Silver and Platinum

Gold—Gold coin in the Treasury on Dec. 1, 1917, was $3,040,472,040, comparing with $2,741,669,491 in 1916; held in Treasury as assets of Government against banknotes, $1,192,279,247, comparing with $255,669,836 in 1916; held by Federal Reserve Bank against note issues, $389,210,005; gold money in circulation, $1,065,170,819.

Silver—This market has remained very steady during the last week. Moderate amounts only of silver are going to London. The bulk of the bullion has been consigned this year to the East via San Francisco. Exportations from that port for the Calendar year 1917 so far have been about 25,000,000 ounces.

Mexican dollars at New York: Dec. 13, 66c.; 14, 67c.; 15, 67c.; 17, 67c.; 18, 67c.; 19, 67c.

Platinum—Unchanged at $103@105.

Palladium—Strong at $130.

Zinc and Lead Ore Markets

Joplin, Mo., Dec. 15—Blende, per ton, high, $71.80; basis 60% Zn, premium $70; medium to low, $60@50; calamine, per ton 40% Zn, $35@38. average selling price, all grades of zinc, $54.74 per ton.

Lead, high, $79.80; basis 80% Pb, $75@80; average selling price, all grades of lead, $73.69 per ton.

Shipments the fortnight: Blende, 10,438; calamine, 852; lead, 2469 tons; value, all ores the fortnight, $811,020.

Snow fell to a depth of 14 in. Friday of last week and, accompanied by zero weather, tied up electric interurban service and most of the mines three to four days. The severity is unprecedented at this season of the year. Many of the mines are only getting free from the deluge of snow; hauling was light during the last week, and for this reason the report is given for the fortnight.

Platteville, Wis., Dec., 15—Blende, basis 60% Zn, unchanged at $75 base for premium grade down to $57 base for second grade. Lead ore, basis 80% Pb, $75 per ton. Shipments reported for the week are 3470 tons of zinc ore, 192 tons of lead ore, and 332 tons of sulphur ore. For the year to date the figures are: 141,498 tons of zinc ore, 6881 tons of lead ore, and 27,337 tons of sulphur ore. Shipped during the week to separating plants, 3249 tons of zinc ore.

Other Ores

Manganese Ore—Metallurgical ore continued to be quoted at $1.20 per unit.

Molybdenum Ore—There was considerable demand and sales were made at $2.25@2.30 per lb. of molybdenum sulphide on the basis of 90%. There is reported to be a large inquiry in the market from a steel maker.

Pyrites—Spanish lump is now quoted at 15c. per unit, on basis of 10s. ocean freight, buyer to pay excess freight and war risk, except that concession of 2% of war risk is allowed. However, a small lot of Spanish lump ore was recently sold on a basis of 15½c. Ocean rates remain at 35s. for Northern, 40s. for Southern and 42s. 6d. for Gulf ports, but recent charters have exceeded these rates in several instances.

Prospect of Government red tape in distribution and allotment of Spanish pyrites is worrying importers.

Tungsten Ore—Considerable business was done in both wolframite and scheelite. We quote scheelite at $26 per unit. The quotation for wolframite is wholly a matter of grade. Ore of 65% grade, free from impurities, realized $25, while ore of 64% containing 3% S fetched $24. Other ores were sold at $22@24.

Charles Hardy, under date of Dec. 18, reports as follows:

"Wolframite according to quality ranged from $22@24 a unit and scheelite was again sold at $26. Of late, South America has shipped larger quantities of scheelite of an excellent quality, free from all impurities and the late arrivals have all been well above 70%. A premium has been paid for this grade of ore. At a meeting held yesterday by the American Iron and Steel Institute arrangement was entered into whereby tungsten will be subject to the same regulations as are now applying to tin and all consignments will in future have to be shipped to the order of the American Steel and Iron Institute, with modification to the importer. By so doing the Government will have control of the imports and the importer will have facilities in getting his lecense granted so much quicker. The new arrangement covers not only tungsten, but practically all ores that are regularly imported from abroad into this country."

Iron Trade Review

NEW YORK—Dec. 19

The handicaps on pig iron and steel production have been increased in the last week by heavy snows in the East and Central West, causing fresh shortages in coal and coke. The week's steel output in the Youngstown district, says "Iron Age," has been only about half of the capacity; at Cleveland the American Steel & Wire Co.'s plants were closed down for nine days; in eastern Pennsylvania five furnaces were banked; 20 were banked early this week at Pittsburgh and in the two valleys; and throughout the country the coal situation of iron and steel works has been either worse or unimproved.

At Chicago the shortage of coal and coke is cutting down the production of some companies, while all are worried by the smallness of the margin of safety. Six blast furnaces of the Illinois Steel Co. are banked and one furnace and one mill of the Wisconsin Steel Co. are idle. One new South Chicago stack of the Mark Mfg. Co will go in blast early in 1918.

Following the Federal Trade Commission's cost conference with iron and steel companies at Washington on Friday, at which the October increases in production cost were emphasized, the impression has gained strength that no important revision of existing price schedules will be made on Jan. 1. The steel manufacturers' committee met in New York, Dec. 19, and a meeting with the War Industries Board at Washington is expected to be held soon.

Work has stopped on Russian locomotives and many of those already built but not shipped may yet be converted for use at home. A large program of locomotives and car building for domestic roads, under Government auspices, is being worked out.

General export business is at a low ebb. Harassed by priority interference at mills, by the scarcity of ocean-vessel space, by delays and refusals of cars and by frequent changes in regulations, exports are under pressure from buyers abroad who try for the agreed price scales. The outlook until after the war or until Government demand is more accurately measurable is for thin picking in exports. One successful release of plates covers 1500 tons for France, done at 4.75c. A French railroad is willing to pay 5c. at mill for 300 tons.

The volume of structural steel business for shipbuilding and other Government needs is surprising in view of the almost total absence of private building work. The Bridge Builders' and Structural Society reports 138,500 tons of shop capacity put under contract in November, more than in any other month this year.

An example of the large tonnage called for at private works on Government account is 4000 tons just let for a new ordnance plant at Alliance, Ohio. Later building at the same place will require 3000 tons. The leading fabricator will be busy for most of next year on work already in hand, much of it for shipyards.

Sheet-bar and billet buying has quieted down, chiefly because so little steel can be had. Some sheet mills have been unable to contract for bars, but are taking what they can get from week to week.

Pig-iron consumers feel the situation tightening upon them. Central Western steel companies find it hard to get iron in the market to make up their shortages, but it is known that one of them recently closed for 22,000 tons of basic iron. Forge-iron sales of 15,000 to 20,000 tons are reported at Pittsburgh. In the East, where activity has been greatest, the week has been the quietest in a long time.

Pig-iron producers are now reporting each week to the Government, giving full data as to sales, production, destination of shipments and stock on hand. This serves to check up priority orders, which every week seem to be covering a larger proportion of the output.

All imports of ferroalloys or of their ores, by arrangement between the War Trade Board and importing interests, will be handled by the American Iron and Steel Institute. This was decided at a meeting in New York this week, the plan being identical with that now followed in the case of pig tin. Ferromanganese imports have dwindled to a small figure and at the same time domestic production has declined. There is a further complication from the proposal of the Government to commandeer vessels that have been depended on to bring Brazilian manganese ore to this country.

STOCK QUOTATIONS

N. Y. EXCH.†	Dec. 18
Alaska Gold M	1⅛
Alaska Juneau	1¼
Am.Sm.& Ref.,com.	69¾
Am. Sm. & Ref., pf.	100½
Am. Sm. Sec., pf., A	90½
Am. Sm. Sec., pf. B	‡96
Am. Zinc	11½
Am. Zinc, pf	40
Anaconda	55
Batopilas Min.	1⅜
Bethlehem Steel	68½
Bethlehem Steel, pf.	85
Butte & Superior.	13½
Cerro de Pasco.	25½
Chile Cop	13¼
Chino	37¼
Colo Fuel & Iron	31¾
Crucible Steel.	48¾
Dome Mines	6½
Federal M. & S	8½
Federal M. & S., pf	28
Great Nor., ore ctf.	23¾
Greene Cananea	35
Gulf States Steel	80
Homestake	‡90
Inspiration Con	39
International Nickel	25¼
Kennecott	29¼
Lackawanna Steel	72½
Miami Copper	25¾
Nat'l Lead, com.	39¾
National Lead, pf	98½
Nev. Consol	16½
Ontario Min	5½
Quicksilver	‡ .50
Quicksilver, pf	‡1
Ray Con	20¼
Republic I. & S., com.	72½
Republic I. & S., pf	89
Sloss-Sheffield	35
Tennessee C. & C.	12
U. S. Steel, com	82½
U. S. Steel, pf	105
Utah Copper.	71¾
Va. Iron C. & C.	50

N. Y. CURB†	Dec. 18
Big Ledge.	1½
Butte & N. Y.	.75
Butte C. & Z.	6½
Butte Detroit	.25
Caledonia	46
Calumet & Jerome.	1
Can. Cop. Corpn.	1½
Carlisle.	2
Cashboy	.04
Con. Ariz. Sm.	1⅟₁₆
Con. Coppermines	6½
Con. Nev.-Utah.	⅟₁₆
Emma Con	¼
First Nat. Cop	1¼
Goldfield Con.	¼
Goldfield Merger.	.03½
Greenmonster.	.50
Hecla Min	4⅟₁₆
Howe Sound	3½
Jerome Verde	¾
Kerr Lake	4½
Louisiana.	.50
Magma	37½
Majestic	.32
McKinley-Dar-Sa	59
Milford	1½
Mohican	⅟₁₆
Mother Lode	28
N. Y. & Hond	12
Nipissing Mines.	8½
Nixon Nevada	1½
Ohio Cop	75
Ray Hercules	3½
Richmond	‡ 56
Rochester Mines.	.35
St. Joseph Lead.	14½
Standard S. L.	⅟₁₆
Stewart	.25
Success	.09
Tonopah	4½
Tonopah Ex.	1.15½
Tribullion	¾
Troy Arizona	.15
United Cop	.50
United Verde Ext	34½
United Zinc	1½
Utica Mines	.12
Yukon Gold	1½

SAN FRAN.*	Dec. 18
Alta	03
Andes	07
Best & Belcher	02
Bullion	01
Caledonia	05
Challenge Con	04
Confidence	‡ 06
Con. Virginia	‡ 17
Gould & Curry	01
Hale & Norcross	02
Jacket-Cr. Pt	08
Mexican	14
Occidental	‡ 60
Ophir	06
Overman	04
Savage	03
Sierra Nevada	13
Union Con	1.02½
Utah Con	01
Belmont	3.00
Jim Butler	70
MacNamara	16
Midway	05
Mont.-Tonopah	10
North Star	05
Rescue Eula	08
West End Con.	68
Atlanta	07
Booth	03
Comb. Frac.	‡ 03
D'field Daisy	‡ 02
Florence	09
Jumbo Extension	13
Kewanas	04
Nevada Hills	05
Nevada Packard	.15
Round Mountain.	20
Silver Pick	04
White Caps	51
Big Jim	‡ 75
United Eastern	3.62½

BOSTON EXCH.*	Dec. 18
Adventure	1
Ahmeek	71
Algomah	25
Allouez	46½
Ariz. Com., ctfs	9½
Arnold	20
Bonanza	21
Butte-Balaklava	.35
Calumet & Ariz	56
Calumet & Hecla.	415
Centennial	12
Copper Range	40½
Daly West	1½
Davis-Daly	4½
East Butte	8½
Franklin	4½
Granby	64
Hancock	7½
Hedley	‡15½
Helvetia	.25
Indiana	.75
Isle Royale	20
Keweenaw	1¼
Lake	5
La Salle	1½
Mason Valley	4
Mass	5½
Mayflower	.75
Michigan	1½
Mohawk	58½
New Arcadian	1½
New Idria	13
North Butte	12½
North Lake	.50
Ojibway.	.75
Old Dominion	37
Osceola	55
Quincy	61
St. Mary's M. L.	49
Santa Fe.	60
Seneca	6
Shannon	5½
Shattuck-Ariz.	15
So. Lake	1⅟₁₆
So. Utah	05
Superior	3½
Superior & Bost.	2½
Trinity	3½
Tuolumne	1½
U. S. Smelting	42½
U. S. Smelt'g. pf	44
Utah Apex	2
Utah Con	9½
Utah Metal.	2½
Victoria.	2
Winona	1
Wolverine.	30½
Wyandot.	.50

BOSTON CURB*	Dec. 18
Alaska Mines Corp.	25
Bingham Mines.	9½
Boston Ely	.60
Boston & Mont	.40
Butte & Lon'n Dev.	.13
Calaveras	1
Calumet-Corbin.	‡ 01
Chief Con	1⅟₁₆
Cortez	10
Crown Reserve.	20
Crystal Cop	.45
Eagle & Blue Bell.	2
Gila Copper	17
Houghton Copper	60
Intermountain.	80
Iron Cap. Com	13½
Iron Cap Cop., pf.	‡14½
Mexican Metals	.27
Mines of America	1½
Mojave Tungsten	24
Nat. Zinc & Lead.	28
Nevada-Douglas	1½
New Baltic	.80
New Cornelia	13½
Oneco.	.25
Pacific Mines	1.35
Rex Cons	.10

SALT LAKE*	Dec. 18
Bannack	26
Big Four	‡ 01
Cardiff	2.50
Colorado Mining	.06
Daly	1.00
Daly-Judge	6.50
Empire Copper.	1.17
Gold Chain	14
Grand Central	58
Iron Blossom	60
Lower Mammoth.	03
May Day	01
Moscow	11
Prince Con	51
Rico Wellington	18
Silver-King Coal'n	2.25
Silver King Con.	2.60
Sioux Con	02
So. Hecla	70
Tintic Standard.	1.45
Uncle Sam	02
Wilbert	17
Yankee	02

TORONTO*	Dec. 18
Adanac	10
Bailey	.05
Beaver Con	25
Chambers Ferland	10
Coniagas	3.00
Hargraves	08
La Rose	43
Peterson Lake	09
Temiskaming	27
Wettlaufer-Lor.	04
Davidson	28
Dome Exten	09
Dome Lake.	13
Hollinger	4.90
McIntyre	1.37
Newray	39
Porcu. Crown.	23
Teck-Hughes	25
Vipond	19
West Dome	13

STOCK QUOTATIONS—Continued

COLO. SPRINGS	Dec. 18
Cresson Con	4.37½
Doctor Jack Pot	.03½
Elkton Con	.03½
El Paso	12
Gold Sovereign.	.02½
Golden Cycle	1.46
Granite	43
Isabella	07
Mary McKinney	06
Portland	1.15
United Gold M.	14½
Vindicator.	.35

LONDON	Dec. 3
Alaska Tre'dwell	‡£1 0s 0d
Burma Corp	3 17 6
Cam & Motor	0 11 0
Camp Bird	0 7 0
El Oro	0 8 9
Esperanza.	0 8 3
Mexican Mines.	5 18 9
Min. Corp. Can.	0 17 0
Nechi, pfd.	0 9 9
Oroville	0 19 6
Santa Gert'dis.	0 13 0
Tomboy	1 0 9

* Bid prices. † Closing prices. ‡ Last Quotations.

MONTHLY AVERAGE PRICES OF METALS

Silver	New York 1915	New York 1916	New York 1917	London 1915	London 1916	London 1917
Jan.	48.855	56.775	75.630	22.731	26.960	36.682
Feb.	48.477	56.755	77.585	22.753	26.975	37.742
Mar.	50.241	57.935	73.861	23.708	27.597	36.410
April	50.250	64.415	73.875	23.709	30.662	36.963
May	49.915	74.269	74.745	23.570	35.477	37.940
June	49.034	65.024	76.971	23.267	31.060	39.065
July	47.519	62.940	79.010	22.597	30.000	40.110
Aug	47.163	66.083	85.407	22.780	31.498	43.418
Sept.	48.680	68.515	100.740	23.591	32.584	50.920
Oct.	49.385	67.855	87.332	23.925	32.361	44.324
Nov.	51.714	71.604	85.891	25.094	34.192	43.584
Dec.	54.971	75.765		26.373	36.410	
Year	49.684	65.661	.	23.675	31.315	

New York quotations cents per ounce troy, fine silver. London, pence per ounce, sterling silver, 0.925 fine.

Copper	New York Electrolytic 1916	New York Electrolytic 1917	London Standard 1916	London Standard 1917	London Electrolytic 1916	London Electrolytic 1917
Jan.	24.008	28.673	88.083	131.921	116.167	142.895
Feb.	26.440	31.750	102.667	137.895	133.167	148.100
Mar.	26.310	31.481	107.714	136.750	136.000	151.000
April	27.895	27.935	124.319	133.842	137.389	147.158
May	28.625	28.788	135.457	130.000	152.522	142.000
June	26.601	29.962	112.432	130.000	137.455	142.000
July	23.865	26.620	95.119	128.409	125.500	140.409
Aug	26.120	25.380	110.283	122.391	126.304	137.000
Sept.	26.855	25.073	113.905	117.500	134.071	135.250
Oct.	27.193	23.500	122.750	110.000	142.523	125.000
Nov.	30.625	23.500	134.659	110.000	155.432	125.000
Dec.	31.890		145.316	..	162.842	.
Year	27.202		116.059	.	138.281	.

Tin	New York 1916	New York 1917	London 1916	London 1917
January	41.825	44.175	175.548	185.813
February	42.717	51.420	181.107	198.974
March	50.741	54.388	193.609	207.443
April	51.230	55.910	199.736	220.171
May	49.125	63.173	196.511	245.114
June	42.231	62.053	179.466	242.083
July	38.510	62.570	168.357	242.181
August	38.565	62.681	169.870	243.978
September	38.830	61.542	171.345	244.038
October	41.241	61.851	179.307	247.467
November	44.109	74.740	186.932	274.943
December	42.635	.	183.368	
Av. year	43.480	.	182.096	

Lead	New York 1916	New York 1917	St. Louis 1916	St. Louis 1917	London 1916	London 1917
January	5.921	7.626	5.826	7.530	31.167	30.500
February	6.246	8.636	6.161	8.595	31.988	30.500
March	7.136	9.199	7.375	9.120	34.440	30.500
April	7.630	9.288	7.655	9.158	34.368	30.500
May	7.463	10.207	7.332	10.202	32.967	30.500
June	6.936	11.171	6.749	11.123	31.011	30.500
July	6.352	10.710	6.185	10.644	28.137	30.500
August	6.244	10.594	6.088	10.518	29.734	30.500
September	6.810	8.680	6.699	8.611	30.786	30.500
October	7.000	6.710	6.898	6.650	30.716	30.500
November	7.042	6.249	6.945	6.187	30.500	30.500
December	7.513		7.405		30.500	
Year	6.858	.	6.777		31.359	

Spelter	New York 1916	New York 1917	St. Louis 1916	St. Louis 1917	London 1916	London 1917
Jan.	16.915	9.619	16.745	9.449	89.810	48.329
Feb.	18.120	10.045	18.260	9.875	97.762	47.000
Mar.	16.846	10.300	16.676	10.130	95.048	47.000
April	16.695	9.459	16.525	9.289	99.056	54.632
May	14.276	9.362	14.106	9.192	94.217	54.000
June	11.752	9.371	11.582	9.201	68.591	54.000
July	8.925	8.643	8.755	8.473	50.750	54.000
Aug	8.730	8.360	8.560	8.190	51.587	54.000
Sept	8.990	8.136	8.820	7.966	52.095	54.000
Oct	9.829	7.983	9.659	7.813	54.159	54.000
Nov	11.592	7.847	11.422	7.672	56.023	54.000
Dec	10.665		10.495		55.842	
Year	12.804		12.634		72.071	

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton.

Pig Iron, Pgh.	Bessemer‡ 1916	Bessemer‡ 1917	Basic‡ 1916	Basic‡ 1917	No. 2 Foundry 1916	No. 2 Foundry 1917
January	$21.60	$35.95	$18.78	$30.95	$19.70	$30.95
February	21.16	30.37	18.93	30.95	19.51	30.95
March	21.81	37.37	19.20	33.49	19.45	35.91
April	21.65	42.23	18.95	39.90	19.45	40.06
May	21.78	46.94	19.11	42.84	19.88	43.60
June	21.95	54.22	18.95	50.05	19.34	50.14
July	21.95	57.45	18.95	53.80	19.20	53.95
August	21.95	54.17	18.95	50.37	19.22	53.95
September	22.88	40.40	19.58	42.24	19.53	48.88
October	24.61	37.25	21.26	33.95	21.51	33.95
November	30.07	37.25	28.18	33.95	26.58	33.95
December	35.16		30.95		30.79	
Year	$23.88		$20.98	.	$21.15	

‡ As reported by W. P. Snyder & Co.

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Tin Dredging in Portugal

BY FREDERICK W. FOOTE* AND RASTUS S. RANSOM, JR.†

The description of a successful American operation in Portugal. The dredge is operated by electricity generated by a wood-burning power plant. Electro-magnetic treatment of dredge product to remove ilmenite gives a first-grade product containing 74% tin.

THE Portuguese American Tin Co. has been successfully operating a dredge for four years at Guia, Portugal. Controlling stock in the company is held by Californians, who also have extensive wine interests in Portugal, and the dredging operations are carried on by gold dredgers from Oroville, Calif. The tin deposit occurs in a broad valley on the eastern side of the Sierra Estrella Mountains in the east-central part of Portugal. The deposit is several hundred meters wide, and continues for a distance of 4 km. in length. The actual veins from which the occurrence was derived have not been proved, but numerous lodes in the neighboring mountains are assumed to be the source.

In working the deposit, an all-steel dredge designed by H. G. Peake and built by Fraser & Chalmers, Ltd., is used. This dredge has 4-cu.ft. buckets having a digging capacity of 80 to 90 cu.yd. per hour, a treatment capacity of 40 to 50 cu.yd. per hour and can dig to a depth of 24 ft. Recovery of the tin is accomplished in the following manner:

The buckets empty into a large revolving trommel with ½-in. round holes. The oversize is carried to the stern of the dredge by a traveling belt. Any material that does not fall into the trommel is caught in a hopper and passes to a sluice on the lower deck. The undersize from the trommel is split between eight sluices, each 33 cm. wide and 15 cm. deep, which run the full length of the dredge and extend about 4 m. over the stern. These sluices are provided with removable iron riffles built in sections of seven riffles, 1⅝ in. deep and 2½ in. apart. In ordinary operations only six sluices are in constant use, the two others being in process of cleaning.

When a sluice is clean it is "cut in" and another "cut out" to be cleaned. The material from the sluices is shoveled into a hopper and passes to a second smaller trommel with ¼ in. and 2½ mm. screens. The difference in units is caused by the fact that the dredge was built in England and replacements have been made on the Continent, where the metric system prevails, the nearest metrical equivalent being adopted. The sized material is then jigged in Harz jigs, and the jig product is carried ashore and washed by the native method, which consists of emptying the material into a deep and slightly inclined launder through which a strong current of water is flowing. The mineral is mixed by hand against the flow of water, and the fines are lost.

ALL-STEEL DREDGE OPERATING IN TIN DEPOSITS OF PORTUGUESE AMERICAN TIN CO. AT GUIA, PORTUGAL

It would seen that the method of treatment could be improved by discarding the sluices and replacing them with tables, for first cost should be small compared to the additional saving that would result. Considerable experience with the native method, as applied to tungsten ores, demonstrates the losses involved by that system of treatment. Another improvement not involving large first cost would be to screen out all the material through 1¼-mm. impact screen and sluice only the plus 1¼-mm. size, treating the minus 1¼-mm. size on tables. The dredge would be able to handle more material, the losses in fines would be less and sluicing more efficient.

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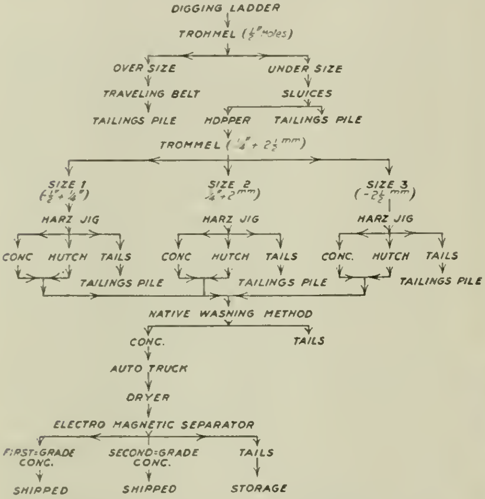
The company does not employ a chemist so it is impossible to give figures as to the grade of material treated and percentage of recovery.

The dredge is electrically operated, power being supplied from a plant owned by the company at Belmonte, 13 km. distant, and transmitted over its own power line to the dredge. The company's offices, machine shop, garage, etc., are situated near the dredge. The town of Belmonte is on the railroad, 350 km. from Lisbon, and affords a convenient means for bringing in fuel and shipping out tin concentrates. The power installation consists of a Babcock & Wilcox horizontal boiler that supplies steam to a direct-connected turbine generator set made by Fraser & Chalmers. This operates at 3600 r.p.m. and generates 315 kv.-a. at 6600 volts and 60 cycles. On shore the current is stepped down to 440 volts and used in separate motors as follows: 75 hp. for the digging ladder, 25 hp. for the jigs and screens, 85 hp. for the pumps and 15 hp. for the side lines, by means of which the boat is moved.



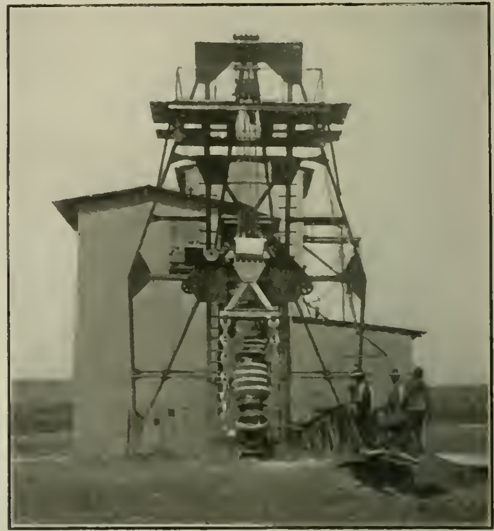
FLOW SHEET OF OPERATIONS AT GUIA, PORTUGAL

The price of coal has reached a prohibitive figure in Portugal ($66 U. S. Cy. per ton) and it is practically impossible to obtain it, so wood is used as fuel at present. Some wood is supplied locally, being brought in by bull carts and pack trains, and some is shipped in by rail often coming from as great a distance as 100 kilometers.

The finishing plant for producing the final tin concentrates is in a building adjacent to the power plant. Waste gasses from the boilers pass through a horizontal chamber above which is a sheet-iron plate on which the product from the hand washing plant is dried. The dried product is then fed to a Wetherill magnetic separator to remove ilmenite from the cassiterite. This machine makes a good separation and produces a 75% grade of tin which is sacked and shipped from Belmonte. The ilmenite is stacked in a waste pile awaiting a possible market.

The company maintains an American staff of manager, superintendent, one dredge master, three shift bosses, three winchmen and a bookkeeper. A company house, containing offices downstairs and a bunk house upstairs, is provided in addition to the manager's house and garage. The company has supplied an auto truck, two automobiles and two motor cycles. Estimates indicate sufficient material to last about four years and no further operating difficulties should be encountered.

In 1914 the production of tin concentrates was 172.29 metric tons averaging 68% Sn. In November, 1917, the company was producing about 60 metric tons of 74% concentrates a month. The 1914 production was obtained from the treatment of 169,577 cu.m. of alluvium or the recovery of 1.01 kg. per cu.m. The following wage scale was in effect during 1914. Superintendent 1500$000,[1] engineer 1200$000, bookkeeper 480$000, guard 146$000 a year. Native employees receive: Carpenters 1$070 a day, blacksmiths 0$900 a day, laborers 0$400 a day, and women 0$240 a day.



FRASER & CHALMERS DREDGE AT GUIA, PORTUGAL

Manganese Ore Movement

During nine months ended Sept. 30, 14 states shipped[2] 70,225 tons of manganese ore containing 40% or more Mn. and 380,169 tons of 15-40%. Seven states shipped 424,438 tons containing 5-15% manganese.

Manganese ore imports into the United States in September were 36,755 gross tons, the lowest for any month this year except April. For the nine months ended Sept. 30, the total imports were 469,222 tons in 1916, and 494,633 tons in 1917; an increase of 25,411 tons. The total this year was sufficient to make about 180,000 tons of 80% ferromanganese.

Manganese ore exports from Brazil for the half-year ended June 30 are officially reported at 245,088 gross tons, against 240,090 tons in the first half of 1916; 102,870 tons in 1915; 88,500 in 1914 and 46,900 tons in 1913.

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[1] The dollar sign ($) in Portugal is written between the "escudo" and the "reis," as 5$500 reads five escudos, 500 reis. The escudo was in November worth about 70c., par being one dollar.

[2] U. S. Geological Survey estimates.

Sampling of Mine Floors

BY ALBERT G. WOLF*

Floor sampling presents many working difficulties which increase with the wetness of the mine. Large flows of water may be temporarily diverted from sample cuts by ditches, pipes, flumes and small dams, and seepage into sample cuts lessened by trenching through loose floor material, assisted by bailing in adjacent trenches above stream. Floor sampling should be avoided where roof or wall sampling is possible, although a few floor samples should be taken for inspection purposes.

SAMPLING mine floors is hard and unpleasant work, and because of inaccuracies involved, is to be avoided where the necessary samples can be obtained from the walls or roof. In floor sampling it is difficult to catch all the fines and keep the sample free from mud or other floor material, to which is added the impossibility of inspecting the vein carefully before sampling without, in some cases, a prohibitive amount of preliminary work. Further difficulties not involved in sampling walls or roof are: Diversion of water flow, removal of loose floor material, tearing up and relaying of track, and sometimes the additional hardships attendant on the necessity of doing the work without interferance with regular mine operations.

CONDITIONS WHERE FLOOR SAMPLING IS NECESSARY

Sometimes, however, it is absolutely necessary to sample mine floors; for example, on a level where the ore is stoped out above; where the drift is tightly timbered; in the floors of underhand stopes; in the bottoms of winzes and shafts, and on outcrops. As to the probability of inaccurate results, this disadvantage is counterbalanced somewhat by the fact that generally the samples are taken from places in the mine where only "probable ore" could be estimated, and not "proved ore," "positive ore," or "ore blocked out," and due allowance must be made in basing any estimate upon such samples.

Workings to be sampled may be classified under two heads, dry and wet. The difficulties and inaccuracies involved in the latter are much greater than in dry mines. By the term "sampling," is meant cutting the ore by hammer and moil.

In dry mines, the chief difficulties are those arising from catching flying sample particles, removing track and loose floor material and, in a mine in operation, conducting the floor sampling without interfering with regular work. The only chances for error involved in sampling a dry floor are in catching all the flying particles, gathering the fines from the bottom of the cut, and preventing extraneous floor material from rolling into it. Catching flying particles is not nearly so difficult in roof or wall sampling, as the particles fly in a general downward direction and can be caught in a box or canvas basket held close to the point of cutting, or by a large canvas spread on the floor; although with the best precautions many pieces fly astray. In sampling floors, the chips fly upward and outward in every direction. To catch these, it is best to place one canvas across the line of cut, just ahead of the point of cutting, and one on each side of the cut. If a deep preparatory trench has to be cut through loose muck on the floor, it should be made wide enough to keep extraneous material from rolling into the sample groove, and the canvas should be pressed down into the trench ahead of the point of cutting. A box held a foot or so above the moil and just ahead of that point, will act as a baffle, preventing the particles from flying too far and causing them to fall back upon the canvas. When one-half the sample has been taken, the canvas should be laid on the other side, and the second half of the cut made, always keeping the canvas close up to the point of cutting. A stiff brush will be necessary to aid in gathering up all the fines.

WATER CONTROL IN FLOOR SAMPLING

In addition to the difficulties already enumerated, in wet mines mud and water must be overcome. In the first place, the main flow of water must be bypassed, so as to make sampling at all possible, and secondly, seepage must be minimized in order not to contaminate the sample with mud.

Obviously, in sampling the floor of a wet mine, handling the water is the chief problem, and the accuracy of the work will depend upon the precautions taken. In the preliminary sampling of a small property, it would be too costly to take all the precautions that might be enumerated. In such a case, where the vein is narrower than the drift, the water can be run through a ditch at one side of the drift, or if the vein is too wide to permit this, the water can be passed across each trench in the loose floor muck by means of a launder or piece of air pipe a few feet in length. In this way, by bailing out the seepage a few times while moiling is in progress, it is possible to get a sample with the least expenditure of time and effort. The sample, it is true, will be somewhat subject to inaccuracies, either on account of mud carried into the cuttings, or, if the cuttings are washed free from mud, by the loss of fines. This is a makeshift method, and justifiable only on a preliminary examination where the necessity for greatest accuracy does not warrant expenditure of more time and money.

In more important examinations, greater care must be taken. If the water in a drift comes from one or a few chief sources, down certain raises or chutes, for example, it can be carried past the working point in launders or pipes. If this is done a day or so before the sampling is started, the loose floor material will have drained to such an extent that seepage into the trenches will be little. On the other hand, if the water comes from a general percolation through the vein, the use of dams must be resorted to in order to collect it, and launders or pipe used to carry off the water from behind the dams. If a level is extremely wet, a dam will have to be built for each short length of drift sampled. For example, beginning at the lowest point

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of a level, which would be (or should be) where it connects with a shaft, crosscut, or other main working, a dam should be built across the drift about 100 ft. distant. This dam can be easily made with a couple of 2 x 12-in. planks, superimposed edgewise, and fitting snugly against the floor and walls. It should be made as nearly water-tight as possible by calking, or tamped with clay, cement, talc or any fine-grained impervious material. The launder or pipe should lead from the upper half. The dam should be only high enough to give a slight grade to the launder with enough elevation to carry it over irregularities in the floor. If the dam is too high, the hydraulic pressure will be such as to cause water to leak through so crude a structure.

With the dam in place, the main flow of water is cut off, and trench digging and sample cutting can proceed. If the inflow of water along the vein is large, it may be necessary to have the dam quite close to the point of cutting, for otherwise the trench may fill with water so fast as to require constant bailing. The seepage into a trench may sometimes be greatly lessened by digging auxiliary trenches above the sample trench, and bailing from them. In some cases, the removal of all loose floor material, instead of just digging trenches, may be necessary to prevent too great an infiltration of mud into the sample cut.

COMPARATIVE ADVANTAGES OF PIPE AND FLUME

The methods of conducting water flow are by pipe and flume. Each system possesses advantages not to be found in the other, the greatest advantage being in favor of the flume, especially under certain conditions, which will be described. Light, galvanized-iron air pipe is easier to handle and put together, and in a straight drift with no branch openings conducting tributary water, is to be preferred to a flume, if the material is immediately available. The flume, while heavier than the pipe, and more trouble to put together, has the following advantages: It can be cut up into short lengths in order to make turns; it is open at the top and can be bailed into, which is a great advantage when more than one cut is being made at the same time, as the bailed water is conducted away instead of running down into the next lower cut; and if a crosscut is adding water to the flow in the drift, a second cut can be built across it at the intersection, and a short flume used to carry the water collected into the main flume.

Catching the cuttings is the chief difficulty in sampling wet floors. A canvas cannot be spread over the floor and down into the sample trench as with dry floors, because the seepage would carry upon it a great deal of mud. Some engineers suggest washing the sample to eliminate this infiltrated mud, but that would cause a loss of fines from the cuttings as well. The best way to catch the cuttings is to hold a canvas sampling bucket, or a conical "butterfly-net" sample catcher, close to the bottom of the trench and a few inches in advance of the moil point, with the opening of the receptacle in a vertical position. The circular shape of the bucket opening permits either to get closer to the floor in the bottom of the trench than is possible with a box.

Two other errors are involved in sampling wet floors. One, the obscuring of the work by dirty seepage, making it impossible to be sure that a uniform cut is being taken; the other, the concentration of rich fines into floor cracks by the action of running water, causing high assay samples. The first cause of trouble has been dealt with; the second can be guarded against by making a preliminary cut across the vein and rejecting the material before making the regular sample cut. If error from this source is expected, the rejects from a few preliminary cuts should be assayed with the regular sample cuts as a check or confirmation, before going to the trouble of making further double cuts.

FLOOR SAMPLING AS A PRECAUTIONARY MEASURE

Although floor sampling, where it is possible to take roof or wall samples, is not to be recommended, frequently it is advisable at least to examine the floors as a precaution against estimating ore where there may have been underhand stoping, especially if it is an old mine that has been badly gouged. For example, at a certain mine that was examined, the maps showed no stoping below the lower tunnel level. An oreshoot several hundred feet long had been opened on this level a number of years previously. Before any appreciable amount of stoping had been done, a report was made on the property by an engineer of prominence. Subsequent to that examination, considerable ore was stoped above the level, all of which was shown on the maps submitted by the owners. Most of the stopes were accessible, and the backs were sampled. Now, as the drift had been sampled by an engineer of unquestioned ability and reputation before stoping had started, it would appear safe to take his results in estimating the grade of probable ore below the drift. However, it was decided to take some floor samples at rather wide but regular intervals, as a check, even though the difficulties were great on account of a heavy flow of water along the vein and much loose material on the floor.

At one part of the drift the depth of muck grew steadily greater up to 3 ft., an extraordinary amount of filling. At this point, when no bottom was struck at a depth of 3 ft., a long drill was driven down into the loose material without touching bottom. Evidently there had been an underhand stope, the existence of which had not been mentioned by the owners or suspected by the examining engineer. The length of this stope, which proved to be of considerable extent, was determined by digging pits followed by driving down long drills. The depth could not be determined without hoisting a large quantity of material, which was out of the question in an examination of that nature. From either end of the drift the samples showed increasing assay values up to the point where the stope started, so that it was evident a high-grade shoot had been gouged. The uncertainty of the depth of this stope and the secrecy maintained regarding its existence manifestly reduced the value of the property, its value becoming dependent largely upon the possibility of opening other orebodies below the existing level by a new adit.

German Metal and Munition Companies are being organized in Berne, Switzerland, according to *Echo des Mines*, three companies having recently been organized, known respectively as Metallum, Militaria and Neutrale. Their object is to conduct metallurgical and electrometallurgical operations, and the intention is evidently to work after the war is ended. It is understood that the organizations are controlled by the Metallgesellschaft of Frankfort, and the Allgemeine Elektricitats Gesellschaft, of Berlin.

Design and Construction of Bucket Elevators

BY ROY REDDIE*

Bucket elevators cannot be standardized to meet all conditions. Modern American mill practice leans toward the bucket-and-belt type for the elevation of a crushed wet pulp. The size, shape, and spacing of buckets, belt speeds, size of head pulley, quality of belt, and method of bucket discharge are all factors that govern the working efficiency of a bucket-and-belt elevator, and should be taken into account in mill design.

THE elevation of crushed ore and pulp is a problem of considerable moment in modern mill practice. In the past engineers have often overestimated the advantages of a gravity-slope mill site. Where steep gradients necessitate arduous climbing back and forth, mill machinery is likely to suffer from lack of attention, which would not be the case, from the cause mentioned, at least, were the mill floor level.

Pulp may be elevated by various devices. Pump and tailing wheels are used on the Rand, at Waihi and a few Kalgoorlie plants; plunger pumps are employed at Bendigo and centrifugal pumps at Tonopah. Working in fields widely separated, the millmen of Broken Hill, Australia, of Idaho and Missouri, as well as many other districts in the United States, show a preference for the bucket-type elevator. Opinions differ as to the respective merits of pumps, tailing wheels or bucket elevators for elevating sand, pulp or slime, but I hazard the assertion that the elevation of pulp crushed to a jig-feed size, or coarser, can be accomplished at less cost by the bucket elevator than by any other device in use at present.

BUCKET ELEVATORS IN THREE CLASSES WITH FOUR TYPES OF DISCHARGE

Bucket elevators may be divided into three classes: (1) Single-chain; (2) double-chain and (3) belt-and-bucket elevators. Each of these may, according to the manner in which the delivery of the pulp takes place at the top of the elevator, be subdivided into types as follows:

Centrifugal-Discharge Type: Such elevators are driven, as the term implies, at a speed adequate to cause discharge by centrifugal force. The buckets are spaced far enough apart so as not to interfere with the discharge.

Continuous-Discharge Type: In this type V-shaped buckets are used. They overlap slightly on the belt and are provided with sides extending outward from the outward leg of the V in such a way that a chute is formed by the outside of the buckets for the pulp of the next succeeding as they are inverted over the head wheel.

Positive-Discharge Type: Buckets of this class are bolted between two chains which, upon passing the head sprockets, are deflected backward at an inclination from the vertical, by leading them over two knuckle sprockets placed just below the head sprockets, and the buckets are inverted over the receiver with a clean and comparatively gentle discharge. The buckets may be spaced or continuous. This type is adaptable for handling friable material which would be likely to produce considerable dust if thrown from a centrifugal-discharge elevator.

Gravity-Discharge Type: This is a combination elevator and conveyor. On passing the head sprockets the buckets move away on a horizontal path until the receiver is reached, where they pass over another sprocket and discharge their loads by gravity.

CHAIN CONVEYORS NOT POPULAR WITH MILLMEN FOR WET-CONCENTRATION WORK

Elevators of the double-chain-and-bucket type may be used to do any work within the scope of a bucket elevator, but mechanical considerations prevent single-chain-and-bucket or bucket-and-belt elevators from performing the functions of the positive- or gravity-discharge types. Chain or link-belt elevators are widely used to handle coal or other non-abrasive material, and also for ore and rock that has been dry-crushed, or the screened oversize from wet-crushed ore. Chain elevators are disliked, however, by wet-concentrator millmen. The detachable-link belt, invented by William D. Ewart, in 1875, was tried for bucket elevators, with the result that wet-concentrator millmen became prejudiced against its use. The articulations of the chains afforded such easy entrance to abrasive sands that the wear was excessive, and the number of articulations as well as the difficulty of inspection made replacement of wearing parts troublesome, tedious and costly. Bushed and riveted chains can, however, now be obtained especially designed to hinder the entrance of abrasive sands in the articulations, thus meeting to some extent the early objection.

The fact that good rubber belt proved more economical and satisfactory for elevator service than the detachable-link belt led many millmen to believe that the belt-and-bucket elevator had established its economic superiority over the chain elevator even for the elevation of coarse crushed rock from the preliminary crushers. Elevators in modern concentrators have to meet conditions so varied, however, that it is futile to expect all requirements to be satisfactorily met by a single type.

Chain elevators should be carefully designed and chains of ample strength provided to overcome that most prolific cause of rapid wear—weaving of the bucket line. To ensure requisite rigidity heavy buckets are needed, and these should be firmly bolted to the chain attachments. The area of the link connections should be such that the bearing pressure does not exceed the bearing strength of the metal, otherwise, and without the entrance of abrasive material, play will result and the deterioration of the chain will be rapid. An ample safety factor should be allowed. The chain tension and journal pressures under which slow-running elevators work are great, and if the buckets are to be loaded to 75% capacity, a chain having a safety factor of 1: 15

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is none too heavy. Roller chains should be used in heavy-service elevators, and these will also give greater satisfaction for elevators of the gravity-discharge type, as the friction on the horizontal run will be reduced to a minimum. Lubrication of the chain is important. Link-belt or any type of chain working on gritty material should be lubricated with graphite. The chain should be run with the back of the coupling hook to the wheel and with the teeth of the driving sprocket pulling against the curve of the coupling hook while the inner side of the cross bar from which the coupling hook extends should pull against the teeth of the driven sprocket.

Various types of sprockets and pulleys are used to carry the bucket line. Sprockets may be used at the head and at the foot of the elevator, or at the head with a flanged pulley at the foot; or a traction wheel may be used at the head and a sprocket or flanged pulley at the foot. A single-strand elevator should be driven by a traction wheel if the elevator is designed to handle gritty material. With a traction wheel the grip is ample for all the work the elevator should be called upon to do, and in the event of choking the chain will slip instead of breaking. Elevators driven by a traction wheel will run more smoothly and last longer than if sprockets are used.

Elevators are subject to violent shocks and in order successfully to withstand the destructive influence of such shocks it is well to allow a wide margin of safety by providing sprockets and wheels of ample strength to support the load and transmit the power required to move it. It is customary to use ordinary cast-iron sprockets for light work, but for heavy work it will be best to provide heavy chilled-iron or preferably cast-steel sprockets, which may be obtained with removable face or tooth segments fitted and held in place by T-headed bolts. The head sprockets of double-strand elevators should be keyed to the shaft with the teeth exactly in line. If sprockets are used in the boot one should run loose upon the shaft to keep the buckets level and to minimize wear. A bushing should be fitted in the hub of the wheel and a sleeve liner placed over the shaft. Bushings and liners are cheap and easily replaced when worn and will prolong the life of shaft and sprockets.

Flanged Foot Pulleys in Chain-Elevator Boots

The use of sprockets in the boot of an elevator is a fruitful source of trouble. If the chains become loose they are likely to ride off the sprockets; they also fail to give sufficient support to the buckets when dredging material from the boot. If the elevator is front-fed and the material that builds up under the buckets is shoveled out frequently the grinding effect upon the buckets will be considerably reduced, but the liability of the chains to ride off will always be present. These objections can be overcome by using a pulley having a deep flaring flange, and, for extra heavy duty, a light dredge tumbler, particularly if the buckets are intended to dredge their load. If long-pitch chains are used the head sprockets will be polygonal and they will in consequence impart pulsations to the chains, thereby greatly increasing the strain. To counteract these pulsations a device introduced by the Link Belt Co., which consists of an equalizing gear made up of a wave-line spur-gear and eccentric pinion may be employed to advantage. In it the number of elevations and depressions of the spur wheel equals the number of teeth in the conveyor wheel and the variations in chain speed exactly counteract the pulsations and eliminate the strains induced by running long-pitch chains over head sprockets. Another device, introduced by the Stephens-Adamson Manufacturing Co., accomplishes the same purpose. It consists of an equalizing gear in which an intermediate gear shaft is connected by eccentric links to the head shaft in such a way as to give it a varying motion in an inverse proportion to the velocity of the elevator chains.

I have used chain-drive transmission for elevators, and chain-driven and belt-driven gear transmission, and have found the direct chain drive the most satisfactory and noiseless for all elevators of moderate height. Low-speed heavy-loaded elevators should be belt and gear driven, so that, in the event of choking, the belt will slip and a breakdown be averted. If split sprockets are used for elevator drives, or for driving any other machine from a line shaft, the hub should be housed in, otherwise a "thrown chain" will be liable to catch on the hub and bend the line shift.

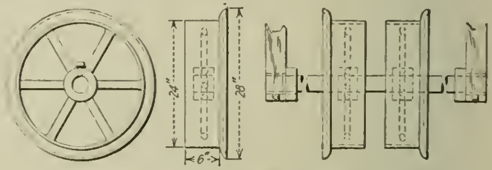

FIG. 1 DETAIL OF TWO-SECTION FLANGED FOOT PULLEY

Various Designs for Head and Foot Pulleys

As a rule cast-iron head or foot pulleys are to be preferred. Pressed-steel pulleys are sometimes placed at the head, but they should never be used at the foot. Cast-iron pulleys, keyed or hydraulically pressed on the shaft, are most satisfactory for head pulleys. Foot pulleys should be of cast iron secured to the shaft by setscrews. They are easy to replace and if the setscrews are provided with jamb nuts there will be no trouble from slipping. Head pulleys vary in diameter from 30 to 48 in., the diameter being determined by a compromise between two opposite conditions. Material that has a tendency to stick or pack in the elevator buckets will discharge at a lower belt speed if the belt is run over a small head pulley than if a large one is used; but if the belt is run over a head pulley of large diameter the internal friction of the belt will be less. High belt speeds tend to keep the material from packing in the buckets and this affects the discharge favorably, but high belt speed shortens the life of buckets, and their tendency to become misshapen and warped increases rapidly with the belt speed. Excessive internal friction will rapidly loosen and separate the plies of cotton duck, causing it to "boot-leg." From my experience with belt-and-bucket elevators I am of the opinion that a head-pulley diameter of from 36 to 42 in. will give best results and larger sizes may be used if the material handled is of such a nature that it will not pack in the buckets. The head pulleys of all belt-and-bucket elevators should be lagged. I have demonstrated to my own satisfaction that lagging the head pulley will increase the life of the belt from 30 to 50 per cent. An 8-ply cotton belt is most satisfactory for lagging and should be secured to the pulley rim by $\frac{1}{4}$-in. small-headed elevator bolts pitched 4 in. on the pulley rim. It will be found that the cost of lagging a pulley will be negligible in comparison with the saving effected.

Various forms of solid-face and skeleton pulleys have been tried in the boots of elevators. Fig. 1 shows a type that I designed, and it is most satisfactory. On material crushed to 1 in. or less this pulley gives ample support to the buckets when dredging from the boot. The flared guides on the rims of the pulley keep the belt from running off, while the space between the two parts of the pulley minimizes the wear resulting from falling gravel caught between the belt and pulley. These pulleys should be cast heavy and be of hard iron. Shafts that carry the foot pulley should be comparatively light. A $2\frac{7}{16}$-in. shaft will be found heavy enough for most elevators. Head pulley shafts should be much heavier in order to insure proper rigidity under working conditions and be able to withstand heavy shocks without appreciable springing. The wear upon shaft journals is great and generally necessitates frequent renewals. To reduce this it is recommended that a cast-iron collar and sleeve be put on the foot shaft of all elevators, as shown in Fig. 2, using a samson-post take-up, and it will also be advisable to use a similar device upon the head-shaft journals of heavy-duty elevators in order to avoid the damage that may result from a broken head shaft.

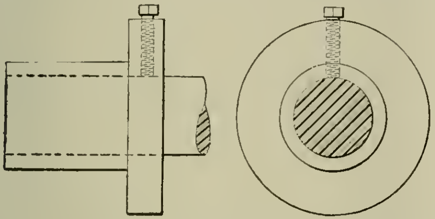

FIG. 2. DETAIL OF SHAFT COLLAR AND SETSCREW

Many mill fires originate from the overheating of elevator head-shaft boxes. To reduce this risk use a good grade of babbitt in these boxes and have them lubricated by positive-feed grease cups carrying a good grade of grease. If oil is used and poured into the boxes from a free-running oil can, sooner or later the bridgetrees and adjoining woodwork will become oil soaked, thus increasing the fire risk. In all dry-treatment mills special precaution should be taken to guard against fire at the heads of elevators, because a fire may gain considerable headway at these points before being noticed.

Rubber Belt Ply of 34-oz. Duck Not Too Heavy

Rubber, cotton, balata, leather, and anhydrous leather are all materials that have been incorporated into belt fabrication for elevator service. Opinions differ widely as to their respective merits, but rubber belting seems to be the favorite. A rubber belt is a fabric that is built up of lengths of cotton duck folded lengthwise, the number of the folds being the number of the ply of the belt. The plies are cemented together by what the trade terms the "friction," after which the outside cover is applied. The whole is then vulcanized under pressure, the degree of which depends upon the service the belt is designed to withstand. Three elements therefore influence the quality of a belt: The cotton duck, giving strength; the "friction," bonding the plies, and the rubber cover intervening between abrasive elements and the carrying fabric. Manipulation during manufacture varies according to the destined service of the belt. Elevator belts must be subjected to greater pressure than transmission belts, otherwise they will become soft and pulpy when water soaked and the bolts attaching the buckets to the belt will easily pull through the fabric. A 32-oz. duck is used in the fabrication of the better-grade belts; cheaper belts are made from lighter duck. It has been asserted that the "friction "cannot be forced through in quantity sufficient to uniformly bond together the different layers of cotton duck if the latter is heavier than 32-oz. material. However, I have it on the word of a manufacturer of repute that this is not the case. A well-known company puts a 34-oz. duck belt on the market said to be "frictioned and faced" with pure Para rubber. This belt has given good service under severe elevator duty and although it is high in price many millmen recognize its economy.

Transmission Belts Not Reliable for Elevator Service

As the strength of cotton duck, other things being equal, depends upon its weight, it is obvious that a heavier duck will make a stronger and, it may be, a better belt if the head pulley is big enough. This, of course, holds good only when experience on the part of the manufacturer has been applied to the fabrication of the belt. So many factors enter into the manufacture of a cotton belt that a heavy duck of loose texture and inferior cotton may easily be inferior to a lighter duck.

The quality of the "friction" will often vary within wide limits. It may consist of new rubber, or it may be a mixture of reworked rubber made from discarded rubber goods, in which case the result will be an inferior material. Reputable manufacturers use new rubber in their high-grade belts, but the ideas of each may vary as to the amount necessary and as to the proper thickness of the outside cover. A high-grade transmission belt may give poor elevator service. I have in mind an occasion when a transmission belt was used for this service and was worn out in two weeks' run. The maker's attention having been called to the poor service of his belt, and the conditions having been explained, he shipped a length of the same brand of belt after it had been specially treated to withstand the conditions of elevator service, and this piece lasted just thirteen months. This well illustrates the importance of considering the manufacturer's advice.

Do not buy cheap elevator belts; the best are none too good. Find out what belt has given good service, and if it continues to give satisfaction use that brand until complete proof is forthcoming that some other brand has given better service. The average user has no elaborate belt-testing plant, and samples are not always to be relied upon, as extra care is sometimes exercised in making them.

Some millmen rely upon the "friction" pull. This test is made by cutting strips 1 in. wide from a piece of belt and noting on a spring-balance the tension that is required to pull the plies apart. It is, however, easy to be fooled by the "friction" test, as belts may be so made as to show a high "friction" test when new, but when they have been stored for a few months many rapidly develop upon usage as many schisms as the Church. The relative merits of different belts may be determined by splicing together lengths of different brands and then studying their behavior under actual running conditions. Satisfactory service, however, can be expected only when a belt made by a manufacturer of repute is used.

In order to get a line on the respective merits of cotton and rubber belts I made up a belt by splicing a length of a well-known brand of cotton belt to a rubber belt of repute. The result of this test was that the belts showed a likelihood of giving cent-for-cent value while running, but a loss occurred on the time the mill was shut down changing belts. Therefore, the belt that gave the longest service was the winner. For light service, however, cotton-duck belts are all right.

Balata belting has also been extensively used, but opinion is divided as to its worth. The cotton duck entering into its composition is not weakened by the vulcanizing heat applied to a rubber belt, and it is asserted that duck of equal weight is 20% stronger. The balata gum can be dissolved to the consistency of milk by proper solvents and will then pass through a much heavier duck than is possible for the "friction" of a rubber belt. It is extensively used in South Africa for conveyor belts, but millmen who have used it in America have failed to approve it unanimously for wet-elevator service. It should disclose a decided superiority to justify the difference in price over rubber belting.

An anhydrous leather belting is manufactured by the Iresen company, of Boston, Mass., and is especially made to withstand the wear and tear incidental to wet-elevator service. It is said to give superior service under any condition other than that produced by pronounced acidity of water. For wet-elevator service, anhydrous belts are made three-ply with the idea of turning the belt when the inside ply shows undue signs of wear. These belts have given good service under severe conditions but have not, so far as I am aware, established an economic superiority over rubber belting. Under certain conditions a cotton belt will give good service, but for heavy-duty wet-elevator work I hazard the opinion that a rubber belt made especially for this service by a manufacturer of repute will prove the most economical. There are various types of belt tighteners. I believe, however, that the one illustrated in Fig. 7 is the quickest and handiest for taking up slack.

V-Shaped Buckets with Rounded Bottoms Effective

The efficiency of a bucket elevator depends greatly upon the shape of the bucket used, and not alone upon its form when new, but upon its ability to retain it under the stress of working conditions. If the buckets are made from light material they will quickly become warped and misshapen before the wear has had time to become appreciable. Once the shape of the bucket is lost, the friction during loading will be excessive, the capacity reduced, and the ability to discharge cleanly impaired to such an extent that much of the material handled will be spilt back into the boot. An L-shaped bucket gives an ideal discharge but has little capacity. A deep bucket has large capacity but discharges poorly. Rounded corners facilitate delivery and as a compromise an elevator bucket should be V-shaped with rounded apex, having the front of the bucket cut lower than the back. Such a bucket has a fair capacity, retains its shape and discharges well. A U-shaped bucket that has a projection of the lip equal to its depth gives an ideal discharge, but soon loses its shape when handling coarse material. When a bucket of this type is made from a single sheet and pressed into shape without being lapped and riveted, the material should be of heavy gage if the bucket is destined to handle coarse gravel, otherwise it quickly becomes distorted. I have found, for instance, that a 6-in. x 14-in. 13-gage cup—a so-called heavy-ore cup—was an abomination when called upon to handle material up to 1-in. mesh, soon becoming so misshapen as to be useless. A malleable-iron bucket should be used to handle hot or corrosive materials, but the ordinary lapped and riveted sheet-steel bucket will be found most satisfactory and economical for handling wet-crushed ore.

For continuous-bucket elevators V-shaped buckets are preferred in order that the discharging material may slide away over the outer sides of the inverted buckets into the receiver. They will not handle material that has a tendency to stick or pack, but are satisfactory for freely discharging substances. If the material be very abrasive it will be found advisable to use a bucket with reinforced edges. Buckets of over 14-in. length should have a reinforcing stay from the back edge to the front edge. This stay materially assists in retaining the bucket's shape and thereby prolongs its life. For wide bucket-and-belt elevators, buckets two-thirds the belt width set in staggered rows will minimize the strains to which the belt is subjected when endeavoring to conform to the pulley's crown. When buckets are thus staggered the millman is able to use a higher-crowned pulley than otherwise and reduce the risk of the belt running off. If buckets of full belt width are employed on wide belts it is advisable to use a flat-faced pulley, keeping the belt on with the assistance of a belt concentrator of the dish-pan type set just below the head pulley, as illustrated by Figs. 3 and 5.

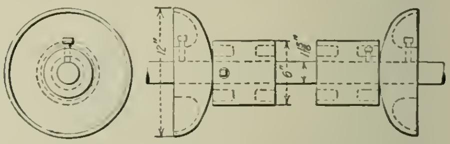

FIG. 3 DETAIL OF DISH-PAN TYPE GUIDE PULLEY

Bolsters consisting of strips of old belt 1½ in. wide and of length equal to the depth of the bucket should be placed between the bucket and the belt. These bolsters allow a stream of water to flow downward between belt and buckets, washing away much of the grit that would otherwise lodge there, and reducing the cutting effect of the back edge of the bucket as it is thrown forward against the belt on passing the head pulley.

Capacious Concrete Elevator Boots Are Best

Elevator boots should be capacious to allow room for workmen to enter and shovel out the boot in the event of a choking. It is preferable to build the heavy-elevator boots of concrete in order to carry the superstructure, but a stout timber framing housed in by 2-in.

plank will serve if the joints are made tight in order to prevent leakage in or out.

Some manufacturers assert that the proper way to feed an elevator is to spout the feed into the ascending buckets. This may be true for slow-running elevators of the continuous-bucket type when handling dry-crushed rock from the preliminary breakers, but experience has taught that the wear and tear upon the elevator handling ore and water are just as great when so fed as when the load is dredged from the boot. Generally a housing should be provided. Slow-running bucket-and-chain elevators are sometimes built uninclosed, but it will be found safer and cleaner to house in the elevator, and such housing should be so roomy that inspection or entrance for repairs will be easy.

Construction Indicated for Special Requirements

The construction of an elevator that has proved satisfactory is shown in Fig. 9. The side under the receiver should be vertical if possible, in order that any material spilt back into the boot may fall clear of the belt. The opposite side should have a batter corresponding to the inclination given the bucket line. Fig. 6 illustrates the samson-post take-up, probably the most satisfactory device for taking up slack in the belt of an elevator. An elevator may be boxed in by nailing boards on the outside of the framing, if it is of the slow-running type or of any type that discharges free from spill; then when repairs are necessary a plank laid from header to header will provide a safe platform or staging for workmen. Wet-elevators and particularly elevators of the centrifugal-discharge type should have the boxing nailed on the inside of the framing or falling gravel will sooner or later cut it away. Build the top high enough to prevent splash going over. The height will depend upon the belt speed; usually 1½ times the head-pulley diameter will be sufficient. The hood may be open on the side opposite the receiver to facilitate inspection, but this will not be needed unless it has been necessary to build a high hood. For a light elevator, or for one that has not been equipped with a belt concentrator, to maintain the alignment of the belt the hood may be drawn in close to the belt, or guide boards as shown in Fig. 4 may be used. If the hood is covered see that this cover is of such a height that discharging material will not be thrown against it. If a roof is placed over the elevator it should be of sufficient height and strength to permit the use of a block and tackle in handling the running gear when repairs are necessary.

Receivers of large-capacity chain elevators handling dry material should be lined with cast-iron plates placed at an angle greater than the angle of repose for the material handled. The receivers of centrifugal-discharge elevators handling ore and water should be made the full width of the elevator-housing and extend in front for a distance equal to two-thirds of the head-pulley diameter, and the edge at the point of overflow should be several inches above the bottom of the receiver in order to allow a dead bed of material to accumulate in the box to protect the bottom from wear. The edges of the buckets should just clear the edge of the receiver.

Millmen differ in opinion regarding the drop that should be allowed from the top of the head pulley to the edge of the receiver. If the material handled has no tendency to pack in the buckets, it will be discharged into a receiver without spill, providing the edge is just level with the bottom of the head pulley and the speed is right. If, as is sometimes the case, the elevator is designed to work upon material that has a tendency to pack, it will be best to lower the edge of the receiver to a point 24 in. below the bottom of the head pulley.

Chain elevators may not be economically driven at the speeds that are customarily adopted in bucket-and-belt elevator practice. The larger sizes should be fitted with large, positively lubricated rollers and the speed should not exceed 100 ft. per min. The smaller sizes of positively discharging chain elevators may be run at a speed of 150 ft. per min. Light centrifugal-discharge elevators of the steel bushed-chain type are sometimes run at a speed of 300 ft. per min., but the wear at that speed is apt to be excessive. In the long run it will be found more economical to place the edge of the receiver from 12 to 24 in. lower than usual, than to run the elevator at an abnormally high speed in the effort to secure a clean discharge into a high receiver. It is better to elevate material an extra 18 in. on the initial lift than to reëlevate pulp that is steadily spilling back into the boot because the edge of the receiver is not low enough to catch it. Slower speeds will also result in longer life to the chain articulations. Bucket-and-belt elevators may be operated at higher speeds than many manufacturers' catalogs would indicate.

Until recently an idea prevailed in many quarters that 300 ft. per min. was the high limit to belt speed for this apparatus, and apparently it was thought this speed was constant, regardless of head-pulley diameter. While 300 ft. per min. may be a suitable speed for an elevator handling free-running granular material and discharging over a head pulley of small diameter, it may, on the other hand, be totally inadequate for an elevator running over a head pulley of larger diameter, or when handling material that has a tendency to pack in the buckets. Even if no trouble is experienced from failure of the buckets to discharge properly, the millman who adopts 300 ft. per min. as a hard and fast rule will not get the most economical service from his belts.

The trajectory of a particle thrown from an L-shaped vane when passing around the head pulley of an elevator can be calculated and plotted, but the curves thus obtained are of comparatively little value except to show that belt speed must increase with head-pulley diameter in order to secure a good discharge from the buckets. When such a vane is provided with a front, however, the emergence of particles is interfered with to such an extent that their path cannot be plotted. Belt speed and shape of bucket then become matters of direct experiment in order to find the most efficient belt speed and the shape of bucket most suitable for any particular set of conditions.

Discharge of Nonhomogeneous Masses

But although the path of particles projected from an elevator bucket cannot be accurately plotted, the path followed by water and fine pulp can be plotted closely. The behavior of such material discharging from a bucket of standard shape at the head of an elevator has been treated in an illuminating manner by Arthur O. Gates.[1] The results obtained when the critical speed of the bucket tip is exceeded are treated in detail and a close study of the article will assist the young designer. Mr. Gates demonstrates that as the elevator bucket is drawn over the head pulley the surface of the water contained therein will continuously move to a position at right angles to the resultant of the forces of gravity and centrifugal momentum. It is stated that the critical speed is that at which these forces just balance each other at the top of the head pulley and it is assumed that an elevator the bucket tips of which are moving at this speed will discharge with maximum efficiency.

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[1] "The Wet-Bucket Elevator," "Eng. and Min. Journal," Oct. 18, 1913.

In practice, such a discharge takes place only from an elevator carrying exceedingly fluid pulp. The material handled by elevators is not as a rule, however, homogeneous. As a matter of fact it consists of matter ranging in size from gravel to fine slime. If an elevator handling such material is watched closely as the buckets pass around the head pulley, it will be noted that the water is cast upward and outward from the lip of the bucket soon after it reaches the head pulley (if the belt speed is right) followed, as the top of the pulley is reached, by a discharge of sandy pulp. Then the coarse substances are projected over the back of the bucket in front and into the receiver. It is abundantly evident that although nonhomogeneous material is acted upon by the same forces the less mobile coarse material has not advanced so quickly to the point of discharge as the fluid pulp, and, because of retarding influences, its discharge has been delayed. This is just what should have been expected from a study of the forces acting upon the material within the bucket during its passage from the boot to the head of the elevator.

Effect of Higher Belt Speeds on Wet Sands

Sand and gravel, due to vibrations of the bucket line, settle quickly, forming a more or less packed aggregate with comparatively clear water above. When the head pulley is reached the water quickly responds to the forces acting upon it, and, obeying the resultant of these forces, begins to discharge upward over the lip of the bucket, if the latter is full and the bucket line vertical. A movement of fluid also will take place within the interstices of the material within the bucket and the finer sand will begin to discharge with the water. It is reasonable to conclude, however, that this movement will be retarded by friction within the settled mass. Presumably as the fluid contents are impelled to move away from the back of the bucket, air will enter the porous space thus vacated and weaken the coherence of the settled mass to the back and bottom of the bucket, and as all this takes place at a time when the discharge side of the bucket is being lubricated, as it were, by the fluid pulp forced against it, the net result is that a sliding movement is initiated along the outward sloping front of the bucket and the mass is projected into the receiver if the critical speed has been exceeded to just the correct degree. It is safer, however, to err on the side of a slight excess in speed and allow the back of the receiver to stop the material thus projected from the bucket than to miss the edge of the receiver and thus permit it to fall back into the boot. The efficiency of an elevator depends upon the amount of material picked up at the boot and landed into the receiver, so it is economy in the end to use a little more power and save the belt.

A vertical elevator will transport more material from the boot to the point of contact with the head pulley than can be raised with an inclined elevator; but, other things being equal, the contents of the buckets of the latter will be carried higher on the head pulley before discharge begins, and will therefore be discharged with a flatter trajectory than from a vertical elevator. Consequently the spill is likely to be less when the bucket line is properly inclined, and the amount of material projected into the receiver will in general be found to be greater than would be the case from a vertical apparatus. An inclination of 1: 10 gives good results. The belt tension is also less when the bucket line is inclined, and the belt wraps the bottom pulley to a greater extent, resulting in less wear from slip. Other things being equal, speed must be increased when the diameter of the head pulley is increased, as the distance a particle must travel to reach the receiver increases with head-pulley diameter and the impelling force must be greater.

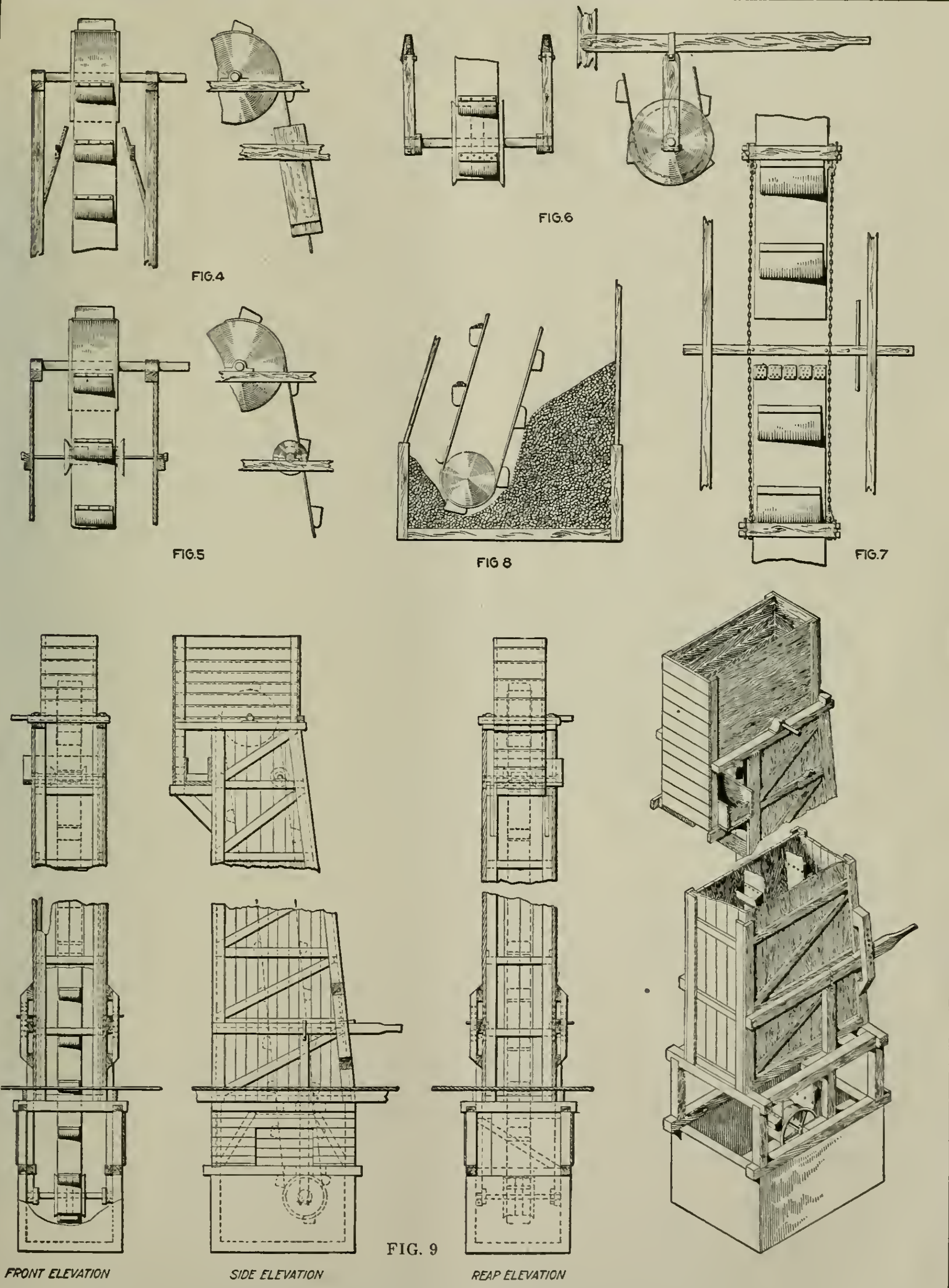
Low Speed Best for Dry Material

Dry-crushed material will be projected from the buckets in a more compact mass than will be the case with wet-crushed material. When dry crushing, however, it is generally desirable to minimize the production of dust, and the belt speed of elevators should be kept low, and the receiver placed lower than when wet-crushed pulp is being hoisted. It is safest, when maximum capacity is desirable, to err on the side of high belt speed and not worry over the warnings of the inexperienced as to the danger of material being carried around the head pulley. I have had elevators running up to belt speeds of 650 ft. per min. for short runs, and the discharge was good. Low belt speed has its evils; the buckets may be so overloaded that a steady spill will occur for some distance above the boot, and much of this material, falling between the belt and foot pulley, will remain there, to be ground between them when the foot pulley is again reached, with disastrous results to the belt. Also, material spilt may bank up in the boot and rapidly wear away the bucket tips as well as consume much power from friction, as illustrated by Fig. 8. An occasional slide of this banked-up material may completely choke the elevator. Be sure that material is not allowed to bank-up at this point.

Slow speed, therefore, although tending to prolong the life of chain elevators by minimizing strains in the chain articulations, may have an entirely opposite effect upon bucket-and-belt elevators and lead to their rapid destruction. Excessive belt speed, however, will also prove detrimental. The correct speed of an elevator can be determined only after all the conditions have been carefully appraised. In the best modern mill practice elevator belt speeds vary from 350 ft. to 500 ft. per min. Good practice indicates that for an elevator running over a lagged head pulley of 36-in. diameter handling material crushed to ¾ in. and less with a ratio of ore to water of 1: 3, a speed of 400 ft. per min. is about right. It will be advisable to decrease this as the size of material increases.

Discharging Buckets with Packed Material

Should an elevator fail to discharge, several expedients may be tried. A canvas lining has been found useful in overcoming the tendency of clayey loads to stick in the buckets. If the material forms a more or less packed aggregate, small perforations in the bottom of



CONSTRUCTION DETAILS FOR BUCKET-AND-BELT ELEVATORS the buckets will loosen the adherence of the mass to the bottom of the buckets. Sprays of water impinging into the buckets have been found to relieve the situation, and a whacker or bumper delivering a blow to the edge of the bucket as it passes around the head pulley has also been found effective. One form of bumper consists of an oak plank swinging on a small shaft and so placed that each bucket will strike it on reaching the top of the head pulley. The impact tosses the plank upward and leaves it in position to fall and strike the bucket immediately following. The pendulum arc must be found by trial and a stop provided to prevent the bumper from striking the belt in case no bucket interposes itself between bumper and belt. The theory of the device is that the impact of the bumper distorts the bucket sufficiently to permit air to enter beneath the settled mass and thus accelerate its projection from the bucket. A piece of an old saw blade may be fixed as shown in Fig. 10. It will be noted that the steel whacker does not interfere with material projected upward from the buckets as the head pulley is reached.

A short length of chain bolted at each end loosely in the bottom of a bucket will also assist the discharge of packed material. At the Trojan mill, in North Dakota, a strip of iron working loosely on two bolts through the bottom of the buckets was used to effect the same purpose. A more positive device than any of these is that of D. T. Blakey,[*] shown in Fig. 11. This is driven by a sprocket chain from the head-sprocket shaft and when properly adjusted for the "knocker arms" to work in synchronism with the elevator buckets of a positive-discharge elevator it will compel the ejection from the buckets of any material that the apparatus should be called upon to handle. Such "kinks," of course, are only makeshifts to assist discharge. It should be remembered that the centrifugal type of bucket elevator is adapted only for material that can be induced to discharge freely under the influence of the forces developed by the flight of the bucket line around the head pulley. If the pulp is sticky or packs in a dense mass in the buckets, a centrifugal-discharge elevator is unsuited to the work and the use of a positive-discharge conveyor is probably indicated.

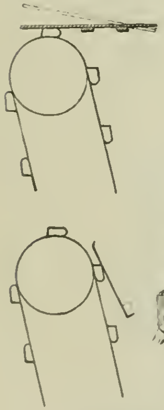


FIG. 10

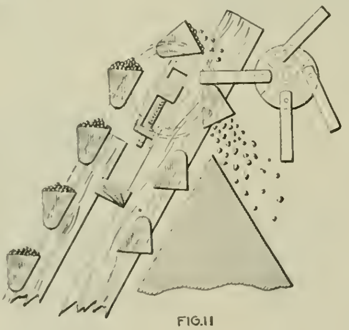


FIG. 11

TAPPING DEVICES FOR DISCHARGING BUCKETS

Handling the usual sizes of material treated upon jigs, etc., in a wet-treatment mill, a well-designed belt-and-bucket elevator will meet all but the most exceptional conditions if the same care be devoted to its design and construction that would be considered imperative in any other unit of a modern concentrator.

Some Aspects of Rand Mining

The annual address of the chairman of Consolidated Gold Fields of South Africa is always interesting by reason of its wide survey of the mining field, but his remarks about Rand conditions are of especial interest to Americans this year on account of the prospective participation of American capital in that field. Other gold-mining fields will also recognize in Lord Harris' speech much that appertains to the particular difficulties under which gold mining is now being conducted all over the world. He also brings up other points of special interest at this time, such as mine taxation and the importance to the British Empire of the continuance of gold production. Lord Harris said in part:

"Turning to general subjects, there is one toward which I think I ought to call your attention specially, although it affects interests far wider than those of the shareholders of the Consolidated Gold Fields. Douglas Christopherson, manager at Johannesburg, says in his report: 'South Africa would undoubtedly have been vitally affected detrimentally had the operations of the gold-mining industry been considerably curtailed.' I think he might have said not only the Union of South Africa, but the Empire also; at any rate, our experience is that those governments that are able to arrange for the exportation of gold are very anxious to get it.

INCREASED COSTS ON THE SAME-PRICED PRODUCT

"You know also that—I have stated it on several occasions—we are getting the same price per ounce for the gold, but it is costing far more to produce. In another part of his report Mr. Christopherson points out that, as indirect taxation is practically in proportion to the tonnage milled, it is obviously a far heavier burden on the low-grade mines, where profitable working is dependent on milling large tonnages, and he illustrates his argument by referring to Knights Deep, where he claims that the above form of taxation in the first half of 1917 amounted, as he puts it, to 200% on the working profit, which was only 9d. (18c.) per ton milled. I take it he means that, assuming a profit, before deductions, of 27d. (54c.), deductions for war levy, miners' phthisis charges, railage on stores and gold and licenses amount to 1s. 6d. (36c.) per ton, leaving only 9d (18c.) per ton working profit, and then before this working profit can be distributed there has to be deducted further expenditure on replacement and renewals of machinery and plant and amounts appropriated for capital expenditure, debenture redemption and interest which are not included in working costs.

"Now, my object in referring thus publicly to this matter is to call the attention of the authorities to the grave risk they are running of 'killing the goose.' If it is a matter of Imperial importance to produce as much gold as possible, some inducement must surely be offered to the shareholders in these mines, which are perilously near having to close down, as, owing to the cost of working being so heavy, they show scarcely any profit. We have time and again pointed out to you that the return from a mine in the shape of dividends is not all true profit; it is partly a return of capital and partly interest on investment, because a mine is a wasting asset, and it would be quite unreasonable to expect shareholders to continue to extract ore from their mine if no return is coming to them, any more than it is reasonable to expect the merchants, traders, or the farmers of this country, whose freedom of operations is being interfered with by the government owing to the exigencies of the war, to carry on their business regardless of whether these businesses are profitable or not. There have been, of course, innumerable cases already where the government has had to acknowledge that a reasonable profit must be allowed. Even the excess-profits tax acknowledges that, in the first instance, a profit to the business concerned is a legitimate first charge.

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[*] Mechanical engineer, Knoxville, Tenn.

Possible Extension of Low-Grade Mines

"I do not see how the government can possibly take the line that the production of gold is so important that it must go on whether it is profitable or not. If they did, then I suppose the shareholders might say that the government must take over the working costs themselves, but even then the property of the shareholders would be wasting and unremunerative unless they received some compensation for disturbance from the government. Mr. Christopherson stated that a quarter of the working mines on the Rand are now affected by this serious outlook, threatening the total extinction of the low-grade mines as taxpayers, as employers of labor and as consumers of South African mining supplies and produce. You will see from his report that he points to this fact—that, whereas 25 mines were working in July, 1914, at an average profit of 5s. 10d. ($1.42) per ton, these mines are now working at only 2s. 2d. (53c.) average profit per ton, showing a decrease in tonnage between the two years of 1,786,416 tons. This result is, of course, not all due to taxation or to increase in cost of labor and supplies; I do not suggest that. It is, in the case of the low-grade mines, also attributable to shortage of native labor.

Relief Necessary to Maintain Gold Output

"Now, these adverse conditions do not apply with equal weight all round. The companies of the Far East Rand have, of course, the advantage, apart altogether from the merits of their ore, of the experience of the older mines, and have been able to avoid expenses which were not avoidable in older days. At present eight Far East Rand companies are working at a profit of 18s. 3d. ($4.44) per ton, while the remaining 42 companies on the Rand are working at only 5s. 3d. ($1.28) per ton profit. Surely in these days, when a graduation of income taxation is recognized as legitimate, it might with justice be applied to the South African profit taxation; but, whatever the method, I do submit that it is necessary for the government to look carefully into this matter and find some way of remedying the unduly heavy burden which is now laid on the poor-grade mines, with a view to providing some relief, and that as promptly as possible, unless they are prepared to do without the gold which, we are given to understand, is so essential for the necessities of the Empire, and also unless the Union of South Africa is prepared to face a considerable falling off in receipts from the taxation of mines.

"The general effect of the adverse conditions under which the gold-mining industry in South Africa is being carried on is best illustrated by the fact that for the year ended July 31, 1917, the amount distributed in dividends by the gold mines of the Rand was £6,732,000 odd as compared with £7,985,000 odd for the corresponding period immediately prior to the outbreak of war, being a decrease of no less than £1,253,000 odd, and this would, of course, have been considerably greater had it not been for the increased dividends paid during the latter period by the Far East Rand companies.

"I submit that this is a condition of affairs which is not justified, having regard to the sacrifice made by you and the efforts that have been made by your officers not only to work your mines economically, but to introduce greatly improved conditions for the employees. The working costs of this group come out at 16s. 2d. ($3.93) per ton milled, as against 18s. 6½d. ($4.51) for the whole of the Witwatersrand.

Improved Working Conditions

"A considerable advance has apparently been made in the use of small machine drills, which are at last showing considerable efficiency; a rigid economy is being exercised in the way of stores, and, owing to the efforts of your representative, amicable results have been obtained by meetings of employers and employees, and Mr. Christopherson considers that there is now a better feeling between the two than has existed in the past. Success is resulting from the continued efforts to eliminate dust in mine workings, and it is becoming apparent that there is now little danger of contracting miners' phthisis. Mr. Leslie claims that the general health and fitness of many of the employees has benefited considerably by the arrangements made for physical culture—which have been supported by Mr. Christopherson—on our mines. Mechanics' working time has been reduced to 48 hours per week, and their holiday leave has been extended. Holiday leave on a more extended scale has been granted to underground employees, who have been offered a 48-hour week, and the war bonus to mine employees has been extended with the increased cost of living. The mining industry is sharing in the expense of a largely extended scheme for giving youths a practical training in mining.

"These various measures constitute collectively a heavy expenditure on the part of the mining industry, and I submit that, having regard to these improvements which have been made by your representatives, and for which you pay, it is only reasonable to advance a respectful petition that the extremely adverse conditions under which the low-grade mines are working shall receive sympathetic consideration from the government. But whether we do receive it or do not, I hope you will not forget that these adverse conditions are temporary. They may entail considerable hardships to shareholders for a short period in the way of loss of income and excess of depreciation, with a resultant drop in dividend; but after the war there will be a return to South Africa of a large number of of natives, and, of course, also many of our skilled employees and officials, and, though the prices of commodities naturally will not drop at once to the old level, still they are likely to seek a lower level than at present. Naturally, we shall do our best to minimize the hardship, and I am hopeful that several factors may add to our profits in the current year and help to counterbalance the adverse circumstances.

"Then we have some more cheering news as regards prospects. The Simmer Deep will have the benefit soon of improved winding equipment in both shafts, which will render the lower levels more accessible for working and the development at the lower levels is so encouraging, especially in view of that in the Clement shaft section, that it has a really good chance of making a much better showing. Were it not for war conditions, the mine would today be making about £7000 profit a month, while the charge for redemption of first and second debentures and the interest on the first and second debentures amounts this year to about £73,000, and is annually decreasing. When, therefore, we reach, as we may hope we shall do when we get the labor back, that level of revenue, the surplus of profit over these recurring charges will annually increase.

At Robinson Deep, the new vertical shaft made excellent progress, and the result of the development work in the Booysens claims is distinctly encouraging. As regards Sub Nigel, you can see for yourselves that the market has viewed favorably the proposal for the increase of capital for the purpose of sinking a new shaft and development for a greater tonnage, and, in connection with the proposed sale of some of our Grootfontein claims to that company, you will have noticed with satisfaction, I am sure, that Mr. Leslie believes, from data showing in the Springs Mines and the Daggafontein mines, together with the development in Sub Nigel, that the Farm Grootfontein is traversed from end to end by the richest course of the gold-bearing reef of the Far East Rand.

"I am able also to turn to Rhodesian affairs with considerably more confidence than previously. The rearrangement of capital has placed the Gold Fields Rhodesian Co. in the dividend-paying list, and the prospects of several of its largest interests are of a distinctly encouraging nature."

Tin Shipments from Hongkong

Shipments of South China tin to the United States during July, August and September were fairly in proportion to the high record set for the first half of the year, according to a report from Consul General George E. Anderson, at Hongkong, British China, dated Sept. 27. In July there was a prospect of a shortage of tin supplies in South China and other producing centers in the East, but since then production has increased somewhat, and, in spite of shipments to the United States during the quarter valued at almost $1,000,000, the market in Hongkong was somewhat easier. Recent sales have probably been made of stocks heretofore held for speculation and now sold to prevent further losses. Exports to the United States for the nine months ended September 30 were valued at $3,264,652, as compared with $1,235,632 in the first nine months of 1916 and with $901,823 in the first nine months of 1915.

Exports of tin to other portions of the world during the year to date have increased a little over 40%, while the total shipments to all countries have increased about 58%. The figures, according to the returns of the Hongkong General Chamber of Commerce, for the first nine months of 1917 are as follows, the quantity being given in slabs of 112 lb. each and the corresponding figures for 1916 being given in parentheses: To Great Britain, 16,920 (22,373); to the continent of Europe, 21,800 (4800); to the United States and Canada, 22,874 (10,829). High exchange had a marked influence against export of the metal, but the nine-month period closed with easier exchange and an easier tin market.

Platinum in Ronda Mountains, Spain*

Prospecting for platinum by the engineers of the Spanish government still continues among the placer deposits in the Serrania de Ronda. The region that is being investigated lies near the coast, halfway between Malaga and Gibraltar, a little to the west of Marbella, and includes several rivers with substantial gravel deposits, among them the Verde and Guadaiza. Considerable preliminary work was done in 1914 and 1915. In February, 1916, the investigating commission under the direction of the Geological Institute was directed to continue its work and to study the deposits of chrome, magnetite, and nickel, which are desired for military purposes. Since then the work has progressed slowly.

In the investigation of the platiniferous placers, holes have been dug at intervals of 200 m., and between these soundings have been made every 20 m. The deposits along the River Verde have all been tested, and along the Guadaiza the examination is nearly completed. On both of these rivers a quantity of platinum is said to have been found which, though not extraordinary, may be regarded as favorable enough from an industrial point of view, considering the present prices of this metal. While the investigation on the Guadaiza is not yet ended, it is believed that the quantity of platinum there is greater than on the Verde and that the average depth is somewhat smaller—not in excess of 33 ft. on the Guadaiza and 49 ft. on the Verde.

On the Verde 68 holes have been dug, making a total depth of 776 m., from which 24,079 liters of material were taken and washed to determine the platinum contents. On the Guadaiza 109 holes have been dug, making a total depth of 872 m., from which 21,800 liters of sand were taken and washed. This work has been carried on with two imported second-hand drills. Operations were discontinued for the summer because of the lack of water and the difficulty of boring. The prevailing heat and miasma also make it advisable to suspend work from July until September.

In prospecting for other minerals the region has been divided into areas of 2 to 5 sq.km., which are being investigated progressively by groups of 8 to 10 men, looking over the ground meter by meter and sending samples to the central office for analysis. It has been established thus far that there are 10 deposits of rich chrome which may be exploited, and from 16 to 18 of magnetite and chrome iron. Deposits of nickel, which is the most important of the metals for military purposes, have been found in quantities which are expected to meet the needs of the Spanish industry for several decades at the rate it is now being consumed; the predominating mineral is garnierite.

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*Excerpt from a report from Consul Louis G. Dreyfus, Jr., at Malaga, Spain, in U. S. Commerce Report, Oct. 23, 1917.

Marketing of Lead by the Smelter

The problem of the marketing of the miner's lead by the smelter is ably set forth by Edward Brush who has long been in charge of the selling of lead and silver for the American Smelting and Refining Company.

MANY facts of interest to the lead miner, the smelter and the purchaser of lead were contained in the affidavit of Edward Brush, vice-president of the American Smelting and Refining Co., in connection with the suit brought by that company against the Bunker Hill & Sullivan Mining and Concentrating Co. in the U. S. district court of Oregon. Limitations of space obviously prevent a detailed presentation of the legal and controversial aspects of the case, but the following excerpts from Mr. Brush's affidavit set forth clearly some of the selling handicaps that have burdened both the producer and the smelter of lead:

The smelting business prior to 1900 had been one of great uncertainty, because the custom of the trade had been to establish numbers of small smelteries, the lives of which were often short, depending upon a given mine, or at least a given mining district. Their metallurgical work was poor and their metal losses consequently great.

The custom of the trade is and always has been for the smelter to buy the mine product, consisting of ores, concentrates and slimes, paying for the metal contents of this product at the time of delivery. The amount paid the producer in the early days was generally a flat price, much less than the market figure, because of the fact that at least three to four months must elapse from receipt by the smelter until the final refined metal, in commercial form, can be sold and delivered in the market. Meanwhile the prices of the metals might change materially. Obviously the smelters would pay only at a rate which would insure them against loss.

NEW YORK PRICES RULE LEAD AND SILVER MARKET

In the metal business the great market for the United States for both lead and silver is New York, and hence all contracts are based upon New York prices, excepting for the soft-lead fields of Missouri and Oklahoma, which are based on a secondary market in St. Louis. However, as the difference between the St. Louis price and the New York price amounts merely to the freight between the two points, this does not make a substantial difference.

To sell its metals without loss is a very important problem in the smelting business. As stated, it takes at least three months from the receipt of the ores before the smelter can finally deliver the lead content thereof in the market. During this time the price of lead and silver may rise or fall, or do both. At first blush, it would seem that the profit made on the rising price would offset the loss made on the falling price; but this does not prove to be the case in actual experience, even though the price may be averaged and on the whole the amount of rise and fall is equal. The effect is not balanced for the reason that when prices are rising the consuming manufacturing trade, realizing the probability of an increase, buys as rapidly as possible to supply its necessities for a considerable time in the future. Also, the mines over-produce at high prices and lower their production when prices are depressed.

The lead and silver business, like nearly all other businesses, such as steel, lumber, etc., is subject to periods of depression, during which time the smelter is obliged to buy the mine product but can sell nothing. As a rule, lead is high when the country as a whole is enjoying great prosperity and there is a consequent building development which necessitates the use of lead for paint and for plumbing purposes, and of late years, when electrical equipment is expanding, for lead-covered wire and for batteries. When the period of falling prices sets in, the consuming trade buys from hand to mouth, because it feels that the price will go down and hence carries no surplus stock.

VARIATION IN SILVER PRICE A TROUBLESOME FACTOR

Silver has also been a disturbing factor in the business and is subject to wide variations which are based not only upon the consumption of silver in the arts but upon its use as money. The price of the metal is largely governed by London. The transportation of the metal in India and China, which still use it as a basis for their money supply, takes considerable time, and hence the risks of handling silver are particularly great and call for great care and attention. It is important that one be in a position to get widespread information and to be able to act quickly upon that information, if he desires to avoid great losses in handling the silver-bearing product.

The result is that the smelter to some extent "holds the sack," to use a colloquial expression. He has to make his contracts more or less based on the requirements of his customers to the extent of his ability to fill them; hence, if the customer wishes a large quantity and the smelter has it, he must supply the amount desired. If, however, the customer wants only a small quantity, the smelting company is left to carry large quantities of lead or silver, with consequent great risk, should the price fall.

METAL EQUIVALENT OF ORES PURCHASED SOLD DAILY

As a consequence of this condition in the old days, before the organization of the American Smelting and Refining Co., the smelters were accustomed to sell, if possible, each day the amount of lead which they received at the price prevailing on that date, agreeing to deliver it three or four months thereafter. This led to the development of a large group of middlemen in New York who would purchase from the smelter and would thus take the risk of carrying the lead until the consumer wanted it. The result was that they acquired what is called "spot lead," that is, lead which could be delivered immediately, and they would obtain control of large quantities of this at periods of low prices and carry it over until they could dispose of it when prices were high. As a result, the mine got on the average an unsatisfactory price for its lead output.

It became obvious that it would be wise for all concerned, mine, smelter and consuming public, if the inequalities of this system could be somewhat mitigated, and both miner and smelter be able to protect themselves. To do this there was inaugurated a form of contract with the miner under which a percentage of the price allowed was given to the smelting company, so that it would be directly interested in the amount obtained for the lead in the market, and thus be compensated for carrying charges and the risks it would have to undertake if it abolished the old plan of selling the lead on the day of receipt for whatever it could get, the lead to be delivered four months afterward. This general policy of the trade was embodied in contracts in which it was agreed to pay for 90% of the lead at 90% of the New York price up to $4.10 per 100 lb., and above $4.10 per 100 lb. dividing the price of the lead between the miner and smelter.

The result in practical experience was that the miner averaged a greater price for his lead than under the old system, while the smelting company, being also interested, had an object in at times carrying the lead over dull periods to sell it in periods of better prices. In fact, it absorbed the functions and the field theretofore occupied by the middlemen above described. But to do this the smelting company had to make contracts with the important consumers. Obviously it could not make such contracts unless it was reasonably sure of being able to deliver the lead.

The present high price of lead is the result of these conditions: (1) Production in Mexico has practically ceased during the years of anarchy which have recently prevailed in that country; (2) the shortage of ships, due to their destruction in the U-boat warfare, and their use in carrying of war munitions, has practically shut off the supply from Australia, one of the largest fields of production in the world, and the same conditions have affected the supply from Spain; (3) the increased use of lead for war purposes.

Owing to the advantages of long-time contracts, or of some connection between miner and smelter, all the important lead-producing mines of the country now have their output arranged for for many years in advance. Every smelter in the business from the years 1890 to 1893 will recall that many smelters in the country were absolutely ruined and that the financial status of all was seriously impaired by the continued fall in the price of silver, which culminated in the famous panic of 1893. The smelters simply could not sell the silver for what they paid for it, until finally in despair they refused to pay for the silver except upon the price prevailing in the market at the time the silver finally reached the market.

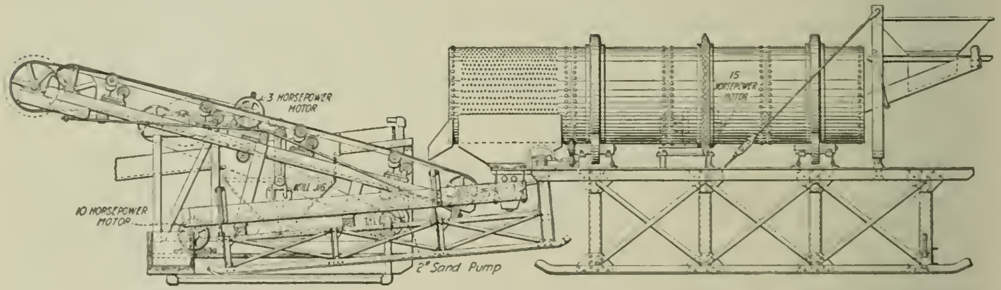
Now, miners as a rule want to sell their products, which are ores, concentrates and slimes, for cash. The risk and expense of selling then fall upon the smelting company and it accordingly equips itself extensively to sustain that burden. It has established lines of information as to the influences affecting the price of lead and silver throughout the world, and has built up a large organization of agents in all important markets.

Recovery of Comstock Tailings from Carson River

By Lewis H. Eddy*

Considerable gold and silver are believed to have been deposited in the Carson River in the form of chlorides, quicksilver and amalgam from the tailings of the mills that treated the ores of the Comstock mines prior to 1899. The Unevida Gold Mining Co. will attempt to recover the quicksilver and amalgam and whatever other valuable metals there may be in the river, by the installation of a plant for conveying and washing the gravel and cleaning bedrock. Three problems, low cost of handling the gravel, cleaning the bedrock, and scouring the recovered quicksilver confront the company.

The Unevida plant will be built at a point near the river shown in the photograph. The cost of recovery can be determined positively only by actual operation, but it may be estimated on the basis of excavating, conveying and washing gold-bearing gravel by the plan of operation that is to be adopted, which is a combination of simple methods already in use in gold-placer mining, composed of (1) endless-chain bucket conveyors, (2) revolving screens, (3) gravel washers, (4) Neill jigs. The bucket conveyor to be installed is designed from one used 20 years ago at the Alturas Mine, Sierra County, California. This conveyor, shown in an accompanying illustration,[1] was constructed by W. S. and A. M. Packer and was not patented. The gravel was shoveled by hand into the buckets on the lower side of the double chain and was carried up and around the driving sprocket on the platform and dumped into the hopper. The empty buckets returned in an inverted position until they rounded the sprocket wheels at the other end and again come into position to be filled. The original conveyor was driven by a 3-ft. water wheel, provided with a 3-in. nozzle under a 40-ft. head.



GRAVEL WASHER DESIGNED TO TREAT THE CARSON RIVER GRAVEL

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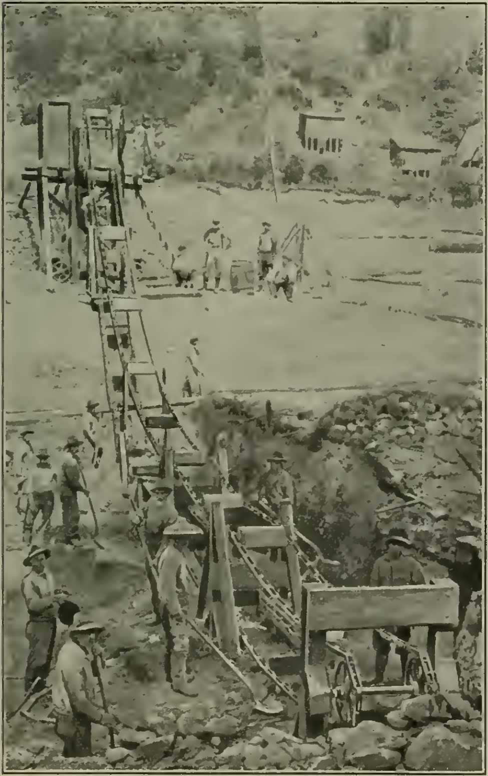
*Associate editor, "Engineering and Mining Journal," San Francisco, Calif.

[1] "Thirteenth Report of State Mineralogist," 1896, Sacramento, Calif.

SITE OF UNEVIDA OPERATIONS ON CARSON RIVER



THE PACKER GRAVEL CONVEYOR, ALTURAS, CALIF

The Carson River plant will be composed of a conveyor of this type; a trommel or a revolving screen as shown in the drawing, 16 ft. long and 4 ft. in diameter; sluices; tailings elevator and Neill jig. Material from the stream bed will pass from the conveyor buckets into the hopper, then to the revolving screen. The coarse will pass out into a conveyor, and the fines, passing through the $\frac{5}{16}$-in. perforations of the screen, will go into the ordinary type of mill amalgam trap. The overflow will pass into a sluice 12-in. wide and about 12 ft. long, which is hung on standards and worked by an eccentric, having an end-shake stroke of $\frac{3}{8}$ in. 400 strokes per minute. This sluice and the revolving screen were originally intended for use at Battle Mountain, Nev.; the idea being to put through the largest amount of gravel possible with the smallest amount of water. The gravel will travel dry through the sluice, the water being used only to wash the fines out of the riffles. In other words, the water does not drive the gravel through, as in ordinary sluice work. From the shaking sluice the pulp will be pumped through a centrifugal pump, which will lift it about 5 ft., the discharge to pass through a Neill jig.

The Carson River is to be turned from its bed by a combination of ditches and centrifugal pumps, the pumps taking care of the seepage. A section of the river will be surveyed, its course diverted and the gravel worked out, and then the plant will be moved forward to another section. The entire washing plant as well as the conveyor plant will be built so as to be readily moved from one point to another.

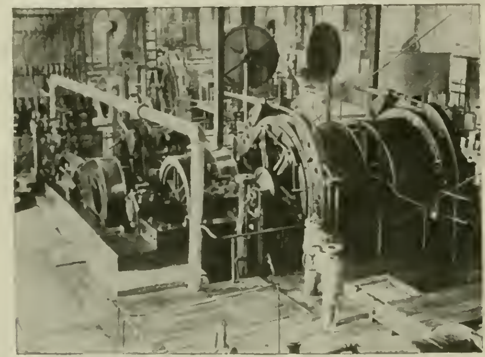
Acquisition of Mines by Aliens Forbidden in Great Britain

The acquisition of mines in Great Britain by aliens without license was prohibited under an order of May 2. This prohibition has been drastically extended under an order of Oct. 28, which forbids the transfer of mine holdings to aliens wherever the mines are situated. The text of the regulation now reads as follows:

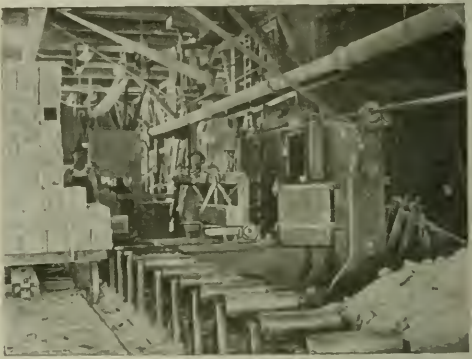
> A person shall not, without the consent of the Board of Trade, transfer or agree to transfer to or for the benefit of an alien or a foreign-controlled company any interest in any mine to which this regulation applies or any interest in an oil field, or any share, stock, debenture or other security issued by any company owning such a mine, or any interest in an oil field, or by a company having directly or indirectly by means of the holding of shares in any other company or otherwise the control of such a mine or oil field, or accept or agree to accept such a transfer. If a person acts in contravention of this regulation he shall be guilty of a summary offense against these regulations. For the purposes of this regulation the expression "foreign-controlled company" means any corporation (*a*) where the majority of the directors or persons occupying the position of directors, by whatever named called, are not British subjects; or (*b*) where the majority of the voting power is in the hands of persons who are not British subjects, or who exercise their voting powers directly or indirectly on behalf of persons who are not British subjects; or (*c*) where the control is by any other means whatever in the hands of persons who are not British subjects; or (*d*) where the executive is a foreign-controlled company, or where the majority of the executives are appointed by a foreign-controlled company. The mines to which this regulation applies are mines wherever situated from which any ores of the following metals are extracted, that is to say, copper, lead, tin, tungsten, zinc or any other metal which may hereafter be added by order of the Board of Trade.

These regulations are assumed to be only for war times. They are likely to prove awkward if enforced in other countries.

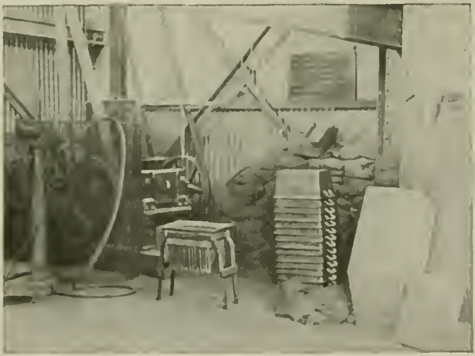
Photographs from the Field



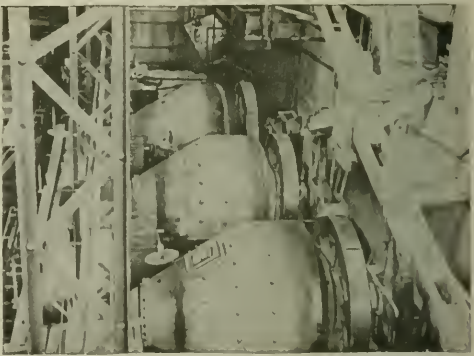
Hoisting engines at "A" shaft of Old Dominion Co.



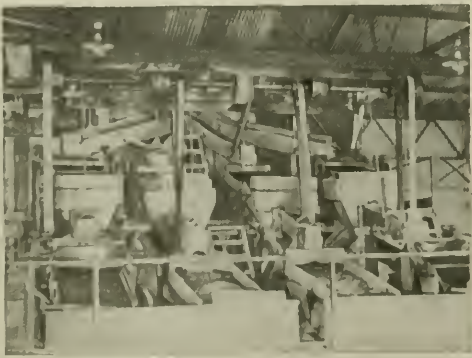
Framing machine for underground mine timber



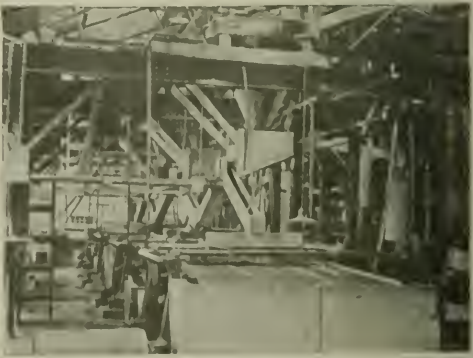
Regrinding room in sampling mill



Hardinge mill section of the concentrator

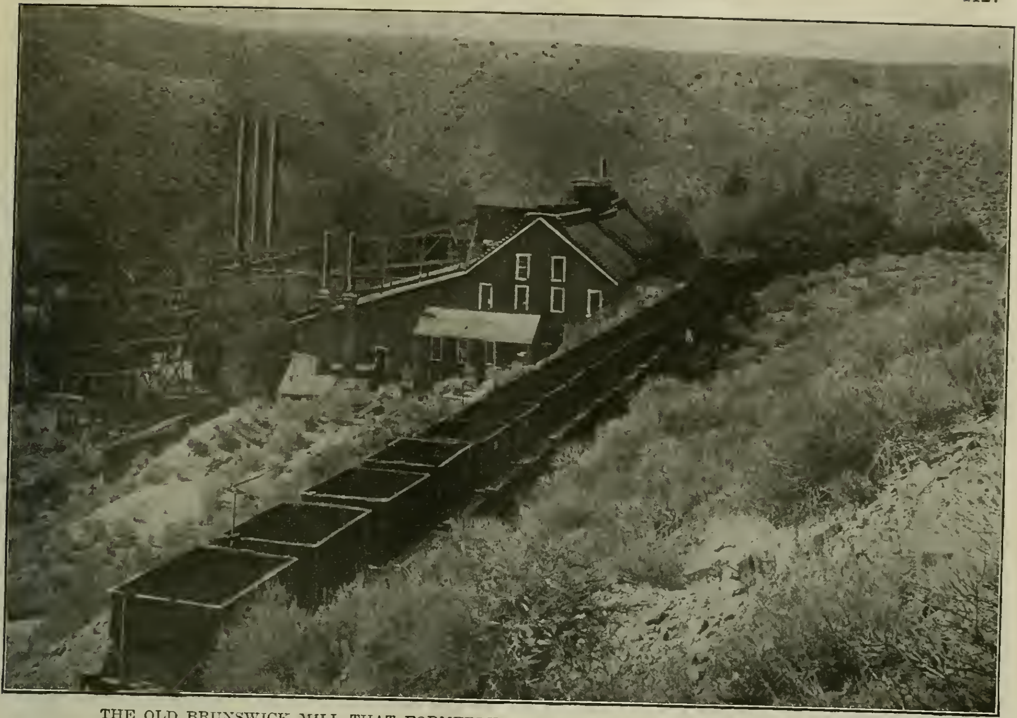


Shaking screens at concentrator



Senn vanners fed from Allen cones

SOME INTERIOR VIEWS AT THE PLANTS OF THE OLD DOMINION CO. AT GLOBE, ARIZ.



THE OLD BRUNSWICK MILL THAT FORMERLY TREATED COMSTOCK LODE ORES IN NEVADA

SITE FOR GRAVEL-WASHING PLANT TO TREAT COMSTOCK LODE TAILINGS IN THE CARSON RIVER

The Unevida Gold Mining Co. expects to work Comstock tailings for the recovery of amalgam and live quicksilver that escaped from mills into the river in the early bonanza days

Correspondence and Discussion

Is Gold Mining Necessary During the War?

I am surprised that J. Parke Channing should advocate the closing of the gold mines of the country.

In his article in the *Journal* of Dec. 8, he deprecates the necessity of our Government accumulating additional reserves of gold. In the same breath he admits the correctness of the policy of Great Britain of increasing its gold reserves by stimulating the production of this metal in her colonies. He doubts, however, whether Great Britain would encourage the production of gold in Great Britain itself. This assumption on his part is rather a ridiculous one, in view of the fact that there is no gold-mining industry in Great Britain.

The financial position of the United States after the war will be sound in proportion to the amount of the yellow metal it has on hand. We are already pyramiding a gigantic war debt on a gold basis none too broad.

The gold-mining industry in the United States is suffering under enough handicaps in the way of high costs of operation without having any additional burdens laid upon it. The policy of the Government should be to regulate the prices of explosives, steel, cyanide, carbide, etc., required by the gold mines by establishing a reasonable maximum, especially in view of the fact that the Government has already fixed the price of gold at $20.67 an ounce. While the owners of the base-metal mines have profited extravagantly, the gold miner has had no compensatory advantage.

The Allies have no lack of the base metals essential to the winning of this war. The great gold mines of the world are comparatively low grade and realize but a small profit per ton of ore treated. Mr. Channing knows full well what it means for any big mine to lose its operating organization, which has taken years of hard work to get together, to say nothing of the rapid deterioration of plants when idle. It would not only be a crime, but the height of foolishness for the Government to close down, for instance, the Homestake Mine, in the Black Hills, where the sole product is gold. This would absolutely destroy a community of 10,000 souls, entirely dependent upon the Homestake, and at the same time deprive the Government of from $7,000,000 to $8,000,000 of gold bullion annually, as well as work an unnecessary hardship upon an industry already taxed to the breaking point by high operating costs.

After the war our allies, England, France and Italy, to say nothing of our South American friends, will be in dire straits for gold. In the current year our Government has issued billions of dollars of bonds, for the redemption of which we will produce this year in round numbers only $175,000,000 of gold and silver. We are carrying the burdens for the Allies, and it is our solemn duty to leave nothing undone to provide as firm a foundation as possible upon which may rest the enormous mass of credits imposed by the war.

A fair consideration of this subject will demand that the production of gold be stimulated, rather than discouraged, and that the Government so regulate the cost of supplies that the industry may continue.

Trojan, S. D., Dec. 21, 1917. H. W. Seaman.

In the *Journal* of Dec. 8, 1917, Mr. Channing raises an interesting question, but it seems to me that he has not considered the subject from all angles. It is possibly true that this nation may be able, with care, to husband its existing gold supply so as to carry us through the period of the war, but how about the period of reconstruction which will follow the war?

The distrust between nations which the war has engendered and intensified will render it impossible to conduct international business on a credit basis; and governmental regulation will be ineffective to maintain artificial conditions of exchange. Most economists seem convinced that large quantities of gold will be required, and even the remonetization of silver may become essential to supplement the metallic basis of exchange.

Production of gold cannot be improvised, nor even rapidly stimulated, to meet sudden demands. It will be an unwise thing to interfere with production now, at the risk of a complete financial deadlock later, when an increased stock of gold is required.

If the principle of stifling non-essential industries be adopted, we can more wisely commence with such trades as are dependent on luxury, such as feminine fripperies, jewelry, and, to a less degree, automobiles, and the plants required to produce unnecessary commodities can be used for more essential manufactures. Above all, the labor temporarily displaced can be registered, and the factories reopened when peace conditions are restored. Mines once closed down are often impossible and always expensive to reopen.

Again, to throttle gold mining will involve wiping out entire communities, which it will be almost impossible to reëstablish after the war, while temporary suspension of industries producing articles of luxury affects, as a rule, only individuals. So far as discouragement of gold mining can be wisely permitted, it has already been done (and overdone) by natural conditions, such as high prices of mining supplies and machinery; and the fact that most of our best men have already left to work for Mr. Channing and his competitors.

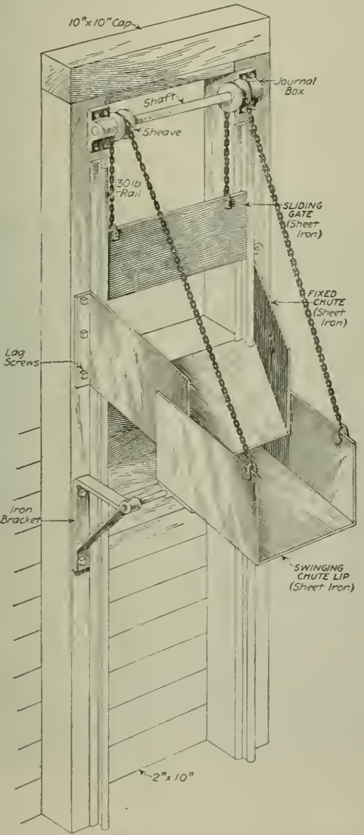
My own idea is that it would be a far wiser plan, in the long run, to assist gold mining (which is insusceptible to adjustment by natural increase of value of the product) by relieving it from all super-taxes. This, for obvious reasons, will not be of much direct benefit to the majority of gold mines; but it will assist the continuance of gold mining by helping to maintain the atmosphere of glamour on which its very existence—necessary as it is to the community under present conditions—so largely depends. George E. Collins.

Denver, Colo., Dec. 15, 1917.

Details of Practical Mining

Counterbalanced Gate and Chute Spout for Underground Ore Pockets

A type of chute gate used in loading 1½-ton cars from an underground pocket in one of the mines of the Southeast Missouri disseminated lead districts is illustrated in the drawing reproduced below. The gate is made of sheet steel, with side-edge fillers, and slides between the head and flange of two 30-lb. rails set vertically along the chute posts. Two light chains are fastened to the top of the gate by clevices, the chains passing over small sheave wheels mounted on a shaft which is held to the chute post above the gate in journal boxes. The chains at the other end are fastened to a swinging chute spout hinged to a bracket casting bolted to the chute post below the chute outside the rails. When the swinging spout is down the chute gate is raised, allowing the ore to pass through to the cars. To cut off the flow of ore the operator raises the swinging spout by means of a bar, and the gate is correspondingly lowered, closing the opening. The combination has the advantage of sharply cutting off the flow with but little overflow, which sometimes occurs when the ordinary gate not equipped with such a lip becomes jammed by large boulders. The illustration gives an adequate idea of the construction and arrangement.

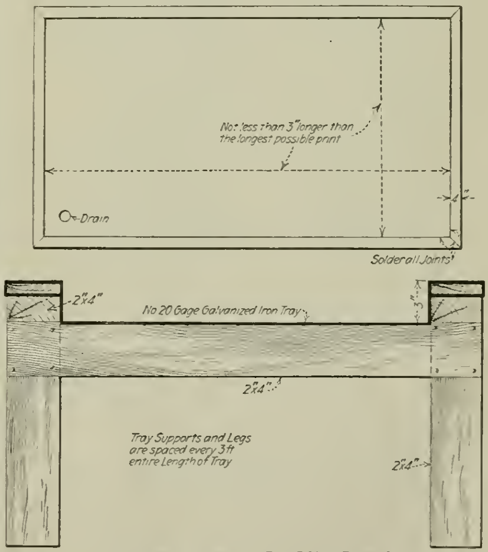


DETAIL OF COUNTERBALANCED CHUTE GATE AND SPOUT

Notes on Blueprinting

Although the increasing cost of blueprint materials has not resulted in the introduction of substitutes, there are several ways in which the waste to which most engineering departments are subject can be eliminated, and, while the following suggestions may embrace repetitions of methods before advanced, most of the "kinks" will be of service.

The blueprinting of an engineering department is often entrusted to a boy whose main idea of efficiency is to get out a certain number of prints, regardless of other considerations, whereas experience has demonstrated that older persons, if properly instructed, will save enough in materials, time and annoyance to more than compensate for the difference in pay. The blueprint room or department should be separate from the main drafting room for a number of reasons, but chiefly because there should be no water or washing tank in the drafting room, since a small amount of water may ruin a $50 tracing. In addition to the regular equip-


Not less than 3" longer than the longest possible print
4"
Drain
Solder all Joints
2"x4"
No 20 Gage Galvanized Iron Tray
3"
2"x4"
Tray Supports and Legs are spaced every 3 ft entire Length of Tray
2"x4"

WASHING TANK FOR BLUEPRINTS

ment in the blueprint room—blueprint frames, washing tank, drying apparatus, etc.—two tables should be provided of a size which would allow of 6-in. overlap on the largest print that the department may be called upon to make. One of the tables may be used for a paper-cutting table and can be marked off at intervals of 6 or 12 in., using brass-headed upholsterer's nails, and will be found convenient in measuring the paper before cutting it. Tracings should not be placed on the unexposed print paper and used as a guide for cutting the paper, as there is always the possibility of cutting them. Standard 10 or 12-in. shears will be found satisfactory for cutting and trimming. For convenience, the cutting table may be provided with a drawer for holding the paper before printing. The other table will be found handy for holding tracings so that they need not be folded or rolled. All tracings in the blueprint room that are not in the printing frame may be kept in drawers in the latter table, to prevent accident, but should be removed to the permanent file when the blueprinting operation is complete. Of the two types of blueprint exposure frames or machines, electric machines, when available, are to be preferred.

The sunlight frame can be used only when sunlight is available, and the printing operation is usually slower, although the cost is slight when compared with the electric machines. The electric machine, where power connections permit its installation, has the advantage of always being ready for use, regardless of the light or time; it prints faster than a sun frame and requires no guess work as to length of exposure, which makes it possible to produce any number of prints of the same shade, this feature being desirable when several prints are to be bound together in pamphlet form.

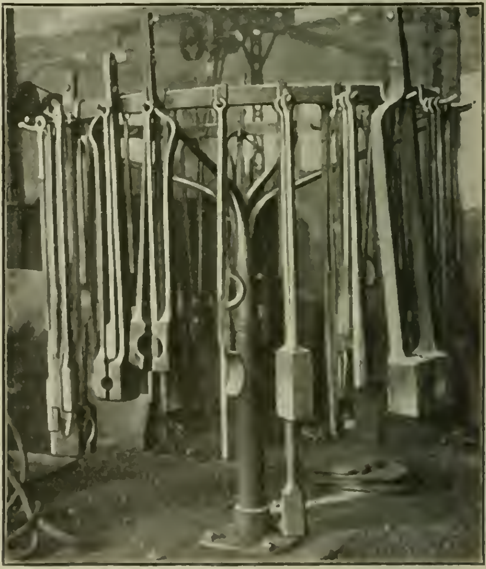
There are a number of washing tanks on the market, but a serviceable tank or tray may be cheaply constructed after the manner shown in the sketch. The water should be piped from a constant source, if possible, and the tank provided with an outlet so that running water may be available for washing the prints. A piece of rubber tubing about 1 in. diameter and 3 or 4 ft. long, attached to the faucet, provides water for the prints. If running water is not available, the water should be changed after washing two or three prints.

In brown printing or negative work the necessary fixing solutions can be put in large bottles and placed upon a small shelf. By means of a number of small rubber tubes, fitted with spring-wire tubing clamps, to regulate the flow of the solution, it may be siphoned off as needed, and it is not necessary to manipulate the bottles by hand while printing. A solution made by dissolving about 4 oz. of commercial potassium-bichromate crystals in one gallon of water can also be placed in a bottle on this shelf and applied to blueprints that have been over-exposed in the following manner: Wash the over-exposed print with clear water, then apply the bichromate solution; let stand until the lines on the print become white—usually about 30 sec.—and then thoroughly wash with fresh water. For drying prints, it will be found that bare copper wire, of No. 16 gage, will make excellent lines, since the copper will not form rust on the prints as do iron or steel wire. It is not necessary to use clamps or holders to hold the prints in place while drying, for if 2 in. of one edge of the print is folded over the wire and lightly pressed against the main part of the print while wet, the moisture will hold the edges together.

By grasping the lower edge of the print in one hand and lightly scraping the wet surface with a large draftsman's triangle, held at an angle of about 30 deg. to the print, it is possible to remove much of the water and facilitate the drying. Large desk blotters are convenient in drying small prints or prints wanted in a hurry. Where electric power is available, an electric fan will hasten the process. A standard trimmer, such as is used by photographers, is useful for trimming small prints, and will save both time and annoyance. Pencil lines, grease, dirt, etc., may be removed from the tracings before printing by rubbing the tracings lightly with a gasoline-soaked rag, taking care that none of the surplus ink is removed from the lines, for this will cause them to present a ragged appearance when printed. After a print has been dried and trimmed, it should be folded in such a manner that the title, date, etc., usually placed in the lower right-hand corner, should be on the outside or exposed portion.

Circular Rack for Blacksmith Tools

A blacksmith's rack that permits heavy tools to be kept in good order is described by Frank A. Stanley in *American Machinist*, from which the illustration is here reproduced. By the use of this device the tools may be found easily when needed and readily removed and replaced. The rack is circular in form, consisting of a steel ring about 6 ft. in diameter supported upon a series of arms branched out from the standard, which is mounted in a square flange at the base. The supporting hooks for the tools are U-shaped and double ended. When placed over the ring that forms the top of the rack, one end projects in and the other out, and thus tools may be hung up inside the ring as well as outside.



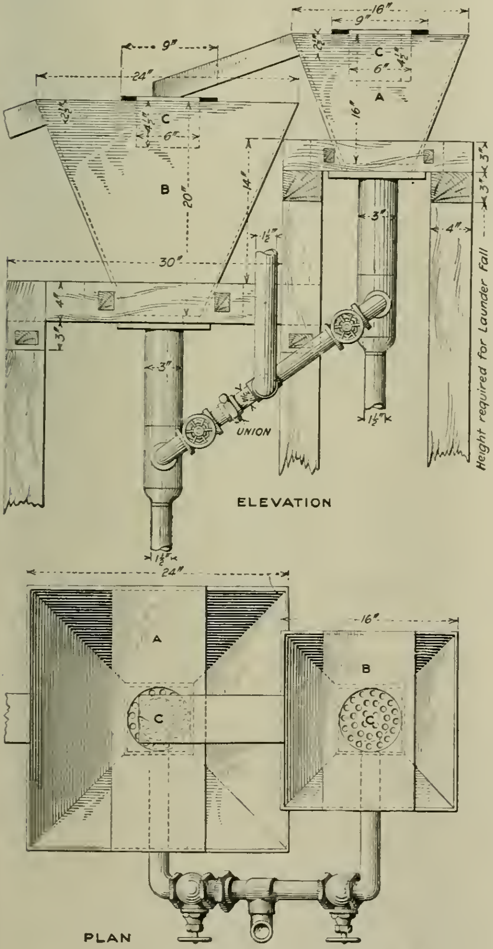
CIRCULAR TRACK FOR HEAVY BLACKSMITH TOOLS

Details of Milling and Smelting

Making an Inexpensive Classifier

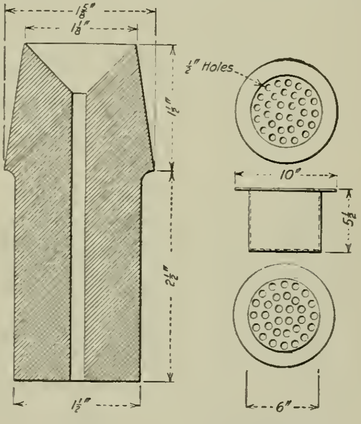
By Frederick W. Foote* and Rastus S. Ransom, Jr.†

In isolated localities or in small mills for working tailings dumps a small two- or three-unit classifier is often essential. The following is a description of a two-compartment classifier that can be made by any mill carpenter and gives excellent results.



DETAILS OF A SIMPLY CONSTRUCTED TWO-COMPARTMENT CLASSIFIER

The two compartments, A and B, are wooden boxes built in the form of truncated pyramids of dimensions as shown. One-half of a 3-in. pipe flange is bolted to the bottom of each box, all joints being made watertight. A 3 x 12-in. nipple is screwed into the flange and a 3-in. tee fitted to the nipple. The horizontal outlet of the tee is reduced to ¾ in. and joined by a ¾-in. nipple to a ¾-in. gate valve, which in turn is joined to a 1½-in. hydraulic water line. One ¾-in. union is required to make this connection. The vertical outlet of the 3-in. tee is reduced to 1½ in. and three wooden plugs are made to fit tightly into the 1½-in. pipe and bored with ⅜, ½, and ⅝-in. holes. The two units are assembled and connected to the 1½-in. hydraulic-water supply. This must be an independent line with a constant head of at least 20 ft. The table pulp passes into box A and is distributed two or three inches below the surface of the water by the tin cylinder C to prevent foaming. The amount of feed water is regulated by changing the wooden plugs until the proper regulation is obtained. This classifier will handle about 50 tons per 24 hours. The following material is needed for its construction: 20 bd.ft. T and G lumber, ⅝-in.; two 3 x 12-in nipples; two 3-in. tees; two ¾-in. gate valves; one ¾-in. union; seven ¾-in. nipples; two ¾-in. 90° ells; two 1½-in. short nipples; one 3-in. flange union; two sets of reducers 3 in. to ¾ in.; two bushings ¾ in. to 1½ in.; one 1½-in. tee; sufficient 1½-in. pipe for hydraulic-water supply line, and 4 x 4-in. lumber for framing to suit requirements; also two tin cylinders, which may be made from any suitable material available.



DETAIL OF PLUG

DETAILS OF TIN CYLINDER

DETAILS OF PLUG AND CYLINDER USED IN TWO-COMPARTMENT CLASSIFIER

Additional compartments can readily be added to the classifier if desired. Only one hydraulic line and union will be needed for any number of compartments (provided there is sufficient head). It is convenient to mark the wheels of the valves at the ¼, ½ and ¾ points.

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Cost of United Eastern Refinery[*]

The refinery of the United Eastern Mining Co. at Oatman, Ariz., is 33 x 45-ft. in area and is constructed of hollow concrete-block walls, steel roof trusses and corrugated-iron covering. It is equipped with two Merrill 36-in., 32-frame precipitation presses, one Case roasting furnace, two 11 x 22-in. muffles and one Case tilting crucible furnace. The cost of construction and equipment is given in the accompanying table.

COST OF UNITED EASTERN REFINERY

	Labor	Material	Total
Plastering	$18 62		$18 62
Excavation	149 75		149 75
Concrete	808 06	$498 22	1,306 28
Machinery, f. o. b. Oatman		1,439 14	1,439 14
Machinery, erection	213 24	90 73	303 97
Building lumber, f. o. b. Oatman		68 06	68 06
Lumber framing and erection	358 20	5 50	363 70
Building covering in place, includes steel trusses	62 00	1,007 22	1,069 22
Doors and windows in place	141 75	147 76	289 51
Tank, f. o. b. Oatman		53 35	53 35
Piping, f. o. b. Oatman		219 14	219 14
Piping, erection	9 56		9 56
Electric wiring, f. o. b. Oatman		31 75	31 75
Electric wiring, erection	46 62		46 62
Engineering, field	63 10		63 10
Furniture and fixtures	3 37	109 58	112 95
Painting	68 13	5 96	74 09
Concrete blocks	151 12	12 00	163 12
Small tools and equipment		7 20	7 20
Total refinery	$2,093 52	$3,695 61	$5,789 13

Precipitation presses were not charged in this account. The Merrill contract did not specify separate prices, and two precipitation presses and one clarification press and zinc feeder were charged to mill. The charge was: Three presses and zinc feeder, $8,450; freight, $439 20; hauling, $126; total, $9,015.20

A 16 x 16-ft. tank outside the refinery receives the barren solution from the presses. From this sump it is pumped to the mill-solution supply tank by a 2½-in. Krogh centrifugal pump, direct connected to a 7½-hp. General Electric motor.

Magnesia Furnace Lining

Discussing some experiments in the installation of monolithic linings of magnesia in ferroalloy furnaces, R. C. Gosrow summarizes the following points in *Metallurgical and Chemical Engineering*, Oct. 1, 1917: (1) After cleaning out some of the highly heated material, the test disclosed considerable ferrous oxide and a honeycombed structure, which resembled incipient fusion and decreased in volume. (2) It was considered that the mix was too high in iron oxide. (3) Hand ramming is difficult to give uniform density on so great a volume of material. Air rammers would be more desirable. (4) The lining walls were too thick, not allowing the effect of the heat to penetrate rapidly enough to burn and frit the whole wall. The inner wall was burned hard, but halfway through the material had no bond and was destructible and soluble, which was evidenced by the sloughing effect. (5) Precautions are necessary to make hard and dense the material over openings, so that this material will not slough and fall down on the electrode, short-circuiting the current through the lining. (6) Rapid heating after burning out tar, and rapid heating to a maximum temperature appeared essential. (7) The tests showed the desirability of using other binders than tar and the futility of carrying on an experiment in apparatus necessary to plant operation.

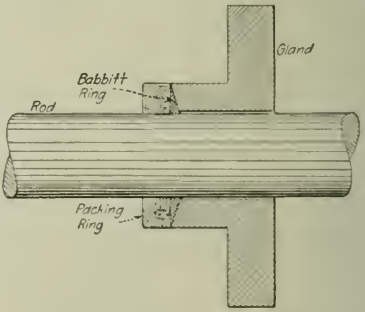
These results show some causes of the failure of monolithic linings to give satisfaction. The author claims to have had considerable success in the last two years in the application of monolithic basic linings for ferroalloy furnaces and other basic smelting processes for tungsten, molybdenum, and manganese.

Guarding a Copper Refinery

At one of the large Eastern copper refineries the plant-patrol department consists of 35 men, each working in nine-hour shifts. This force is distributed as follows: One chief; one assistant chief; 10 regular patrolmen; 17 special patrolmen; one messenger patrolman; five gate patrolmen. The specials report in groups of five at 8 a.m., 4 p.m. and 11 p.m. As each shift comes on duty, five men are relieved (except between 4 and 5 p.m. and 11 p.m. and 1 a.m., when there are two shifts on duty on account of the former's time not being up, which gives the on-coming shift a good opportunity to look the plant over before the off-going shift is relieved). Several special patrolmen also act as traffic men at the entrance to the works and at the railroad crossings. The regular patrolmen change posts weekly, the same as the specials, except that instead of having three shifts reporting in groups of five each at a specified time, they are designated as patrols, Nos. 1 to 10, and are assigned to posts similarly numbered, shifting each week.

Casting a Ring on Piston Rod

The piston rod on our engine had been turned down, leaving the gland a loose fit, and trouble was experienced in keeping the packing from blowing out, writes H. Vipond in *Power*. I remedied it by casting a babbitt ring on the rod. First I wrapped the rod with heavy paper, then wedged the gland central with the rod, put a ring of packing on the rod to babbitt against and made the job leakproof with clay. Only a little dressing up was required after the ring was cast, and it does the work satisfactorily.



Theory of Contact Catalysis was discussed by Prof Wilder D. Bancroft, in a paper before the American Electrochemical Society, from the standpoint of adsorption upon the catalyst as the determining factor controlling catalytic action. He concludes that: (1) Only those substances which are absorbed by a solid are catalyzed by it; (2) while the catalytic action of solids may be solely the result of the increased surface concentration in some cases, this is not always the only factor; (3) a solid catalytic agent may be considered as equivalent to a solvent and may therefore displace the equilibrium; (4) as a result of selective adsorption different reaction products may be obtained with different catalytic agents; (5) a catalytic agent tends to produce the system which it adsorbs the more strongly.

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[*] Excerpted from a paper entitled "The United Eastern Mining and Milling Plant," by Otto Wartenweiler, to be presented at the February meeting of the American Institute of Mining Engineers at New York

Events and Economics of the War

During the week, the probe into the War Department's delay in preparing was accompanied by similar inquiries into the affairs of the Navy and the Emergency Fleet Corporation; the sugar and packing industries were also under investigation. Secretary Lansing published a series of intercepted dispatches revealing more clearly the workings of German intrigue in Argentina and neighboring countries. The Senate agreed unanimously to vote on the Oil Land Leasing Bill on Jan. 7 next. A new commercial treaty with Switzerland was signed. The opening of the new radio station at Cavite completed the chain of naval wireless stations from Washington to the Philippines.

Abroad, Lloyd George stated that Germany must make complete restoration and compensation as prerequisites of any peace discussion. The Germans gained slightly against the British at Ypres. Caillaux, formerly French premier, was placed on trial for treason; General Sarrail, the French commander of the Allied forces at Saloniki, was replaced by General Guillaumat. On the Italian front, the Italians recaptured Monte Asolone, taken by the Austrians early in the week. In Russia, the Bolsheviki opened negotiations for peace with the Central Powers at Brest-Litovsk, though various sections have rebelled against their rule. Canada has forbidden the importation of intoxicants; secession of Quebec from the Canadian union was proposed in the Quebec Assembly; the question will be voted on Jan. 8. Australia voted against conscription.

Government Ownership and Control of the World's Railways

Suggestions of Governmental control of the railways of the United States during the war, now being made by officials at Washington, lend interest to a compilation by the National City Bank of New York showing government control or ownership of the railways throughout the world. It shows that about one-third of the railways of the world are owned or controlled by the governments of the respective countries or states in which they operate, and that in Europe, Asia, Africa and the British colonies more than one-half of the lines are so owned or controlled. In some cases, notably Germany and Australia, the railways are chiefly the property of the states or sub-divisions forming the general government; in others they are the direct property of the government. In Germany, over 90% are classed as government or state railways; Austria-Hungary, 82%; Russia, 77%; Italy, 73%; Switzerland, 99%; the Scandinavian states, 44%; and France at present controls 17%, while other parts of her system have been built in part or whole by the government and are operated by railway companies, but will later revert to the government.

In Europe as a whole, 54% of the lines are classed as state or governmental railways; Asia 70%, Africa 65%, South America 31% and North America but 5%. In Australia 99%, in New Zealand 99%, in India 80% and in the British colonies as a whole, 55% are governmental. While in Great Britain none of the railroads is owned by the government, the entire system is now temporarily controlled by it for war purposes. In Canada about 5% of the railways are government owned. In China some of the railways are being constructed under agreements which will finally make them government property, and in Japan 79% of the railways are now classed as government lines. The principal countries which do not own or at least control any part of their lines are Great Britain, Spain and Turkey, though in certain of the South American countries, notably Argentina, the share of the lines owned or controlled by the government is comparatively small. The United States, though not owning or controlling any trackage in the states forming the Union, owns and operates the railway serving the Panama Canal and is building a line to develop the mineral resources of Alaska.

Engineers Should Be Organized for Civic Service

W. L. Saunders, chairman of the board of the Ingersoll-Rand Co., was one of the speakers at the meeting held in the Engineering Societies auditorium in New York, on Dec. 7, to welcome the American Society of Civil Engineers into the fraternity of the founder societies. In the course of his speech Mr. Saunders said:

"Let me tell you a true story of recent events at Washington. One of the most important laws which a Congress ever enacted is the draft law. This law wisely created district boards for the purpose of determining exemptions. These boards are courts of appeals—courts of last resort, except the President. Each state and territory has one or more district boards. Now, as this war is not only a clash of armies, but a combat between industries, it seemed plain that there were many men engaged in industrial work who might render greater service at home than in the trenches abroad, so the advisers of the President succeeded in placing an engineer upon the proposed list of members of each district board in each state in the Union. On these lists were representatives of the farmers, the legal profession, business men and representatives of labor. Here was the true position for the engineer, the man who is responsible for the creation and operation of our industries. The engineer members were selected from the organization of engineers which had been created by the Naval Consulting Board in each state and territory and through which the industrial plants had been surveyed and listed for war service. The President, acting in harmony with our system of government, a government by states, sent these lists to the state governors, asking them to revise them and make such changes in the names as each governor might deem wise. When the lists were returned to the President more than 90% of the engineers were scratched off to give place to lawyers and others.

"It is useless for us to fume and protest at such treatment as this. It serves us right. We are not organized for civic service. We are not organized for any service. Our institutes, societies and our Engineering Council suffer too much from professional megalomania. Such organizations as we have are not framed to suit the kind of government which we live under—a federation of states, counties and wards—a democracy.

"Let us hope that we begin tonight by placing the cornerstone in a structure to be reared on the lines of engineering democracy. Let us get together, not in high places only, not in the branches, but at the roots of the tree; not alone in scientific fields, but as technical men doing work as citizens, reaching into every village and every ward—a technical civic federation. Let us organize, for in organization there is the secret of greater service and power."

Western Roads Get Higher Freights on Iron and Steel

Increases in freight rates on iron and steel articles ranging as high as 40% were allowed to Western railroads on Dec. 4 by the Interstate Commerce Commission. The increases were not so great as the railroads asked. They wished to cancel commodity rates and apply fifth-class rates, which would have caused increases varying from 20 to 50%. The commission held that these were too high and allowed a varying scale of increases ranging up to 90% of the fifth-class rate. Former rates on iron and steel articles were entirely too low in Western trunk territory, the commission held, owing mainly to the depression of the Chicago-St. Paul rate in competition with water carriers. The new rates, which may be filed shortly, apply principally from Chicago, Peoria, St. Louis, Kansas City, Minneapolis, St. Paul, Duluth, and Mississippi River crossings to various Western points.

No increase is proposed in present rates from Chicago to St. Louis, and other west-bank Mississippi river cities, and the commission specifies that the new rates must not disturb the present relationships in commodity rates from Kansas City and St. Louis. The commission deferred until Apr. 4, 1918, the effective date of proposals of the principal trunk line railroads east of the Mississippi to raise joint rail and lake rates to the level of all-rail rates. Investigation of the entire water competition situation on the Great Lakes will be made.

British Increasing Munitions Output

"Nearly 10,000 workshops in Great Britain are now producing munitions of war," says the London *Times*. "Of these 5000 are establishments controlled by the Ministry of Munitions, and 150 are national factories. The output of material of all kinds is on an immense scale, but the limit has not been reached. The erection of four new national factories, at a cost of over $10,000,000, has just been sanctioned, and extensions are being carried out in many areas. Existing workshops are being enlarged; a new factory is being built for the readaptation of old boxes and packing cases from the battlefields; aircraft and instructional factories are being established; and almost every week there are demands for other varieties of building subsidiary to the production of munitions."

New Kerosene Gasifier May Solve Motor Fuel Problem

A solution of the problem of the utilization of kerosene as a motor fuel is suggested in the patent of J. E. Smith for a new kerosene gasifier. The appliance is a vaporizer and is to be made by the Kerosene Motor Appliance Co., incorporated under laws of Delaware. It can be attached to any car, making possible the use of kerosene as fuel as well as gasoline. The regular carburetor, spark plugs, etc., are used and the new gasifier is merely installed between the carburetor and the intake manifold, taking kerosene from the former and vaporizing it before its entrance into the cylinders. Vaporization is accomplished by arranging the exhaust pipes to pass around the gasifier, thus heating the kerosene and reducing it to a transparent gas.

The motor is started in the usual way by gasoline, which is held in a small additional tank, the regular tank holding kerosene. When the gasifier is hot, the kerosene is picked up automatically, the gasoline turned off, and the motor run on the gasified kerosene. Experiment has shown that about 200 starts may be made on a gallon of gasoline. It has long been known that there are more heat units per gallon in kerosene than in gasoline, and a means has been sought to utilize this lower-grade fuel in internal-combustion engines. Smoke fumes and carbon deposits have been the obstacles to overcome. The new gasifier has been evolved to produce a dry gas to explode in the cylinders with a clean exhaust.

Experiments are said to indicate a substantial saving in fuel cost. A stock touring car averaged, according to report, 15.21 miles per gal. on gasoline and when fitted with a gasifier averaged 21.5 miles on kerosene, over the same course. James H. Whiting, formerly president of the Buick Motor Co., is president of the company making the gasifier.

Daylight Bill Will Save Fuel

Fuel conservation is as vital to the success of America's and her co-belligerents' cause as food conservation, according to C. H. Larson, head of the Motor Club, and whole-hearted support should be given to the Daylight Saving Bill for that reason. The bill, soon to come before Congress, might well be called the "coal-saving bill," Larson pointed out, "because that phrase indicates its real primary purpose. If that large part of the public which still regards daylight saving as a fad could see in one pile the 300,000 tons of coal England saved by turning the clock forward in the summer of 1916, opposition would cease.

"The saving of gasoline and oil, so wisely determined upon, is simply the first step. The dimming of huge electric signs during specified hours is another. Why not take the great stride? Why should factories' output be limited and gigantic manufacturing enterprise be handicapped that coal may be conserved for war, when the same end may be gained in much easier and much more efficient fashion? It is better, both in theory and practice, to use positive rather than negative measures. Why curtail industry to save coal when millions of pounds can be saved without that curtailment?

First Standardized Ship Begun

The keel for the first of one hundred and fifty 5000-ton standardized cargo steamships was laid at the new ship-building yard of the Submarine Boat Corporation, in New Jersey, on Dec. 20. The yard has been 70% completed in 76 days. It is said to be the largest in the world, though described by H. R. Sutphen, vice president and general manager, as "merely an assembling plant," where ironworkers are to rivet together plates and girders fabricated at 49 steel mills east of the Mississippi. Of the work of building hulls 18% will be done on the 28 ways building in the yard, and 82% at the fabricating plants. As the hulls are launched they will be towed to an outfitting basin within the yard, where engines and fittings will be installed.

Britain Seeks To Control Trading in Non-Ferrous Metals

The Non-Ferrous Metal Industry Bill was passed on the second reading by the House of Commons on Dec. 11. The bill, if finally enacted, will give the British government control of all dealings in non-ferrous metal and is intended to destroy German monopoly in these metals. The following important sections of the bill are reproduced:

> It shall not be lawful for any company, firm, or individual after the expiration of six months from the passing of this act, or such longer period as the Board of Trade may in any particular case allow, to carry on the business of extracting, smelting, dressing, refining, or dealing by way of wholesale trade in metal or metallic ore to which this act applies, unless licensed to do so by the Board of Trade: provided, that the purchase of metal by persons for the purposes of use in their trade shall not be deemed to be dealing in such metal by way of wholesale trade where the trade carried on by the purchaser is not primarily the trade of dealing in metals.
>
> The metals and ores to which this act applies are zinc, copper, tin, lead, nickel, aluminum, and any other non-ferrous metals and ores to which this act may be applied by order of the Board of Trade, and the expression "ore" shall include concentrates, mattes, precipitates, and other intermediate products.

Penalties of imprisonment, fine or both are provided in the bill for conducting such business without a license or for neglecting or refusing to furnish information required under the terms of the bill or for knowingly furnishing false information. John Dillon, in the course of the debate, expressed the belief that when a peace conference came, President Wilson, on behalf of the Government of the United States, would require that the bill be made ineffective.

Hoover Asks Greater Food Saving

The following additions have been made by the Food Administration to the directions on the "Home Card" given to each signer of food pledge: To the wheatless and meatless days is added a porkless day, and to each day a wheatless and a meatless meal. The consumer is urged to use sugar on the basis of 3 lb. per person per month. Hoarding in the household is not only unnecessary but it is selfish and is a cause of high prices. Propaganda against conservation and increased production is direct assistance to the enemy. As a nation we eat and waste 80% more protein than we require to maintain health. Therefore, we can reduce the amount of meat we eat without harm. We eat and waste 240% more fat than is necessary.

Lane Reviews Chemical Progress

In his report for the last fiscal year, Franklin K. Lane, Secretary of the Interior, predicts that Congress will take action to encourage leasing of water-power rights and development of new petroleum fields. In reviewing the phenomenal growth of chemical industries in the last two years, Secretary Lane states that the country now manufactures practically everything required along chemical lines. The increase in capital invested in chemical industries was, in 1915, $65,565,000; in 1916, $99,244,000; and up to September, 1917, $65,861,000 over the preceding year. Before the war 90% of the artificial colors and dyes were imported, five or six concerns with 400 operatives producing 3300 short tons per year. Now there are over 90 enterprises, each making special colors, and 100 concerns making crudes and intermediates.

Sulphuric acid, the chemical barometer, has doubled in production. Byproduct coking doubled its capacity in the last three years. Gasoline production has increased from 35,000,000 to 70,000,000 bbl. per annum since 1914. The production of explosives and consequent consumption of nitric acid has increased enormously. The nitric acid is still made almost entirely from Chilean saltpeter, but synthetic nitrogen plants are under process of construction. Before the war 40,000 tons of barite were imported from Germany for the manufacture of lithopone. Now five companies are producing this article from deposits in Tennessee, Kentucky, Virginia, and Missouri.

Would Discourage the Use of Gold in Making Up Payrolls

"The use of gold coin as a circulating medium leads to rapid abrasion and consequent loss of value," said Secretary McAdoo in a recent statement. "There is real economy in using currency in all ordinary domestic transactions, letting coined gold be held as security behind gold certificates and as reserve for Federal reserve notes and other forms of paper currency or for foreign exchange settlements in cases where nothing else can be used in adjusting international balances. There are some firms and corporations, however, which have been accustomed, in making up their payrolls, to use machines for counting money. While there is no objection to these machines handling silver coins, the use of gold in them in times like the present must be discouraged."

Emery Mines of Asia Minor have been closed to the Allies because of the war. Emery is an important material in the production of munitions. The island of Naxos, Greece, one of the chief sources of supply of the fine grades, has had its emery industry stimulated by the Turkish embargo.

Industrial News from Washington

By Paul Wooton, Special Correspondent

Litigation Hinders Tin Development at Cash Creek, Virginia

The tin deposits on Cash Creek, in Virginia, are receiving the consideration of Governmental officials. The Martha Cash tin prospects are regarded by many engineers as more promising than any other known deposit of this mineral in the United States. Half a century ago the head of the Cash family died after making an oral division of the property among a number of heirs. Deeds were not drawn and upon the discovery of float tin, disputes as to title arose. Some prospecting was done, however, and several veins of cassiterite and tungsten-bearing ores were opened. The engineers making the examinations were of unanimous opinion that the deposits possessed great promise. This led to intense competition for options and the disputes as to title took on the proportions of a family feud. Court struggles to secure possession of the more desirable parts of the property were initiated and are still in progress. Prospecting excavations have been filled and at some points the veins have been covered over.

Capital is immediately available for prospecting the properties on a large scale, provided some arrangement can be made that will guarantee against loss arising from inability to secure title. The importance of developing a tin supply in the Blue Ridge region of Virginia so near the centers of consumption, is believed by many to be such as to justify state or Federal action to secure the immediate opening of the properties. This function may be included among those of the proposed director of mining industries.

Iron and Steel Prices To Continue During Next Quarter

Present prices on iron ore, coke, pig iron, semi-finished and finished steel products will be continued until Mar. 31, 1918. After extended consideration the War Industries Board voted to the above effect, but without a preliminary conference with the interests affected, which heretofore has characterized agreements as to prices. Joseph E. Davies, of the Federal Trade Commission, and J. L. Replogle, director of steel supply, sat with the War Industries Board and advised them as to costs. The October cost report covering the production of steel, compiled by the Federal Trade Commission, had been submitted to the President previously.

Manganese Outlook for 1918

Production of domestic manganese ore will approximate 200,000 tons in 1918, according to a carefully compiled estimate furnished the War Industries Board. The estimate covers ore containing more than 40% manganese. The output of low-grade ore will depend largely on the capacity of plants to absorb the material. Some are said to be able to use rhodocrosite ores without previous preparation. One highly reliable steel maker reports that he is successfully using ore which averages 40% manganese and is high in silica, in making normal 80% ferromanganese.

Evidence is reaching Washington of a widespread feeling that the Government should take some step to reduce the risk to capital investing in manganese operations. The uncertainties of the situation are such as to preclude development on more than a hand to mouth basis. If the risk could be lessened, it is believed by several of the Government's specialists, the country could be made practically independent of foreign supplies within the next two years.

State Explosives Inspectors Meet in Washington

Whether magazines containing explosives are to be guarded is to be left entirely to state and local authorities. That the Director of the U. S. Bureau of Mines does not expect to issue any order covering this point was brought out at the meeting of state explosives inspectors in Washington last week. The inspectors were called to Washington to receive instructions with regard to the enforcement of the Explosives Act and to discuss any problems that might be presented. They were asked to encourage better construction for magazines. Burglar- and fire-proof magazines with bullet-proof roofs are so obviously desirable that it is believed companies using explosives will be willing to build them to prevent disaster.

The President's lenient attitude toward Austrians has caused hundreds to write to the Bureau of Mines asking if Austrians are now to be permitted to take out licenses. The reply is to the effect that Austrians are enemy aliens and are ineligible to receive explosives licenses.

Work of Bureau of Mines Stations

The Salt Lake City station of the U. S. Bureau of Mines is ready to make large-scale experiments in volatilizing lead and zinc, which has hitherto been confined to muffle tests. Experiments to raise the grade of oxidized zinc ores by calcination have met with some success. Work has also been started on zinc sludge with the object of recovering zinc dust used in certain processes. A series of flotation tests has also been made on silver-manganese ores.

The Berkeley, Calif., station has made arrangements with quicksilver operators, who have been coöperating with the Bureau, whereby experimental work is to be continued at one of the quicksilver plants. Plans are also being considered for the coöperation of the Berkeley and Tucson stations in experimenting with nitric acid for treating sulphide ores. The Bureau has made investigations of the nickel deposits at Nickel Mountain, near Riddle, Douglas County, Oregon.

Editorials

What Are We Going To Do About It?

WHAT American can fail to experience mortification over the revelations of the inefficiency of his country as a warring power? We are the nation that was going to do things as they ought to be done. We were going to prosecute the war with the same celerity and capability that characterized our developments in science and arts. We smiled at the slowness of our British cousins in getting their gait in warfare, at their ineptness in administration, at their waste of money and resources, and vowed that we would give them a lesson, and after nearly nine months we find ourselves as badly muddled as they were at the corresponding period. We have not even their excuse of novelty in the undertaking, for we had the teachings of three years of the experience of Great Britain and France.

It is true that we have accomplished a good deal for which we may take proper credit. We have financed our allies with promptness and generosity, we have aided them with embargoes on goods to the enemy, we have dispatched an expeditionary force to France and a naval force to British waters with surprising speed, we have adopted conscription without any fuss and have begun the organization of a great army with a minimum of delay; we have taken steps of fundamental importance in maintaining international food supply, we have repaired the interned German ships and we are well along with a great program of new naval construction. We think we may take some pride, moreover, in the Liberty motor, that is now being turned out in steadily increasing numbers.

This is our favorable report. Now for the unfavorable. Our whole system of railway transportation is creaking badly. The whole country is suffering from shortage of fuel supply. After a long period of disgraceful wrangling we have but just begun to build the ships that are so vitally needed. The arming of our new military forces is dangerously delayed. Their equipment is imperfect. The sanitary provisions for them are not what they ought to be. These facts have been disclosed in the Congressional investigation, which has shown in high quarters in the supply and ordnance departments of the Army a horrifying indecision, inability to plan, and incapacity to do things. Left to themselves the manufacturers of this country had been for three years providing the armies of Europe with rifles, machine guns, big guns, ammunition, and supplies of all kinds. We had a comfortable feeling that if our country ever should become involved in the war, these plants and this experience would be immediately available and would offset the negligence of Congress to enter upon the policy of preparedness that had been preached by prophets who had talked to deaf ears. Yet such has been the ineptness in administrative quarters that the usefulness of these manufacturing plants has been all but paralyzed. Mechanics in Connecticut have been playing checkers in working hours while officers in Washington have been debating and vacillating respecting non-essential matters. The Washington bureaus have been trying to organize the war on principles that would wreck a business enterprise. In the matter of machine guns, for example, the Browning may turn out to be the best ever, the Lewis may have failed in certain ordnance tests (the failure may have been insignificant), yet the fact remains that the British have been using it to the number of 70,000 or so, our own Navy is adopting it, and our manufacturers were ready to make it, and were not ready to make another kind. The attitude of General Crozier in this matter is like that of the lawyer who, after listening to the story of an incarcerated client, said to him: "Why, they can't put you in jail for this"; whereupon the prisoner replied: "But they did, and I'm here." It is fact vs. theory.

Now, who is responsible for this situation and what are we—the people—going to do about it? Congress is looking around for scapegoats, and doubtless they will be found and will be thrown overboard to satisfy popular clamor. But this will be simply removal of manifestations, not eradication of the trouble. Congress itself is more responsible, though it will not see it, but the real responsibility lies with the people and their leaders. The department heads are merely victims of a vicious system created by Congress in its ignorance, a system of red-tape, circumlocution and absence of business methods. The revelations lately made in the Congressional hearing are merely fragmentary. The same conditions have prevailed in many other departments, and discussion of them has been going on for months among men who know.

But while Congress may be responsible for the creation of a system, just as for the creation of a non-understandable war-profits tax law, it is not responsible for principles of action. Congress never leads and originates. It merely registers the will of the people. The real responsibility for the present muddle lies, therefore, with the people and the leaders who have misled them. They starved the railways. They decried the corporations and acted toward big business as if it were synonymous with crookedness and exploitation of the people. They excluded business methods from the executive departments. They would not listen to Theodore Roosevelt and General Wood in their preaching of preparedness. If it had not been for the persistence of those men in establishing officers' training schools things would have been far worse than they are today.

Comes the war, and the people, through their leaders, continue to ignore the principles of business, although they are embarking upon the mobilization of the nation. They disregard the experience of our allies. They do many things against which they are specifically warned. They have ideas of running a cheap war and are in such fear of profiteering that they mess things by price-fixing and the fantastic idea of annuling the law of supply and demand. They talk about the conscription of wealth and place excessive burdens on producers. The wealth that has already been wasted outweighs by far all the fictitious economy of cheese-paring theorists. And for this the responsibility rests not upon General Crozier and the other bureau chiefs, not upon Congress, but upon the people themselves and their chosen leaders. The people have got to get out of their heads that idea of a new freedom which means the pulling down of efficiency and the following of false theories of economics, the taint of Bolshevik poison.

What is the practical remedy in the present juncture? One would be to say that the work of the Army and Navy is to fight, and that the supplying of them, and of ships, and the operation of the railways, etc., should be turned over to corporations, to be conducted as matters of business. The corporation system has proved efficient. Therefore why should not the Government make use of it? So ideal a plan must be characterized as visionary, however. What is far more probable is the creation of a department of munitions, with authority so to organize itself as to do things; the concentration within it of all the work that is now being carried on in a chaotic, irrelevant way, and the adoption by it of such business methods as are to be found, for example, in the management of the U. S. Steel Corporation. And when Congress authorizes this department, let us hope that it will confine itself to broad language and principles, and not try in the organic law to formulate precise conduct and definitions, in which it would be likely to meet with the same poor success as characterized its definition of invested capital.

Bill of Materials

WHEN a corporation is going into a new business for which it must build a plant, the first thing to be done is to have the engineering corps prepare plans for what is to be built, after which it furnishes a bill of materials, that is, an estimate of the quantity of cement, brick, lumber, steel, etc., that is needed. This estimate may be only approximate, according to the degree of study put into the preliminary plans, but, anyway, it gives the purchasing department some data on which to proceed.

In organizing the United States for war nobody appears to have prepared any kind of a bill of materials. Going further back, nobody has prepared any general plan of construction, any chart showing how many ships, aëroplanes, locomotives, railway cars, motor trucks, guns, rifles, etc., are to be built, how much ammunition is to be provided, and so on. Consequently, nobody knows definitely how much material must be secured. Vast quantities are talked about, but there is manifestly an absence of coördination. Such thought as there is runs along the line of commandeering; the Government can take all it needs, and that is all there is about it. The fascination of such dictatorial authority has obsessed the dollar-a-year civilians as well as the uniformed officers of the Army and Navy.

But this comfortable sense of power fades away when one department finds that it has commandeered what does not exist, or what may be obtained only by depriving our allies of their supplies, or that it has preëmpted what may be needed by some other branch of the Government. Thus the Navy may requisition all the tin supply and embarrass the canners who are supplying both it and the Army with food. The Navy may not really have needed the whole, but it was easier to earmark it for itself than to do any estimating of what it really needed and compare with the estimates of other departments. (This is a paraphrase of a recent actual occurrence.)

In obtaining the supply of metals, which is done through the War Industries Board, nobody knows what the Governmental consumption is going to be, and therefore producers can make no definite plans. (Even if they could the theory of price-fixing heads them off.) Last spring the Government talked about requiring a supply of lead that was far in excess of what it actually took, and upset the industry accordingly. On the other hand, plans are now being made for the use of a very essential material that is not obtainable. It may be obtained if steps for its manufacture are instituted without a day's delay. Experts have failed to get this into the head of the officer commissioned in the matter, who says simply that the material will be requisitioned!

When we have a department of munitions, if it be properly organized, the first thing that it will do will be to coördinate the estimates of the several bureaus. We think, however, that there ought to be a superior war council—a board of directors, so to speak—that would coördinate the requisitions, determine how many ships, motor trucks, locomotives, etc., ought to be built in conformity with a general scheme. Manifestly, there is no use in building motor trucks in excess of any possibility of getting them to France. The board of directors having arranged plans on definite lines, the department of munitions, as the purchasing and manufacturing organization, would secure the material in the most feasible way. The War Industries Board, the War Trade Board, the War Credit Board, the purchasing bureaus of the Army and Navy, and all the bodies that are now working at sixes and sevens, ought to be absorbed by the new department, the organization of which should be such that subordinates would be clothed with the authority to do the things that fall within their province in any private or corporate business.

War is no respecter of persons. Uncle Sam himself is not exempt from its inconveniences. This, in large measure, accounts for the slow and irregular deliveries of the *Journal* concerning which some readers have written us. Upon making a careful investigation into the causes for these complaints, our subscription department finds that the irregularities are traceable to the unprecedented congestion of the mails—due, in part, to the war program of curtailing train schedules; but mostly to the going into military service of many thousands of postal clerks. The postoffice authorities assure us that no stone will be left unturned to get back to normal service at as early a date as possible. Meanwhile, until the necessary readjustments in service are made and new clerks are trained to take the places of the enlisted men, it will be necessary to exercise a little patience. We are helping Uncle Sam all we can to deliver your paper on time.

While on the subject of thrift and cutting out useless work, work unnecessary for the prime purpose of prosecuting war, we think that the Government would do well to take a look through its own bureaus and discover whether there be not many hundreds, or thousands, of employees who are blissfully doing the inconsequential things that constitute their "jobs" just as they did before America entered the war. Some of the published literature we receive inclines us to this opinion.

BY THE WAY

Residents of the Michigan copper country have always pointed with pride to the famous "C & H" band, composed of employees of the Calumet & Hecla mines. The following is told of a "Cousin Jack" who formerly worked at the Isle Royale mine near Hurontown. He had been West for a number of years, and, returning to Michigan, attended one of the concerts given by the C. & H. band. "M'son," he remarked to his nephew who was entertaining him, "thirty year ago, the 'Urontown band could blaw louder and longer than they."

A notable sentence uttered by Mr. Hoover while outlining what the newly formed Federal Food Board expects to accomplish was the one in which he said: "At present either the prices of food must come down or there must be a wage increase, and every time there is such an increase there is a loss of efficiency." In other words, Mr. Hoover holds that, while wages and prices act reflexively, an advance of either necessitating an advance of the other in endless progression, as the process goes on there is a loss, not a gain, in production. He had in mind, presumably, says the New York *Times*, the truth which Macaulay, almost a hundred years ago, was not the first to recognize—the truth which "labor" always does deny and others would like to deny, but cannot—the truth that men do not work with a diligence proportioned to their remuneration. What they really do, as a rule that has, of course, its exceptions, and not a few of them, is to work just as much as, and no more than, is required for earning the money they must have to satisfy their conscious wants and to live as they want to live. That amount of remuneration attained, the common human tendency is to be idle until the money is spent. This tendency is more obvious in the lower than in the higher ranks of labor, but it exists in them all—and perhaps it is not absent, but only better hidden, in the very highest by the existence there of more thought about remote needs and the consequent willingness to provide for them. It is easy to understand, therefore, why Mr. Hoover aims at the cutting down of prices rather than at bringing about a sufficient amount of rise in pay to meet a constant advance in the cost of living. He thinks in terms of productivity, and it is well for us that he does.

There are 1147 stars in the service flag of the American Smelting and Refining Co. and the American Smelters Securities Co. Roger W. Straus, a director, is a lieutenant in the army. Of the officers of the company, Daniel Guggenheim and Edward Brush have each given two sons to their country, and Judd Stewart, F. H. Brownell and R. P. Reese follow with one each. The following technical men have left the various plants to join the colors: W. E. Deedy and R. R. Hasbrouch, of the engineering force of the southern department; Charles M. Brister, assistant metallurgist, John P. Phillips and William St. Clair, assayer and assistant assayer respectively, and Frederick B. Woods, electrical engineer, all of the Baltimore plant; J. C. Pape, flotation foreman, Durango plant; Arnold Hanchett and L. V. Weeks, chemists, A. Peterson, W. F. Way and R. V. Woods, draftsmen, Oliver Punshon, tracer, and W. S. Stack, smoke expert, all of the Garfield plant; W. W. Leach and R. L. Mason, chemists, Globe plant; Taylor Belcher and H. R. Hammond, chemists, Omaha plant; John Jones, assayer, Jens Jensen and Clifford De Leon, chemists, John Huntley and Herman Switzer, surveyors, Perth Amboy plant; G. C. Dewey, chemist, Charles Harsant, assayer, Selby plant; C. E. Finney, chemist, H. H. Crary, assayer, R. H. Wonnenberg and C. E. Putman, civil engineers, Tacoma plant; Franklin A. Luis, assayer, Christmas mine; L. R. Raymond, chemist, Thomas Wilkinson, assistant chemist, R. F. Kirkpatrick, draftsman, and William Elliott, mining engineer, Flat River plant; Charles E. Woodell, engineer, Imperial mine. At the Perth Amboy plant, H. H. Alexander, general manager, and G. G. Griswold, superintendent of the smelting department have each a son with the colors, and John Burleigh, freight claim agent in the New York office, has two sons in the service.

W. E. Nesom in the *Evening Post* addresses Mr. Hoover thus, with apologies to R. Burns:

Hear, Land o' Dough and brother Yanks,
From Maine to Rio Grandy's banks,
If there are wasters in your ranks,
You'll have to drop 'em,
For here is one that knows their pranks,
And means to stop 'em.

If, while at lunch, you chance to sight
A well-conditioned, portly wight
Who seems to note your every bite,
That's he, no other;
And he would curb your appetite,
Were you his brother.

Beside the miller's elevators,
Among the farmers' stores of 'taters,
In places where they can tomatoes,
You'll find him sentry,
With optics peeled for speculators,
And such like gentry.

The cook that swells her butcher's orders,
Purse-haughty "We-can-well-afford"-ers,
Landladies who concede their boarders
A second helping—
He's on their trail. And you—ye hoarders—
Hear ye his yelping?

It's told he was a miner bred,
And dug for silver, gold and lead;
But when he saw that meat and bread
Were greater treasures,
He dropped the pick, and took instead
To scales and measures.

Now by the powers o' prose and verse,
O Hoover, if thou canst disperse
The devils that beset my purse,
Both small and greater,
I'll say we might have chose a worse
Administrator!

Manganiferous Iron Ore Occurrences at Red Cliff, Colo.*

BY JOSEPH B. UMPLEBY†

Two lenses of manganiferous iron ore have been developed at Red Cliff, Eagle County, Colo., by the Empire Zinc Co., while mining for zinc and pyrite. The district requires further exploration before estimates of available tonnage can be obtained, but excellent transportation and mining facilities exist.

AT THIS time of taking stock of the manganese resources of the country as a war measure, the occurrence of large deposits of low-grade manganese ore at Red Cliff, Colo., is worthy of record. This manganiferous ore is not mined at present, but the rapid extension in the application of spiegeleisen in the steel industry has increased requirements for manganese ores and because of the growing cost and difficulty of importing high-grade ore from Brazil, the Red Cliff deposits should be recognized as an important national asset. During a recent investigation of several Western manganese deposits, more than three-quarters of a million tons of ore, averaging 12 to 15% manganese, 38% iron, 1 to 2% silica and low in phosphorus, were found at Red Cliff, Colo., available for transportation and so situated as to permit rapid removal at low costs.

TWO DEPOSITS DEVELOPED IN LENSES PARALLEL TO LIMESTONE BEDDING

The Red Cliff or Battle Mountain mining district[1] is on the main line of the Denver & Rio Grande R.R. at a point 20 miles north-northwest of Leadville. The manganese deposits crop out about 500 ft. up on the canyon side two to three miles below the town of Red Cliff. The principal orebodies occur as great lenses parallel to the bedding of the inclosing Carboniferous limestone, which dips 15° to the northeast. Two deposits, occurring at nearly the same stratigraphic horizon but 3500 ft. apart along the strike, have been extensively developed for zinc and pyrite. The eastern deposit has been explored continuously for 1900 ft. down the dip in the Eagle No. 2 mine, while the western deposit is opened up for 3000 ft. on an incline of 14° at Eagle No. 1, formerly the Iron Mask mine. Both of these deposits are owned and worked by the Empire Zinc Co. Ore from the Eagle No. 2 mine is delivered to the railroad by a gravity tram while a tunnel is used at Eagle No. 1 mine, through which the ore is trammed to the track level.

The position of the orebodies was determined by shallow synclines at right angles to the general strike of the formations. The synclines are now marked on the surface by pronounced recessions in the sides of the main canyon, and as three other such recessions occur along the general belt known to be mineralized, it is probable that other orebodies will be found.

The western oreshoot, although irregular in outline, is about 300 ft. wide and from 10 to 65 ft. thick. It is continuous to the lowest level, 3000 ft. down the dip, the ore consisting of intimately mixed pyrite and sphalerite in a manganiferous siderite gangue. Some galena is found on the margins of shoots and oxidation is complete from the surface for 300 ft. down the dip. This part of the shoot contains the manganiferous iron ore. Distributed through the oxide mass are occasional bunches of lead carbonate, and beneath the lower end of the deposit and extending downward beneath the blanket of sulphide ore, considerable zinc carbonate has been found.

The manganese ore deposits have not been fully developed by present explorations but the main incline seems to pass about through the center of the body. Westward drifts, now caved beyond 150 ft., have penetrated the orebody for 500 ft. and are said to be in ore at the face. Eastward the workings, now only partly accessible, extend for an equal distance in oxidized material, and an old shaft from the surface shows manganiferous iron ore on the dump. Raises indicate that the mass averages perhaps 50 ft. in thickness. Casts of manganiferous siderite widely distributed through the oxide ore clearly indicate that comparatively little transfer of material took place during its formation. Kidneys and seams of yellowish iron oxide are abundant in places and would require hand sorting if mined. In estimating the tonnage in this orebody, therefore, allowance must be made both for waste and irregularities not revealed by present exploration. However, the estimate of 500,000 tons made by J. T. Boyd, general superintendent, seems conservative and may be accepted for present purposes as representative.

OXIDATION EXTENSIVE IN EASTERN DEPOSIT

In the Eagle No. 2 mine the general relations are similar except that in the primary ore sphalerite and pyrite are remarkably segregated. Of two stopes less than 100 ft. apart on the same orebody, in many places 60 ft. thick, one may yield pyrite ore averaging 44% iron and the other a sphalerite ore averaging 45% zinc. Oxidation is more extensive than in the No. 1 mine. At a point 880 ft. down the 14½° incline, which starts from the end of a tunnel 520 ft. long, a raise up the dip and over the main incline opens up manganiferous iron ore for 105 ft. Eastward there is no development in this orebody, but westward and higher on the shoot 200,000 tons of fluxing ore was mined a number of years ago. It is said to have run 15% manganese, 38% iron and from 1 to 2% silica. A drift 200 ft. west from a point 400 ft. down the incline is all in manganese ore. From the comparatively small caved area that represents the removal of the 200,000 tons and the known extent of oxidation along the dip of the oreshoot, it is clear that a large tonnage of manganiferous iron ore remains in this deposit. It is not improbable that it will yield as much as the western deposit, although the basis for so definite an estimate is lacking.

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*Published with the permission of the Director, U. S. Geological Survey.

†U. S. Geological Survey, Washington, D. C.

[1] Described by A. H. Means, "Geology and Ore Deposits of Red Cliff, Colo." Economic Geology, Vol. 10, pp. 1-27, 1915.

In conclusion, it seems highly probable that Red Cliff is capable of yielding 750,000 tons of ore containing 12 to 15% manganese, 38% iron, and 1 to 2% silica. With additional tramming capacity and further preliminary development, a large daily tonnage of manganiferous iron ore can be shipped from the district.

Government Miners' Training Schools in South Africa*

The systematic training of miners which is being conducted by the British government in South Africa affords an opportunity for the younger generation to acquire a knowledge of mining while earning a sufficient wage to defray expenses. The work has been carried on at the Wolhuter School, at Johannesburg, for the past five years, and recently another school was established at the Bantjes Mine, where arrangements have been made to train 50 apprentices. The Government purposes to establish additional schools as they are needed. Apprentices under 16 years old are not accepted. Those seeking instruction must be of good physique and must go before the medical bureau appointed under the Miners' Phthisis Act for examination before being allowed underground. The course of training consists of two years' practical work underground, which embraces all the more important branches of mining work, with two periods of two weeks each in the fitting shops on surface, and evening lectures two or three times a week, with written examinations periodically. It will thus be seen that apprentices gain not only a sound knowledge of practical mining but also a useful training, a general education, elementary mathematics, and the theory of mining. Physical-culture classes and other healthful forms of recreation are provided, and, as the apprentices reside in the school buildings and are at all times subject to the discriminating supervision of the principal, parents and guardians may rest assured that every care is taken to promote their welfare.

Since the establishment of the schools, in July, 1911, 302 apprentices have matriculated, coming from Johannesburg, Transvaal, Cape Province, Orange Free State, and Natal. Of these, 17 apprentices have qualified, the others having only partly completed the work or left before the termination of the service period. The undertaking of military operations in German East Africa resulted in many apprentices joining the colors.

Men Wanted for Ground Personnel of Navy's Aviation Service

For the further extention of the aviation branch of the U. S. Navy, Secretary Daniels has authorized the enlistment of 8000 young men. There is immediate need for mechanicians for naval aviation for the ratings of machinists' mates, carpenters' mates, quartermasters, coppersmiths and blacksmiths. These men will not be enlisted for pilot's duties but will receive special training in building, handling, repairing and overhauling the navy's aircraft. On attaining proficiency they will be used as the ground personnel of the flying corps. Requirements for enrollment will be the same as those for the regular service of the U. S. Navy. The age limit for this enlistment is 21 to 35 years, and each candidate will receive the U. S. Navy physical examination and not that required for flight duties. Men enlisting for aviation duty but failing to qualify will, if recommended by their commanding officers, be assigned to general service.

Have You Joined the 27th 'Engineers' Comfort Club?

Join the Comfort Club for the 27th Engineers and start the New Year right. Get your name on the list below. Enroll yourself among those who recognize a good cause when it is presented and who will back their opinion with their money. Contributions thus far received are:

CONTRIBUTIONS TO THE COMFORT CLUB

Engineering and Mining Journal	$1000.00
New York Engineering Co	1000.00
A Friend, Nov. 23	5.00
H. H.	5.00
D. E. Charlton	5.00
H. W. Hardinge	1000.00
Frank N. Spencer	5.00
W. L. Coursen	5.00
J. H. Polhemus	5.00
J. H. Janeway	10.00
Albert D. Beers	10.00
J. E. Hayes	10.00
J. A. Van Mater	25.00
L. Vogelstein & Co	100.00
"Cuprite"	10.00
R. H. Bassett (Hanna Ore Mining Co.)	10.00
A Friend, Dec. 10	10.00
P. A. Mosman	10.00
American Zinc, Lead and Smelting Co.	100.00
J. G. H.	5.00
A Friend, Dec. 13	50.00
Daniel Guggenheim	100.00
Willard S. Morse	25.00
August Heckscher	100.00
Anaconda Copper Mining Co	1000.00
F. W. Bradley	100.00
Charles Le Vasseur	5.00
A. H. H.	5.00
Total	$4715.00

The Comfort Club has but one purpose and that is to make life as pleasant and comfortable as possible for the men of the mining regiment—the 27th Engineers, now being formed by Maj. O. B. Perry. The Club is as democratic as the war itself—all may join, from the board of directors to the toll-nipper. A check or an order payable to the *Engineering and Mining Journal* will make you a member. Start the New Year right and enroll now. The money will be spent with the aid of the regiment's officers, as occasion requires, in purchasing the little comforts of life which the Government does not provide and which often are not purchasable abroad. The money will also be used as far as possible to render any needed assistance to the families of the men in the regiment. As Mr. Bradley said in remitting:

> These men of the 27th Engineers are deserving of every comfort and consideration you have in mind for them, and I herewith enclose my check in favor of the *Engineering and Mining Journal* for $100 to help the worthy cause along.

Perhaps you have had joining the Club in mind, but through the press of business have kept putting it off. You have felt it your duty to help, but the myriad little things of the day's routine have crowded the intention aside. The miners and engineers in the regiment deserve your backing. Put yourself in their place. Send that check today.

Increase of Pig-Lead Carload Minimum to 60,000 lb. in straight carloads or in mixed carloads with certain other articles has been requested by carriers represented by F. A. Leland. This increase is in connection with domestic rates. An increase to 56,000 lb. in connection with export rates is also asked.

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*Excerpts from "Annual Report for 1916 of the Chairman of the Board of Control of the Government Miners' Training School," Johannesburg, South Africa.

Personals

Have you joined the Comfort Club for the 27th Engineers?

H. C. Wilmot has returned to New York from Arizona.

F. R. Weekes recently returned to New York from California where he was on professional business

William Asseltine, recently with Dome Mines, South Porcupine, Ont., has taken charge of the Trethewey mill, Cobalt.

Prof. H. L. Smythe, consulting geologist for the Cleveland-Cliffs Iron Co, is in Ishpeming, Mich., on business for the company.

A. E. Drucker is in Baltimore supervising the construction and starting of a concentrating plant for the Baltimore Tube Company

A. P. Watt, of the Missouri Metals Corporation, is in New York and is making his headquarters at the American Institute of Mining Engineers.

J. A. McAllep, formerly engineer for the Towne interests at Asientos, Aguascalientes, Mexico, is now 1st lieutenant in a regiment of engineers in France.

J. E. Looney has been advanced from the position of underground superintendent to that of general superintendent of the Zimmerman mine on the Menominee range.

H. W. Aldrich has resigned his position as superintendent of the Ladysmith Smelting Corporation, Ladysmith, B. C., to go with the Anaconda Copper Mining Company.

R. H. McDonnell, superintendent of underground-mining operations for all mines operated by the Hanna interests on the Michigan, Mesabi and Cuyuna Ranges, has enlisted in the 27th Engineers.

L. F. S. Holland, lately field engineer for the Consolidated Arizona Smelting Co, Humboldt, Ariz, has been appointed consulting engineer to the Arizona Mines and Reduction Co., Wickenburg, Arizona.

L. T. Gavin, superintendent of the mines of the American Manganese Manufacturing Co., on the Cuyuna Range, has been commissioned first lieutenant in the Engineer Officers' Reserve Corps, and ordered to report on Jan. 5 at Fort Leavenworth.

Alfred D. Flinn, deputy engineer of the Board of Water Supply, New York, has been elected secretary of the Engineering Council, secretary of the Engineering Foundation, and secretary of the United Engineering Society. Thus all "super-society" activities will center in one man.

W. H. Johnston has retired from the position of general superintendent for the Oliver Iron Mining Co., on the Marquette range, being succeeded by **F. E. Keese.** Mr. Johnston has figured largely in the industrial and political development of that region and has been on many state boards. He intends to go to Maitland, Fla., where he will make his permanent residence.

N. M. Van Brunt, for four years superintendent of the Aetna Powder Co.'s plant at Ishpeming, Mich., has left to take charge of a chemical plant for the same company in Sinnamahoning, Penn. **R. H. Smith** succeeds Mr. Van Brunt at Ishpeming. The employees of the Ishpeming plant presented Mr Van Brunt with a watch as a token of the cordiality which governed the business relations of those concerned

Auguste J. Rossi, of Niagara Falls, N. Y., has been awarded the Perkin medal for 1918 by the New York Section of the Society of Chemical Industry, in recognition of his work on titanium. The presentation will take place at a meeting of the Section to be held on Jan. 18, 1918, at the Chemists' Club, New York The Perkin medal was founded in 1906 by the New York Section to commemorate Sir William Perkin, the founder of mauve

Obituary

A. H. Purdue, state geologist of Tennessee, died on Dec 12

Francis G. Newlands, United States Senator from Nevada died suddenly in Washington on Dec 24

Carl Henrich, mining engineer of Metasville, Ga, died at the Johns Hopkins Hospital, Baltimore, Md, after a lingering illness He was 69 years old

Maj. Arthur B. de Saulles, superintendent of the New Jersey Zinc Co's plant at Bethlehem Penn, for nearly 23 years, died at South Bethlehem on Dec 24 aged 78 years. He was born in New Orleans, La., and was graduated from the Rensselaer Polytechnic Institute at Troy, N. Y. He earned his title while serving as an engineer in the Confederate Army in the Civil War. Major de Saulles leaves a wife and three children, one of whom is C. A. H. de Saulles, a director of the American Smelting and Refining Co and president of the United States Zinc Company.

Louis Pope Gratacap, curator of mineralogy in the American Museum of Natural History for the last 21 years, died suddenly at his home in New York on Dec. 19. He was born in Brooklyn in 1850 and was graduated from the College of the City of New York in 1869 and from the Columbia School of Mines in 1876. He became assistant curator in mineralogy at the Museum in 1876 and was made curator in 1900, later becoming head of the department of conchology also His work in popular education at the Museum was noteworthy. He was the author of several books including "Geology of the City of New York" and "Popular Mineralogy."

T. D. Merton, inventor of the Merton roasting furnace, died last month in England, aged 63 years. He was born in New South Wales and began his metallurgical work there at the Clyde Chlorination Works. One of his earliest furnaces was erected at Edwards Metallurgical Chlorination Works, Ballarat, Victoria. He subsequently commenced operations on his own account in Melbourne, where he discovered a method for refining arsenic which reduced the cost considerably. Later the gold discoveries in Western Australia led to his specializing in the chlorination of West Australian ores. He soon turned his attention to roasting problems generally, and it was in this field that the earlier types of the Merton roaster were developed. The success which came to him in Australia, and the increasing demand for his furnace, ultimately led him to go to England in 1902, where he established offices which ultimately became his headquarters. He also had wide experience in mining and a close knowledge of developments in Australia.

Societies

American Institute of Mining Engineers—At a meeting of the board of directors the following nominations were submitted: For president and director, Sidney J. Jennings; for vice president and director, Robert M. Raymond and H. S. Drinker; for directors: G. C. Stone, Hennen Jennings, S. A. Taylor, F. G. Cottrell, and Arthur Thacher.

Institute of Metals (British) has announced that Sir Charles Parsons, member of council of the Institute, will give the eighth annual May lecture before the Institute next spring. His subject will be the formation of diamonds to produce which artificially he has spent 30 years in research work. An election of members was announced for Dec. 12. During the present year the Institute's membership has grown from 660 to 860. It is expected to pass the thousand mark during the coming year.

Association of Iron and Steel Electrical Engineers held its regular monthly meeting in the Hotel Chatham, Pittsburgh, Dec. 15. G. E. Stoltz of the Westinghouse Electric and Mfg. Co. presented a paper entitled. "Fly Wheels on Steel Motors." The January meeting of the Pittsburgh session will be a joint meeting with the American Institute of Electrical Engineers Papers will be presented on generation, distribution and consumption of power, as well as power factor correction.

Colorado School of Mines has announced that the "Course for Prospectors" will be given for the fourth time from Feb. 4 to Mar. 2, 1918 This course will include lectures and laboratory work covering the subjects of common rocks and minerals, under Prof Ziegler and Prof Van Tuyl, chemistry, under Prof. Coolbaugh and Prof. Test; metallurgy, ore dressing and assaying, under Prof Palmer Lectures will also be given in general geology, including gas and oil, by Prof Ziegler, placer mining mining claims, and lode mining, by Prof Wolf, and mine-safety engineering, by Prof. J C Roberts

United Engineering Society's Engineering Council held a meeting on Dec 6, in the Engineering Societies Bldg, New York. Alfred D Flinn was elected permanent secretary for the Engineering Council, the United Engineering Society and the Engineering Foundation The resignation of Calvert Townley, who has held office since the organization of the Engineering Council, was accepted with expressions of appreciation for services rendered Mr Flinn's term of office will begin Jan. 1, 1918 A report of the committee on rules was adopted, providing a method for electing to membership in the Council additional engineering and technical societies. The rule adopted are to go to the governing bodie of the four founder societies for consideration. A resolution was adopted and telegraphed to the Secretary of War urgin that in administering the Selective Draf law, the Government take steps to enabl qualified engineering students to continu their studies to graduation if possible, o until needed for active service.

Industrial News

Western Electric Co. announces the appointment of G. A. Schneider, formerly o its San Francisco sales organization a manager of its Buffalo house, succeeding J. W Tabb, who has been transferred to New York.

Walter A. Zelnicker Supply Co., of St. Louis, announces that L. B. Moses has joined its organization as second vice president in charge of the rail department, with headquarters at the company's main offices in St. Louis. Mr. Moses has been sales manager of the Kettle River company of Minneapolis for the last six years.

Dry Milling Engineering Co., Denver, Colo., has been incorporated and appointed Western agents for the Raymond Bros. Impact Pulverizer Co., of Chicago. It will have exclusive agencies in the West for the automatic pulverizers, roller mills, air separators, etc., made by the Raymond company. The company will also represent the Buckeye Dryer Co. of London, Ohio, the Dust Recovering and Conveying Co. of Cleveland, and the Quigley Furnace Specialties Co., of New York. The Dry Milling company is headed by William B. Senseman, who has been employed by the Raymond company for the past eight years in erecting, operating and selling their pulverizing equipment.

Trade Catalogs

"Cut-Weld" Combination Torch, Alexander Milburn Co., Baltimore, Md., Form 1191, a circular describing an acetylene torch for cutting and welding.

Hoisting Engines, Wire Rope, Buckets, Locomotives, Cars, Trucks, Derricks, Skidders and Loaders. Walter A. Zelnicker Supply Co., St. Louis, Mo. Bulletin No. 232. Pp. 4; 3¾ x 8½ in. A bulletin issued Dec. 11 covering articles named.

Milburn "Reliance" Light, Alexander Milburn Co., Baltimore, Md., Form 1194; a two-page circular describing a portable carbide light which, it is claimed, will give 1000 c.p. for 12 hours at less than 5c. per hour, and which possesses among other advantages that of being wind- and storm-proof.

New Patents

United States patent specifications listed below may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

Drill Chuck. Alfred Jonsson, Lidköping, Sweden. (U S. No 1,249,766; Dec. 11, 1917.)

Drilling—Apparatus for Drilling Holes George H Gilman, Claremont, N. H, assignor, by mesne assignments, to Sullivan Machinery Co., Boston, Mass. (U. S. No 1,250,103; Dec 11, 1917.)

Dump Car. John H Herget, Seattle, Wash., assignor of one-half to Pauline E. Herget, Portland Ore (U S No. 1,249,624, Dec 11, 1917.)

Electrodeposition of Metals, Apparatus for August Leuchter, Brooklyn, N Y (U. S. No 1,249,787; Dec 11, 1917.)

Excavating and Dredging Machine. Roy E. Witt, New Madison, Ohio (U S No 1,249,875; Dec 11, 1917)

Flotation Separation, Apparatus for Charles Frank Spaulding, Salt Lake City, Utah. (U S No 1,249,681; Dec 11, 1917.)

Furnace Doors, Apparatus for Lifting Sydney Dillon, Edgewood, Penn (U. S. No 1,249,605; Dec 11, 1917)

Furnace for Treating Ores, Gottwerth L. Tanzer, Seattle, Wash (U. S No. 1,249,854; Dec 11, 1917)

Potash—Process for Increasing the Solubility of Potash in Cement-Kiln Dust Evald Anderson, Los Angeles, Calif., assignor to International Precipitation Co, Los Angeles, Calif (U S No. 1,249,708; Dec 11, 1917)

Editorial Correspondence

SAN FRANCISCO—Dec. 22

Plymouth Consolidated Gold Mines, at Plymouth, has produced $2,147,833 since the property was reopened five years ago. However, the greater part of this sum has been expanded in development and equipment in addition to the original expenditure of $967,140. The cost of labor and salaries amounted to $820,000 and machinery, plant and mining supplies to $636,550. These facts were brought out in a report of W. J. Loring to Hennen Jennings, consulting engineer of the U. S. Bureau of Mines. The mine ships 135 tons of concentrates per month and receives about 50 tons of various sorts of supplies.

DENVER—Dec. 22

Colorado School of Mines Course for prospectors, which was inaugurated in January, 1915, proved so popular and profitable to those who attended, that the course has been repeated each year since. As a result of the success that attended this innovation, it has become an established part of the work of the School of Mines and will be offered annually as long as there is any apparent need or demand. The fourth annual course will be given at Golden during the four weeks beginning Feb. 4 and ending Mar. 2, 1918. It is planned to condense the work so as to keep the prospectors occupied throughout each day. This will be an advantage from the point of view of instruction and will make the course less expensive to those who attend. All of the courses will be of the most practical nature and will comprise instruction in mineralogy, elementary chemistry, principles of ore dressing, assaying, and the more common metallurgical processes; methods of valuing, buying and selling ore; placer and lode mining, location of mining claims, safety engineering. The courses are given entirely by regular members of the faculty and consist of lectures, supplemented by practical laboratory demonstrations.

BUTTE—Dec. 22

Minerals Separation vs. Butte & Superior litigation over flotation-patent infringement is to come up for hearing before the circuit court of appeals in San Francisco next month. Mining men from all over the country are interested in the outcome of this case and well-known mining lawyers have been engaged to appear in court. The result of the appeal is of great importance to the Butte & Superior company as it might have to pay an immense sum of money for use of the flotation process. Since the case was heard in the Federal court in this city all the exhibits in the suit have been in the custody of the clerk of the court and now an order has been made transferring them all to San Francisco.

Philipsburg Manganese Production is gradually increasing. Some weeks ago the amount sent East averaged about 400 tons a day and this had been increased until now a considerably larger output is being sent out. All this is shipped to Philadelphia for treatment. In the Butte district at present no manganese is being treated, but it is an assured fact that the Butte-Detroit mill will get back to operation about the first of the year. The Emma mine of the Anaconda company is hoisting around 75 tons of manganese a day, in addition to about 150 tons of zinc ore. The manganese ore goes East for treatment. There are two properties which are being developed purely as manganese mines and both expect to be ready to ship high-grade material early in the coming year. The demand for manganese is brisk and the mining people are being urged to hurry along production with all possible speed in order that the steel companies may maintain a good supply on hand. In outside districts some manganese properties are being opened and there is hope they will be producers in a short time.

Anaconda Copper Mining Co., according to a statement issued by the officials, is practically back to normal in the output of copper. The production is now exceeding 15,000 tons of ore a day with slightly over 10,000 men at work. With the independent properties, such as the Butte & Superior, North Butte, the Clark mines, Davis-Daly, Tuolumne, East Butte and other companies, there are now 17,000 miners at work in the district, which is the largest number since last June. This clearly shows that the power and influence of the I. W. W. element is lost. The Anaconda company is not producing as much zinc as usual, due to the condition of the spelter market and to the fact that there are five months' stock of zinc concentrates at the plant in Great Falls awaiting reduction in addition to a large stock of crude ore at the Washoe zinc concentrator in Anaconda, which it is believed will keep the plant working for some time at the present rate of milling. The company was treating a considerable amount of ore from the Coeur d'Alene district, but it has been found necessary to notify the shippers that no more zinc ore will be received for the present. Despite the fact that the Anaconda company has five mines down, namely the High Ore, St. Lawrence, Belmont, East Colusa and Alice, the December production will exceed any month in the year since last June and the coming year is expected to take place alongside of 1916 for copper output according to present indications.

SALT LAKE CITY—Dec. 22

Wage Increase is announced by the Utah Power and Light Co., to go into effect Jan. 1, amounting to in round numbers an increase of $100,000 to the payroll. This increase, with that of July 1, makes a total rise in wages of 30% in six months. With the increase in wages, the company announced new working rules and the adoption of the eight-hour day for electrical workers of the company.

JOPLIN, MO.—Dec. 22

Establishment of a Rolling Mill in this district may result if a movement started at the weekly meeting of operators at Webb City comes to anything. The operators will attempt to increase the use of zinc and may finance such a project. T. F. Coyne, president of the organization, appointed a committee of three to investigate and report on the proposition.

Christmas Gifts for Employees were abandoned at the property of the American Zinc, Lead and Smelting Co. at Carterville, upon the suggestion of the superintendents, foremen and sub-foremen. A notice signed by Howard I. Young, manager of mines for this district, to all the foremen and sub-foremen at the property was posted Dec. 20, suggesting that the custom of bestowing Christmas gifts on the "bosses" be abandoned this year and that the men join the Red Cross instead. The suggestion was taken to kindly by the men, most of whom were glad to pay their dollar into the Red Cross fund.

Production Records for this district have been broken again. The Golden Rod Mining and Smelting Co. started its No. 2 mill in operation at Picher, Okla., during the week. On Dec. 19, in a 10-hour shift, the plant turned out 35 tons of concentrates, the ore showing a recovery of 31%. On Dec. 20, 48 tons of concentrates were made from ore that gave a recovery of 41%, probably the highest in the history of zinc production in this camp. On Dec. 21, the plant in 10 hours made 67 tons of concentrates, the ore this time showing a recovery of 38%. F. C. Wallower, Joplin, is manager. About one-third of the output is lead and the remainder blende. The blende assays 62% zinc and the lead concentrates 82% metallic lead, the product in each case being concentrates which command a premium.

Curtailment Of District's Output is expected as a result of the recent visit of operators to Washington. Burt W. Lyon, commissioner for the Associated Zinc Ore Producers of Joplin, returned yesterday and last night gave an interview for publication in which he said it was useless to try to cover up true conditions. He said his investigations at Washington have convinced him, there is now in this country a large amount of spelter, actual and potential. This may be called stocks or surplus, but by reason of the decreased demand for the product from the Allies, it amounts to a surplus calculated to hold down the price of spelter and zinc ore for some time to come unless there is a decided curtailment of production. Mr. Lyon reports that smelters in most cases are harder hit by the situation than are the ore producers, which is something he hardly believed before his trip East. No meeting of producers has yet been called, but it is expected some move will be made in the near future to bring about a systematic curtailment of the output from this district. It is understood the Government authorities are agreed that such a course is not only permissible but proper under the circumstances. It would mean a conservation of powder and the turning loose of workmen that could be used in other industries to advantage.

SPOKANE, WASH.—Dec. 21

Northwest Mining Convention at Spokane, will be held Feb. 11 to Feb. 17, and mining men are requested to send samples of ore for exhibition. Arrangements have been made for free transportation of the samples. The purpose in asking that ore be sent now is to give plenty of time for arrangement of the displays and also to avoid the likelihood of delayed freight trains which are frequent later in the winter. Officers of the Northwest Mining Association request that ore be sent from all promising prospects as well as from partially developed claims and mines. At previous conventions it has been noted that capital has frequently become interested in a prospect through the showing of ore.

Industrial Insurance on magnesite operations, which employ 400 to 600 men at Valley and Chewelah, was awarded a decreased payroll premium under the state industrial insurance administration. Until this ruling was made the mining and transportation of magnesite in wagons has all been classed as quarrying, one of the heavy-risk industrial activities and 5% of the payroll has been collected to care for accidents. The commission has segregated the employments in connection with magnesite mining, so that hauling the calcined product from the kilns to the railroad is put in a lower-risk class, and only 2½% of the payroll will be collected hereafter in this department. The remainder of operations are still regarded as in the quarrying class. The commission has also put hauling of ore from metal mines, and lumber from mills, in the 2½% rate division. The new order complies with a request of the magnesite operators. Although this decision classifies magnesite operations as quarrying, such enterprises will still be regarded as mining in the popular mind.

TORONTO—Dec. 24

Issues of New Securities will be prevented by an important order-in-council, recommended by the Finance Minister of Canada, which has been passed under the authority of the War Measures Act. By this order-in-council no new issues of bonds, debentures, or other securities, of any provincial, colonial or foreign government, municipality, commission, local government, institution, corporation or incorporated company, can be issued or sold without the approval of the minister of finance by his certificate in writing. This also applies to any new issue or offering of shares whether preferred or common, of any incorporated company. It is provided that nothing in the order-in-council shall affect the trading in bonds, debentures and other securities which have already been issued and placed on the market. Any issue in contravention to the order-in-council may be restrained and heavy penalties are provided for violation of the regulations. The object of these regulations is to conserve the Canadian financial market for issues of the Dominion government bonds, and to prevent the issue of securities that may well be deferred till the end of the war Owing to the need of credits for the Imperial government in order that the Canadian agricultural and manufactured products may find a market, the financial opinion of the country is that this regulation is necessary so the war loans may have the full benefit of the Canadian market. This will serve as a check on the issue of mining shares of a number of flotations that have been awaiting a favorable market condition, before using the sucker lists, but will not have any effect on legitimate mining enterprises.

The Mining News

ALASKA

ALASKA GASTINEAU (Juneau)—Rumor of shutdown because of heavily increasing floating debt, has been denied. President Hayes states that current assets of Alaska Gold Mines Co., the holding concern, are in excess of liabilities.

ARIZONA

G. W P HUNT DECLARED GOVERNOR by the Arizona Supreme Court in the contested election. Governor Campbell, who now holds the office, was given 15 days to file an appeal but he announced no further action would be taken.

Cochise County

SHATTUCK-ARIZONA (Bisbee)—Grading for new mill on Denn ground completed, concrete foundations being put in; initial capacity, 400 tons.

Mohave County

GOLD ROAD BONANZA (Oatman)—Drifting on 550-ft. level to be continued according to F. T Torpey, president. Drift already in 400 ft. being driven to cut intersection of vein and dike about 100 ft. south. R. M. Rogers, superintendent.

Pima County

SILVER QUEEN (Tucson)—Silver Queen property owned by W. J. Bryan, Jr., optioned to A. W. McCuen, of New York, representing Morgan-Frick syndicate. Drilling begun

ROOS AND TOVOTE, of Tucson, purchased Socorro smeltery and contemplate moving it to Tucson H William Stevens of Prescott, formerly president of Yuma Warrior Mining Co., also interested.

Pinal County

ARIZONA CORONADO (Price)—Sinking in vertical shaft opened at depth of 125-ft., orebody 13 ft. wide by 225 ft. long.

PINAL CONSOLIDATED (Price)—First car silver ore shipped recently. S. Hall representing the F. C. Armstrong interests, in charge.

QUEEN CREEK (Superior)—Opened 20-ft high-grade copper orebody on 300-ft. level; 300-ft. adit to be driven on silver vein.

Yavapai County

BLACK CANYON (Turkey) — Black Canyon Mining Co. planning to erect flotation plant of about 200-tons capacity.

HILLSIDE (Hillside)—Considerable body of ore carrying 50% zinc, 6% lead, 10 oz. silver and 2% copper opened in Hillside mine. A. M Gillespie, in charge

ARKANSAS

NORTH ARKANSAS zinc and lead field has been in grip of blizzard for the last week. Heavy fall of snow and unusually cold weather closed down all mills, which will not start again until it thaws.

BOLD JESSE (Rush)—Operated by A. J. Mossman. Developing 12-ft face of good milling ore.

GLORIA (Zinc)—Three cars of concentrates and three cars hand-cobbed silicate in bins George Miller, superintendent.

ANNA MAY (Buffalo)—Temple Mining Co has nearly completed 100-ton concentrating plant. Expect to begin production in January. Ore is zinc carbonate.

ZINC BASIN (Rush)—Development started on this mine on Clabber Creek, by Okla-Ark Mining Co Luther Evans, member of the company and pioneer of this camp, in charge

WILLETT (Yellville)—Liberty Lead and Zinc Co., building 100-ton concentrating plant on Willett zinc mine near here, will complete plant within two weeks if weather favors

CALIFORNIA

Amador County

LINCOLN CONSOLIDATED MINING CO (Sutter Creek) Authorized by Commissioner Carnahan to distribute $60,655 pro rata to stockholders out of any surplus profits arising from its business, accumulated and undistributed, and thereafter any excess of said sum, over the amount of such surplus profits, out of the assets of the corporation

Inyo County

SILVER-LEAD MINES near Zabriskie are active and shipping steadily, the price of silver stimulating development. Copper and gold bearing ores also being developed.

LICENSE FOR EXPLOSIVES in Inyo County may be obtained from W. P. Yaney, Bishop; L. A. Engley, Big Pine; Jesse Hession, Independence; Cris Carrasco, Lone Pine; A. T. Smith, Keeler; Theodore Peterson, Darwin; J. E. Curran, Ballarat; Hugh Frazer, Zabriskie; F. G. Thisse, Skidoo.

STANDARD TUNGSTEN (Bishop)—Mike Zellasco fell from end of rope in an air chute, Dec. 3, receiving injuries from which he died on Dec. 8. Rope was too short, but Zellasco persisted in making descent instead of waiting for longer rope, which had been sent for.

DARWIN DEVELOPMENT CO. (Darwin)—Preparing for increased operation. Productive ground opened in Lane and Lucky Jim. Recently purchased Defiance mine and Coso water rights. Contemplating deep development; with sufficient water expect to proceed on large scale.

SALINE VALLEY SALT CO. (Keeler)—Internal differences in management being adjusted. Investigation of properties by stockholders, included F. R. Kellogg, an oil man, who may succeed to the interests of Menning and Porter. Property has 13-mile bucket tramway for transporting salt across Inyo Range while mill was in operation.

Lassen County

AT CAMP McNABB, near Doyles, copper mining and prospecting are in progress. Shipped recently two lots of copper-gold ore. Situated 16 miles north of Doyles and 2½ miles east of southern end of Honey Lake. Louis Sutter, of Honey Lake, contemplates building wagon road from his ranch on county road to camp.

Kern County

SEGOR MINING AND MILLING CO (Los Angeles)—Permitted to issue and sell capital stock; 50,000 shares to Edward R. Fewerborn, V. M. Gelesnoff and Martin E. C. Bertrand, for purchase option on Esperanza mines, situated 40 miles northwest of Mojave in Sageland district; 50,000 shares to be sold at 30c., proceeds to be used in installation of equipment and to start operation, the milling plant to have capacity of 25 tons per 24 hours.

Mariposa County

EARLY MINING CO. (San Francisco)—Properties situated in Sweetwater district, has been permitted by commissioner of corporations to issue 79,885 shares of capital stock to L. I. Sussman and 20,000 shares to J. H. Robertson, as trustee for W. S Arlington, in return for option and money advanced. Several claims in the group held under option in return for the stock issued. There is also a 10-stamp mill on one of the claims.

Plumas County

MARBLE CONE GOLD MINING CO (San Francisco)—Permitted to issue 200-000 shares of stock to Walter C. Robinson, Julius H Becker and others for placer claims on middle fork, Feather River, and in consideration for money advanced for prospecting; also to sell 60,000 shares for development Proposed to divert stream through tunnel and operate gravel deposit in gulch. Prospecting done by diving.

San Bernardino County

WHITE FLOWER (Atolia)—Strike of high-grade scheelite on Nixon lease recently

J C RAYNOR made consolidation of tungsten claims on property adjoining Atolia mines, just south of Paradox and South Side claims Motor trucks in regular operation hauling ore from claims west of Atolia

Trinity County

INDEX (Weaverville)—Installed new mill and chlorination plant on property at New River, formerly known as the Larsen, was producer in past but no method adopted for treatment of base ores Now operated by San Francisco men. William J. Ivy, general manager

Tuolumne County

CHROME MINING in Mountain Pass, Peoria Flat and Jamestown district, is prosperous. C. W Terry and Jesse Sell producing ore from shaft 102 ft. deep in Mountain Pass. George and Thomas Richards developing promising chrome prospect in Peoria Flat. William and Frank Pereira developing in same district. William Powell and associates, of Jamestown, started work on claim on Rosasco place, near old Crimea house.

COLORADO

Chaffee County

MADONNA (Monarch)—Lessees shipping lead carbonate ore.

LILLY (Garfield)—Shipping oxidized copper ore to Salida.

ECLIPSE (Monarch)—Adjoining Madonna mine, being worked by lessees.

Clear Creek County

ONE-FORTY LEASING CO. (Georgetown)—Working portion of Seven-Thirty ground; shipments made from development; crosscutting opened feeder veins of promise.

DAILY DISTRICT, nine miles above Empire, an old silver-producing section, is being revived Chief operation at present is work of Primos Chemical Co. on molybdenum mine at Camp Boericke.

Gunnison County

DOCTOR (Almont)—Shipping zinc-carbonate ore; production may be curtailed during winter months for development.

STAR (Crested Butte)—Shipping lead-silver ore; nine teams hauling. Will develop on deeper levels and crosscut to strike Independence vein at depth. Stated milling plant will be built next spring to treat low-grade ore. Snow may stop shipments for winter; elevation 11,500 ft., and ore must be hauled 18 miles.

Hinsdale County

SILVER FLEECE (Lake City)—Shipping silver ore.

SUNFLOWER (Lake City)—Development work being done.

GOLDEN FLEECE (Lake City)—Mill working on old tailings; flotation plant installed and operating successfully.

VERMONT (Lake City)—Being worked under partnership agreement Long crosscut tunnel being driven to cut main vein at depth. Other smaller veins have been cut, showing good-grade ore

Lake County

CAR SHORTAGE during fall months felt all over Colorado, was especially burdensome in Leadville district; was chiefly caused by shipments of fruit and farm products; conditions now greatly alleviated.

WOLFTONE (Leadville)—Recent car shortage necessitated storage of ore Force not reduced, but employed on development.

NISI PRIUS (Leadville)—Operations resumed; producing small tonnage iron-manganese ore. Ore shoot opened on 185-ft level.

JAMIE LEE AND TIP TOP (Leadville)—Regular production being made from these properties, operated by Leadville Unit of U S Smelting, Refining and Mining Co.

DOWN TOWN MINES CO (Leadville)—Production recently reduced on account of car shortage; this now relieved Pumps at Penrose shaft lifting 1200 to 1500 gal. per minute.

Pitkin County

HURRICANE (Aspen) Shoots of high-grade lead-silver ore opened, will drift 200 ft farther to cut large shoot opened in old Chinox shaft Will continue all winter.

PARK TUNNEL (Aspen)—Recently incorporated for 150,000 shares, par value, $1, acquired 20 claims in Turtelotte Park section, including Best Friend, Camp Bird, Edison, Iowa Chief, Justice, Jenny Lind and Silver Star To cut this ground a 3000-ft tunnel will be driven from head of Keno Gulch to point under Last Dollar workings. Tramway will be built to railroad near portal of Newman adit. Old properties included have combined production of over $1,000,000 in silver.

San Miguel County

CAR SHORTAGE IN TELLURIDE DISTRICT has been relieved, and most of stored concentrates have been shipped.

LIBERTY BELL (Telluride)—Now milling large tonnage of good-grade ore from ground leased from Smuggler-Union Mining Co.

TOMBOY (Telluride)—Agreement entered into with Revenue Mines Co. whereby several claims of Revenue company, on opposite side of range in Ouray County, will be worked under lease; workings connected.

LEWIS (Telluride)—Water pumped out below third level. Planned to connect Lewis and Little Dorrit mines by crosscut tunnel. Mining and milling of ore will begin soon; concentrates will be stored for winter, as it is impracticable to keep trail open.

Summit County

MOLLIE B (Breckenridge)—Shipping gold-silver-copper ore. Bismuth ore opened in development.

CARBONATE (Breckenridge)—Shipping lead-carbonate ore from this Bald Mountain property; being worked under lease.

WELLINGTON (Breckenridge)—Milling plant running steadily; shipping lead and zinc concentrates.

FRENCH GULCH (Breckenridge)—This dredge, working in French Gulch, 2½ miles from town. Capacity of dredge, 2000 cu.yd. per day. Considerable nugget gold in clean-up.

EVANS DREDGE (Breckenridge)—Nearing completion; to have 8-ft. buckets and capacity of 4000 cu.yd. per day; electrically driven. Ground prospected by churn drilling, and dredging will begin at point north of "two-mile" bridge, north of town.

FARNCOMBE DREDGING CO. (Breckenridge)—Owns large acreage in upper Swan River Valley, at base of Farncombe Hill. Being worked under lease by Tonopah Placers Co. by dredge No. 2, a 4000-cu.yd. machine. Farncombe Hill noted for specimens of wire and crystallized gold.

Teller County

ELLA W (Cripple Creek)—Lessees shipping good-grade ore from surface discovery.

ELKTON (Cripple Creek)—Lessees shipping in both Elkton and Tornado workings.

OCEAN WAVE (Cripple Creek)—Being operated by lessees. Shaft sunk to 400-ft. level, station cut, and crosscutting to vein. Property on Battle Mountain, near Eclipse station.

IDAHO

Shoshone County

YUKON GOLD (Murray)—Dredge on Prichard Creek began operations on Dec. 6; now operating with two nine-hour shifts. Has acquired all ground along creek, about 14 miles, and if dredge proves successful, it is understood that two more will be added.

CARBONATE HILL GIANT (Mullan)—About 30 men employed erecting buildings and laying 2½-mile pipe line from old Snowstorm compressor, preliminary to beginning sinking, which will be extended to 1000-ft. depth if necessary to prove oreshoot. This property is consolidation of the former Carbonate Hill and Idaho Giant groups; new company controlled by W. D. Greenough.

NATIONAL (Mullan)—Shipped during November nine carloads of concentrates averaging 18% copper, 45 oz. silver and $1 in gold. Only half of mill running, handling from 220 to 240 tons of ore per day. Gasoline motor will replace electric for conveying ore over tram for distance of mile and a half. With gasoline motor expected to increase mill feed to 300 tons per day, and eventually will be able to supply full capacity of 500 to 600 tons daily.

HECLA (Wallace)—Outside improvements costing between $40,000 and $50,000 are nearing completion. These include ore bins with capacity of 1000 tons, new sorting plant, and large modern concrete dry and change room for miners. Shaft being extended from 1600-ft. level to 2000-ft. Oreshoot on 1600-ft. level is practically continuous for 2000 ft. Two levels will be connected and intermediate one opened. Electric haulage to be installed, using storage batteries.

MICHIGAN

Copper

WINONA (Winona)—Tributers milled in November 365 tons daily, in addition to South Lake's rock.

CALUMET & HECLA (Calumet)—Milling 9987 tons daily, of which 810 tons from Tamarack, which is working shafts Nos. 3 and 5 on day shift.

HANCOCK (Hancock)—Tonnage decreased from 1100 to 1000 tons daily, due to shortage of labor.

OSCEOLA (Osceola)—Milled 100,000 tons in November. Old Osceola will work more freely with closing down La Salle drift.

SOUTH LAKE (Lake Mine)—Improvement in copper showing this month. November tonnage 2500 as against 6000 for October, due to shutting down night shift.

NEW ARCADIAN (Houghton)—Shaft still in main lode with vertical width of 20 ft. in heavy copper with small masses; only 4° difference between inclination of shaft and lode.

NEW BALTIC (Houghton)—Has 350 ft. of good-grade ore on 275-ft. level; centering work on south drift as largest territory is in this direction and shows richer rock now.

MAYFLOWER-OLD COLONY (Houghton)—Shaft down 85 ft. using buckets and two Jackhamer drills, soon to be increased to four; foundations for shaft house laid.

MICHIGAN SMELTING (Houghton)—Installing Uniflow engine, first in this district, of 350 hp. directly connected with a 180-kw. Allis-Chalmers, direct-current generator, from Nordberg Manufacturing Co.

Iron

CARTER BROS. (Ishpeming)—Operating serpentine marble quarry near Ropes Gold mine will shortly have railroad to property permitting shipment of marble heretofore prevented by expense of team haulage. Hoose & Person, the contractors, progressing with the grading and will commence laying rails soon.

MINNESOTA

Cuyuna Range

GREAT LAKES ORE SHIPMENTS closed for season; 1917 shipments from range totaled 2,430,000 tons. Increase over 1916, 633,326 tons.

NORTHERN MINNESOTA IRON CO. (Deerwood)—Sinking exploratory shaft on Sec. 20-47-28.

HOPKINS MINE (Ironton)—Will become regular manganiferous producer on opening of shipping season. Operated by Breitung interests.

RIEDER IRON CO. (Duluth)—Have proved iron property in sec. 6-46-29; estimated tonnage is 2,000,000; shaft will be sunk 110 ft. to ore.

JOAN NO. 4 (Ironton)—Making all-rail shipments of one car daily to Chicago of high-grade manganiferous ore; will continue throughout winter.

PENNINGTON (Ironton)—Removing 150,000 cu.yd. overburden from this open-pit property preparatory to increasing next season's output.

Mesabi Range

DRAPER (Calumet)—Laying tracks for stripping. Aone unit washing plant to be constructed this winter on shores of Snow Ball Lake to take care of wash ore.

HAWKINS (Nashwauk)—Operated by Wisconsin Steel Co. for International Harvester Co. is largest in district. Shipments expected to exceed 700,000 tons for season, having mined over a million and a quarter tons, which was treated at washing plant on O'Brien Lake. Three shovels worked during summer in pit. Erecting engine house for four locomotive and carpenter shop of tile and concrete construction.

MISSOURI

Joplin District

BUTTE-KANSAS (Joplin)—At Waco, started 400-ton mill moved from Carterville. Two shafts in ore.

INSPIRATION (Baxter, Kan.)—New mill started in operation, following taking over of property by Merrill Mining Co.

YELLOWSTONE (Joplin)—Started new mill on East 15th St. in city in operation; 150-ton capacity.

U. S. SMELTING (Joplin)—Changing from gas to coal-fired boilers at Metals mine, recently purchased. Situated just south of Picher, Okla.

WACO (Joplin)—Second mill almost ready for operation; sinking deep well for drinking water and boiler purposes; two shafts into rich ore. First mill operating steadily with rich recovery.

DORRIS (Quapaw, Okla.)—Erecting mill on lease near Quapaw, entirely without plans or specifications. Second instance in district, having erected similar mill at Diamond, Mo., five years ago.

MORNING STAR (Joplin)—F. V. Wasserman, of Joplin, and associates, have taken over Muddauber mine at Belville. Renamed Morning Star; sunk shaft from 95- to 115-ft. level, and getting good recovery.

MEDICAL (Miami, Okla.)—Planning 300-ton mill on lease north of Quapaw, Okla.; 18 drill holes, most of which show ore. Shaft down to ore. Dr. E. S. Lain, president.

SCOTT (Duenweg)—Replacing mill recently lost by fire. New mill, 200-ton capacity. Equipped with double-sludge mill, operated separately. Gas used for power and plant specially protected against fire. Will erect No. 2 mill on adjoining lease soon. Haywood Scott, Joplin, president.

SENECA FAULT (Seneca)—Recently leased 2000 acres near Seneca, Wyandotte County; a subsidiary will start on Sycamore tract of 90 acres. Drills being placed and will prospect at deeper level than ever before. A. T. Estes, Pallacios, Tex., president and general manager.

MONTANA

Fergus County

BARNES KING (Kendall)—Report for November as follows: North Moccasin, ore treated, 2077 tons assaying about $9 per ton; estimated bullion production, $22,500. Gloster and Shannon in Lewis and Clark County, total ore treated 4853 tons, estimated bullion production, $62,000; shipped from Gloster, 1490 tons, assaying $6.74 per ton; from Shannon, 3044 tons, assaying $14.75 per ton. On Dec. 1, Shannon shaft reached depth of 55 ft. below 500-ft. level. Sinking at favorable rate.

Mineral County

TARBOX (Saltese)—Announced from Wallace, Idaho, office that crosscut from bottom of 800-ft. shaft cut vein 20 ft. wide, with excellent milling ore and some high-grade material, which may be sorted and shipped. Lead predominates, while in workings above zinc was in excess.

AMAZON-DIXIE (Saltese)—Situated near the Idaho line, has just completed pipe line 6000 ft. long, to provide water power for all underground work. New compressor installed, to be used jointly with old one. Tunnel 3000 ft. in length driven, 600 ft. in milling lead ore. From this level, shaft sunk 250 ft., vein crosscut showing good body of ore. With new water power company will extend shaft 250 ft. farther.

Silver Bow County

DAVIS-DALY (Butte)—Two cars of ore to Washoe works during five days of week ended Dec. 15 brought net returns of $1650 and $1250 respectively.

GREAT BUTTE COPPER CO. (Butte)—Suit instituted Dec. 14 against Great Northern Ry. to decide title to five mining claims in Silver Bow County, over which defendant has right-of-way and therefore claims interest in ores. Plaintiff asks that such claim be adjudged void.

NEVADA

Nye County

TONOPAH ORE PRODUCTION for week ended Dec. 15 amounted to 7655 tons, valued at $133,962, comparing with 10,206 tons, the previous week. Producers were: Tonopah Belmont, 2582 tons; Tonopah Extension, 2380 tons; Jim Butler, 936 tons; West End, 859 tons; MacNamara, 504 tons; Montana, 338 tons; Halifax, 55 tons; Midway, 15 tons; miscellaneous, 41 tons.

Storey County

OPHIR (Virginia)—Installed compressed-air locomotive on 2000-ft. level. Saved 40 tons in cutting out for four sill-floor sets, averaging $5.79. Andes saved 89 cars, averaging $10.30 per ton.

UNION CONSOLIDATED (Virginia)—Produced in first week of December, 353 tons, assaying $34.72, treated at Mexican mill. Sampling in 2400-ft. level showed $89.99 per ton. Other lots sampled $63.02, $51, $48.78, $45.35 per ton.

JACKET (Gold Hill)—Surface tunnel sent 200 tons to mill gloryhole. Saved 14 cars from raise in crosscut No. 5 West and 116 cars from No. 5 West gloryhole. Sunk winze 8 ft. in No. 5 East crosscut and saved 28 cars of ore. Mill working on new equipment; old cyanide plant operating; ball mill and tables operated 100 hr. Put into mill bins 322 tons of mine ore.

NEW MEXICO

CARLISLE (Steeplerock)—Operations stopped. Company may be reorganized.

LUCKY BILL (Vanadium)—Shipping regularly to smelters.

GROUND HOG (Vanadium)—Three compartment shaft to be sunk by J. B. Gilchrist. Complete outfit on property.

LAST CHANCE (Lordsburg)—Fairly, Wells and Sholly shipped two carload; high-grade silver ore from this property under option and lease.

BONNEY (Lordsburg)—Water on 400-ft. level now under control; work will continue on ore lenses encountered in development, operated by Lawrence Mining Co.

JIM CROW (Steeplerock)—La Jara Mining Co. has given up property and stopped operations. George Utter again operating mines. Rival Mining Co. in same region installing machinery; Gold Buttes company also preparing to start up.

SOUTH CHINO COPPER CO. (Lordsburg)—Will be name of new company, formerly known as Atwood Consolidated Mining Co., operating Atwood and Southern groups of mines. Company financed in Boston; payment completed on property until January, 1917.

OREGON

STITH (Kerby)—John Lewis doing assessment work on this gold quartz mine, on Josephine Creek.

NIEL SUCCESS (Kerby)—Owned by Seattle company and managed by Richard Furth. Small crew working on gold quartz prospect; about 100 ft. of adits completed

KERBY QUEEN (Waldo)—D. W. Collard, owner, has reopened this chrome mine, five miles northeast of Waldo. Developed by 900-ft. adit on lower level and 300-ft. on upper. Considerable tonnage of 4% copper ore on dumps; high-grade ore being shipped averaged $6 per ton gold.

SOUTH DAKOTA

Lawrence County

HOMESTAKE (Lead)—Special dividend of $1 per share will be paid with regular distribution for December. The total dividends for the year will amount to $2,210,208 Second power plant on Spearfish Creek completed; will be in commission before Jan. 1.

TROJAN (Deadwood)—Changes to lower costs and increased capacity completed; treatment plant now equipped to handle 500 tons daily. Purchased Two Johns Mine and have Republic under lease. Motor trucks used at latter to transport ore to nearest railroad point.

Pennington County

HOMELODE (Silver City)—Small mill erected during last year satisfactory. Plant will be enlarged Diamond drilling to determine extent of orebodies.

UTAH

Beaver County

MAJESTIC MINES (Milford)—Affairs of old Majestic Copper Mining and Smelting Co., predecessor of above company, being wound up. Regular shipments of copper ore being maintained.

Juab County

TINTIC SHIPMENTS for week ended Dec. 7 amounted to 190 cars. Production for year estimated at 9900 cars of ore, or about 400,000 tons, valued at $12,000,000 in round numbers. There were shipped during 11 months just ended, 9108 cars of ore of an estimated tonnage of 364,300 tons.

IRON KING (Eureka)—Being developed, and during week ended Dec 7 shipped first recent car of ore.

TINTIC STANDARD (Eureka)—Shipments first 11 months, 1917, were 193 cars; heaviest month was November, with 32 cars

GRAND CENTRAL (Mammoth)—Shipments 11 months, 1917, were 432 cars, estimated at 15,000 tons. During last five months shipments averaged 32 cars monthly, going as high as 53 cars in one month.

EAGLE & BLUE BELL (Eureka)—According to present smelting arrangements able to ship about 200 tons daily

EUREKA MINES (Eureka)—Opened 20 ft of silver-lead ore of shipping grade on 700-ft level

Piute County

UTAH POTASH (Marysvale)—Shipping car of ore about every 10 days for milling at Trenton, N J Shipments limited by freight embargo on Eastern railroad

YELLOW JACKET (Marysvale)—This group of 10 claims covering potash deposits acquired by the American Smelting and Refining Co situated in Henry district, near Twin Peaks and Krotki iron mine Former owners, J U and Frank Sargent

San Juan County

KEARNS URANIUM (Thompson)—Reported warehouse to be built to store ores Stated to have 800 tons of carnotite ore on hand Not known whether property will be opened further

Salt Lake County

CARDIFF (Salt Lake)—Roads between mine and ore bins at mouth of south fork of Big Cottonwood Canyon showing improvement; hauling 30 tons daily by sleds; using trucks down canyon, along which stockpiling ore.

UTAH METAL AND TUNNEL (Bingham)—Mining and shipping lead ores discontinued because of present price; confining work to copper ore; new body estimated to carry 3% copper opened on 950-ft. level. With present milling capacity, production should be about 500,000 lb. of copper monthly. Mill at present treating about 300 tons daily.

EMMA COPPER (Alta)—New fissure cut by drift to southeast from crosscut on third level from Bay City shaft, just below orebody followed 35 ft. to southwest, showing separate ore channel from that forming bodies to north. Expected from this and diamond drill indications that two oreshoots will be found to exist below third level.

OHIO COPPER (Bingham)—Estimated production for year will amount to about 5,500,000 lb. copper, with operating profit of about $500,000. Mining and milling about 2300 tons daily. Slimes treated in experimental flotation plant giving good recovery. First unit of new 3000-ton plant—600 tons—expected to be completed in about a month. Club house for employees and four new cottages at Lark completed for use of employees.

Summit County

PARK CITY SHIPMENTS for week ended Dec. 7 were 5,508,372 lb.

CALIFORNIA-COMSTOCK CONSOLIDATED (Park City)—Operated by this newly formed company, is again changing hands, it is said, and passing over to Eastern men. Consideration is given as $300,000. Under present management considerable ore opened but not enough of shipping grade. Stated to be good tonnage of milling ores.

DALY (Park City)—Preliminary figures give shipments for first 11 months of 1917, between 4000 and 5000 tons. Output held down during last few months by car shortage, embargoes, etc. At present, working forced reduced and shipments being made from ore accumulated in old stopes. Physical condition of property stated to be better than in many years.

Tooele County

WOODMAN (Gold Hill)—Shipping good-grade copper ore. New find of scheelite in raise from main tunnel.

MONOCCO (Gold Hill)—Kimball-Davis lease shipped third car of copper ore, has 100 tons more awaiting shipment. Silver ore of good grade also found.

WESTERN UTAH EXTENSION COPPER (Gold Hill)—Ore carrying gold, silver and copper opened in raise above No. 2 tunnel. Shipping-grade ore continues as raise being driven.

POLE STAR (Gold Hill)—Victor shaft down 190 ft. in ground mineralized with iron, to be continued to 250 or 300 ft., when drifting will be started. Crosscut to north from west drift in No. 1 tunnel in quartz and porphyry showing sulphides.

COPPEROPOLIS (Gold Hill)—Car of first-class ore carrying copper, silver, and gold shipped, following earlier shipment of lower-grade ore Third car of ore being prepared for market. Bambergers, of Salt Lake City, interested with N. A. Dunyon.

WESTERN UTAH COPPER (Gold Hill)—Total of 87 cars shipped during November; during early part of month shipments held down to 125 tons daily, later increased to 200 tons. Most of ore is copper; a few cars of low-grade lead-silver ore also Test shipment of iron ore made to ascertain if it could be handled profitably

WASHINGTON

UNITED COPPER MINING CO. (Chewelah)—Purchased Copper King mine from H S. Wales, who recently bought property from receiver for $76,000. United company now owns a mile and a half along strike of vein

NORTHWEST MAGNESITE (Chewelah)—Expenditures for quarry development and plant equipment will reach $450,000, according to R. S. Talbot, president. First appropriation, made over one year ago, was $250,000, but plans have since been expanded with much of additional equipment installed Shipping six carloads daily of calcined material, weighing about half of crude H K Devereaux, of Seattle, appointed general manager with headquarters at Chewelah

WISCONSIN

Zinc-Lead District

PARSON (Dodgeville)—Sheet of blende said to be 4 to 12 in. thick, struck in drift at depth of 80 ft. by Evans Brothers, on land formerly known as Blewett farm, two miles east of Dodgeville.

NEW ROSE (Platteville)—New shaft on Brunton land being sunk; foundations laid and Mud Range mill equipment from Potosi being removed.

CANADA

British Colombia

IN EAST KOOTENAI DISTRICT, Sullivan lead-zinc property has been the largest shipper to Consolidated Mining and Milling Co.'s smeltery, at Trail, this year. Total production up to middle of November was 114,183 tons. During same period, Center Star, Le Roi and White Bear, of Rossland, shipped 89,435 tons, and Josie, of the Le Roi No. 2, in same field, 7777 tons.

Manitoba

FARAWAY (Long Lake)—Strike of gold quartz showing visible gold made in course of assessment work.

GOLD PAN (Rice Lake)—Drifting being done in quartz, showing good gold content. Pumping outfit will be installed to provide against seepage; shaft will be put down to 200-ft. level without delay.

Ontario

IN LIGHTNING RIVER DISTRICT in the Abitibi region the new gold discovery has been taken over by syndicate of Toronto men; preparing for active development. Over 200 claims staked in section but original discovery seems to be the best.

DOME (South Porcupine)—Doing only development work. Most of staff released.

PATRICIA (Boston Creek)—Also known as Boston Hollinger; shaft down 70 ft., the ore found on surface persisting at depth.

KIRKLAND PORPHYRY (Kirkland Lake)—Crosscut at 170-ft. level reached 32-ft. point from shaft in ore all the way. Shaft will be put down to 300 ft.

KERR LAKE (Cobalt)—Production during November was 205,522 oz., compared with 213,802 in October and 210,388 in September.

ELLIOTT-KIRKLAND (Kirkland Lake)—Crosscut driven to orebody at 300-ft. level shows deposit 12 ft. wide with commercial ore. Shaft will be sunk to 500-ft. level.

MILLER LAKE O'BRIEN (Gowganda)—Shipped in November, 61,960 lb. of ore. Rumored in certain quarters that this is one of the mines purchased by Thomas W. Lawson.

CANE SILVER MINES (Elk Lake)—Recently organized; developing group of claims in Cane Township. Several promising veins opened and shaft will shortly be sunk.

TEMISKAMING (Cobalt)—Making extensive preparation for developing recently acquired properties in Kirkland Lake district. Mining plant of North Dome being taken down to be transferred to Kirkland Lake.

PORCUPINE CROWN (South Porcupine)—Opened main vein at 1000 ft.; is first development below 800-ft level for over a year; grade of ore stated to be good; ore reserves estimated at $1,000,000 and cash assets at $275,000.

McENANEY (South Porcupine)—Crosscut at 100-ft. level tapped three veins with good gold content. Diamond drilling will be undertaken to prove large 16-ft vein at depth of 800 ft; 150-ton mill will shortly be installed.

McINTYRE (Schumacher)—Ore reserves considerably increased by recent development at 800-, 900- and 1000-ft levels. Drift at 1000-ft. level across McIntyre Extension entered Jupiter ground, where gold orebody reported to be 50 ft in width. Electric-haulage system being installed at 1000-ft level

LA ROSE CONSOLIDATED (Cobalt)—Shareholders ratified dissolution of holding company and distribution of assets. Capital stock of operating company, the La Rose Mines, Ltd., will be reduced from $6,000,000 to $1,500,000, each shareholder of La Rose Consolidated receiving one share for each share of old stock.

MEXICO

TAMPICO DISTRICT SHIPMENTS of crude oil and petroleum products to the United States in October were 3,150,061 bbl; from Tampico shipments were 2,494,594 bbl and from Tuxpam, 655,170 bbl. To points other than the United States shipments in October were reported as 847,825 bbl Gross shipments were 3,997,889 bbl

The Market Report

SILVER AND STERLING EXCHANGE

Dec.	Sterling Exchange	Silver		Dec.	Sterling Exchange	Silver	
		New York, Cents	London, Pence			New York, Cents	London, Pence
20	4 7515	86⅜	43¼	24	4.7515	86⅝	43⅜
21	4 7515	86⅝	43⅜	25		. . .	
22	4.7515	86⅝	43⅜	26	4.7515	86⅝	.

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

DAILY PRICES OF METALS IN NEW YORK

Dec.	Copper	Tin	Lead		Zinc
	Electrolytic	Spot.	N. Y.	St. L.	St L.
20	*23½	†88	6¼ @6½	6.25 @6.35	7⅜ @7½
21	*23½	†88	6 30 @6.50	6.25 @6.35	7⅜ @7½
22	*23½	†88	6.30 @6.50	6 30 @6.40	7.50 @7.60
24	*23½	†88	6⅜ @6½	6.30 @6 40	7 50 @7.60
25	....	...			
26	*23½	†88	6⅜ @6½	6 30 @6.40	7.55 @7.65

† Nominal.

* Price fixed by agreement between American copper producers and the U. S. Government, according to official statement for publication on Friday, September 21, 1917.

The above quotations (except as to copper, the price for which has been fixed by agreement between American copper producers and the U. S. Government, wherein there is no free market) are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

The quotations for electrolytic copper are for cakes, ingots and wirebars.

We quote electrolytic cathodes at 0.05 to 0.10c. below the price of wirebars, cakes and ingots.

Quotations for spelter are for ordinary Prime Western brands. We quote New York price at 17.5c. per 100 lb. above St. Louis.

Some current freight rates on metals per 100 lb. are: St. Louis-New York 17c.; St. Louis-Chicago, 6.3c.; St. Louis-Pittsburgh, 13.1 cents.

LONDON

Dec.	Copper			Tin		Lead	Zinc
	Standard		Electrolytic				
	Spot	3 Mos.		Spot	3 Mos.	Spot	Spot
20	110	110	125	308	298	30½	54
21	110	110	125	308½	299½	30½	54
22	.						.
24	.	.	.	.	.	.	.
25	. .	.	. .	.	.	. .	.
26	. . .	. .	.	.	.	. . .	. . .

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2,240 lb. For convenience in comparison of London prices, in pounds sterling per 2,240 lb., with American prices in cents per pound the following approximate ratios are given, reckoning exchange at $4 7515. £30½ = 6.4696c.; £54 = 11.4545c.; £120 = 25.4544c.; £137 = 29.0605c.; £240 = 50.9089c. Variations, £1 = 0.2121205c.

Metal Markets

NEW YORK—Dec. 26, 1917

All the markets were dull this week, but in those that are still competitive—lead and zinc—there were evidences of increased strength.

Copper—There is nothing of interest to report, except larger and more urgent specifications for Government account.

Copper Sheets are quoted at 31½c. per lb., f.o.b. mill, for hot rolled, and 1c. higher for cold rolled. Copper wire is quoted at 26½@27½ f.o.b. mill, carload lots.

Tin—None is being offered and the quotation continues purely nominal at 88c., which price would willingly be paid.

Ricard & Freiwald report stocks of tin in London and other United Kingdom ports, 4341 tons; landing and in transit, 550 tons; afloat from Australia, 54 tons. Banka or Billiton afloat to Europe and America 1636 tons. Spot or landing in United States, 1592 tons. November deliveries are reported at 1738 tons to Great Britain, 62 tons to Holland and 1400 tons to United States exclusive of Pacific port receipts.

Lead—Transactions were light, but those that were made were at better prices. There is a strong undertone to this market and a feeling that the development of more inquiry will advance the price distinctly. Transportation delays are playing an important part in local markets. Smelters report large quantities of lead accumulating at their works, sold but unshipped.

Zinc—The main feature of the week was some large sales on competitive bids to the U. S. Government. This business was for Grade C. spelter, Navy Specifications, which is something like the trade classification of "Selected," or low-grade brass special. One of these transactions, that was made public, was for 1000 tons, to be delivered over six months, which was taken at 7⅝c., New York. Allowing for delivery, interest charges, etc., it was reckoned in the trade that this was equivalent to 7⅜c. for Prime Western at St. Louis. Outside of the Governmental transactions there was not much business in spelter this week, but a few round lots were reported sold to Europe.

Zinc Sheets—Price of zinc sheets has not been changed. Market is still at $19 per 100 lb. f.o.b. Peru, less 8% discount.

Other Metals

Aluminum—This market continues dull, though there is slightly greater inquiry. No. 1 ingots are offered at 37@38c. per lb., New York.

Antimony—Unchanged at 15c. for spot and 14c. for futures, c.i.f., in bond. Market very quiet.

Bismuth—Unchanged at $3.50 per pound.

Cadmium—This metal is quoted at $1.50@1.75 per lb., depending on the quantity.

Nickel—Steady at 50c. per lb., premium of 5c. per lb. for electrolytic.

Quicksilver—Unchanged at $115. Stocks in this market are very light, but there are large supplies in transit that are overdue. San Francisco reports, by telegraph, $112.50, firm.

Gold, Silver and Platinum

Silver—This market has been steady to firm with but little variation in the price. The holiday season has created dulness but the demand is likely to be revived with the opening of business after the English Boxing Day, Dec. 26, which is a London holiday.

Mexican dollars at New York: Dec. 20, 68c.; 21, 68½c.; 22, 68½c.; 24, 68½c.; 25, ...; 26, 68½c.

Platinum—In fair demand at $105 per oz.

Palladium—In brisk demand at $130@$135.

Zinc and Lead Ore Markets

Joplin, Mo., Dec. 22 — Blende, per ton, high $71.40; basis 60% Zn, premium $70; medium to low, $60@50; calamine, basis 40% Zn, $38@35; average selling price, all grades of zinc, $54.62 per ton.

Lead, high, $81.50; basis 80% Pb, $75; average selling price, all grades of lead, $72.94 per ton.

Shipments the week: Blende, 7727 tons; calamine, 273 tons; lead, 1438 tons, Value, all ores the week, $541,810.

The larger part of the zinc shipments is on coal cars, and word was in circulation today these are to be withdrawn. All buyers are asking and insisting they receive more cars, being short their requirements while using coal cars. If these be withdrawn mining here will be greatly restricted.

Platteville, Wis., Dec. 22—Blende, basis 60% Zn, $62 base for premium grade down to $57 base for second grade. Lead ore, basis 80% Pb, $75 per ton. Shipments reported for the week are 3578 tons of zinc ore, 258 tons of lead ore, and 678 tons of sulphur ore. For the year to date the figures are: 145,076 tons of zinc ore, 7119 tons of lead ore, and 28,015 tons of sulphur ore. Shipped during the week to separating plants, 4455 tons of zinc ore.

Other Ores

Antimony Ore—Quoted nominally at $1.75 per unit.

Manganese Ore—Metallurgical ore is unchanged at $1.20 per unit, for 48% grade, delivered to buyers.

Molybdenum Ore—Considerable business was reported at $2.25@2.30 per lb. of molybdenum sulphide, basis 90%.

Iron Ore—While at the initial agreement between the Government and the iron and steel trade, the result of which was announced Sept. 24, it was arranged that Lake Superior ore should continue at the 1917 season prices, based on $5.05 for Mesabi nonbessemer at Lake Erie dock, it was understood that the price was to be modified to the extent of any change in the Lake rate from the standard $1 rate for 1917. There is talk now in some quarters of seeking for advanced prices for the 1918 season, however. The movement down the Lakes has been barely sufficient to tide the furnaces over until the opening of navigation next year.

Upper Lake shipping ports have sent down their last iron ore cargoes and the Lake movement for the season is now estimated at 62,300,000 to 62,400,000 tons, December yielding rather a smaller total than seemed probable after the extraordinary performance in November.

Pyrites—Spanish lump is quoted at 15c. per unit, on basis of 10s. ocean freight, buyer to pay excess freight and war risk, except that concession of 2% of war risk is allowed. Ocean rates remain at 35s. for Northern, 40s. for Southern and 42s. 6d. for Gulf ports, but recent charters have exceeded these rates in several instances.

Tungsten Ore—Scheelite was sold at $26, and high-grade wolframite, at $24.50. Vigorous inquiry, both foreign and domestic, produced strength in this market.

Iron Trade Review

NEW YORK—Dec. 26

In the closing days of 1917 the steel trade has the satisfaction of knowing that it will enter the new year free from the fear that present price schedules may be overturned, says "Iron Age." The War Industries Board, after a conference on Saturday with the Federal Trade Commission, recommended to the President the indefinite extension after Jan. 1 of the prices promulgated late in September and those built upon them in the last three months.

It is expected that the President will issue a proclamation shortly extending the operation of the present schedule. Whether a definite period will be named remains to be seen, but it is believed that some readjustments will come within the next 90 days.

Recent rumors of a sentiment in a part of the Federal Trade Commission in favor of some reduction in pig iron led to a meeting of merchant producers in New York Dec. 20 at which a committee was appointed to present the case of the smaller furnaces. It was urged that a reduction in price would cause some of them to close down and only aggravate the existing famine in pig iron.

The manufacturers' committee on steel and steel products made an important announcement of additional prices this week, putting forging ingots at $73 per ton, splice bars and tie plates at 3.25c. per lb., rail steel bars at 3c., steel spikes at 3.90c., iron spikes at 4.50c., track bolts at 4.90c. and cut nails at $4 per keg.

PITTSBURGH—Dec. 24

Operating conditions in the iron and steel industry have improved slightly but are still altogether unsatisfactory. A few of the banked blast furnaces have resumed as more Connellsville coke has come through, while the byproduct ovens are working better and their attendant blast furnaces are now nearly all running. The steel works that were short of coal have been receiving somewhat better shipments, although still far from a full supply.

The restriction in output is usually exaggerated. Pig-iron production thus far in the month has averaged 75 to 80% of capacity in the central west, against an average of about 90% of capacity earlier in the year, and the output of ingots is short of capacity by a somewhat larger margin. There is question, indeed, whether the steel capacity could operate full if the blast furnaces were running full, as there has been more building of steel furnaces than of blast furnaces.

Practically the entire restriction of production in the iron and steel industry is due to insufficient freight movement, first of coke, next of coal and then of a few minor items.

There is now practically no expectation that iron and steel prices, as set under Government auspices, will be revised in the near future. The prices appear to be satisfactory to the trade and trouble might result from a downward revision and the market would certainly be disturbed.

Ordinary commercial buying of steel products has dropped to practically nothing, but Government orders are heavy and there is also considerable buying by manufacturers who have Government orders for their finished product. Commercial consumption has decreased and consumers seem to be well covered by existing contracts.

Pig Iron—If the merchant furnaces had been able to operate full during the last few weeks they would probably have a little iron to spare, but as it is they are behind in contract deliveries and have nothing to offer. Regular market buyers of pig iron seem to be fairly well supplied, but the steel works would buy considerable iron if it was to be had, to supplement their own make, which has been curtailed. The set prices continue to represent the market: Bessemer, $36.30; basic and foundry, $33; malleable, $33.50; forge, $32.50, f.o.b. furnace, the freight from valley furnaces to Pittsburgh being 95c. A sale of a round block of Alabama basic has been made for shipment to Pittsburgh, at $33, f.o.b. furnace, the freight being $4.55.

Steel—Occasionally an odd lot of soft-steel billets or sheet bars can be picked up in the open market, but the aggregate tonnage is insignificant. Discard steel arising in the manufacture of shell quality is plentiful and will be rolled to any size of billets, usually at about $2.50 discount from the set prices for soft steel. Demand for this steel is limited as it is not suited to most requirements, but consumers may modify their views when they find soft steel almost unobtainable and discard steel in such good supply. The set prices remain at $47.50 for billets, $51 for small billets, $50 for slabs, $51 for sheet bars and $57 for wire rods.

Ferroalloys

Ferromanganese — The market continue quiet, with $215 usually quoted, and sometimes shaded, for prompt or forward. The Geological Survey reports the production of manganese ore increasing rapidly, with 70,225 tons shipped in the first nine months of this year and 52,000 tons estimated for the last three months, while 1918 production is forecast at 175,000 to 200,000 tons. The last named would be nearly one-third the total requirements, assuming no imports of ore or alloy.

Coke

Connellsville — Car supplies have increased somewhat since the cold wave of a fortnight ago, but are still quite insufficient to maintain full production. The furnaces that have coke ovens of their own are on the whole suffering much more from coke shortage than are the furnaces that use purchased coke, so that price-fixing has nothing to do with this shortage. A merchant furnace in Pittsburgh was banked for a week only 50 miles from its coke ovens, and with a five days' supply of coke lying on railroad sidings between. Set prices remain at $6 for furnace, $7 for 72-hour selected foundry and $7.30 for crushed, over 1 in., per net ton at ovens.

STOCK QUOTATIONS

N. Y. EXCH.†	Dec. 24
Alaska Gold M	2
Alaska Juneau	2
Am.Sm.& Ref.com	71
Am. Sm. & Ref., pf	100
Am. Sm. Sec., pf., A	90
Am. Sm. Sec., pf. B	196
Am. Zinc.	12
Am. Zinc, pf	35
Anaconda	56
Batopilas Min	1
Bethlehem Steel	71
Bethlehem Steel, pf	95
Butte & Superior	15
Cerro de Pasco	28
Chile Cop	14
Chino	39
Colo Fuel & Iron	33
Crucible Steel	50
Dome Mines	9
Federal M. & S	8
Federal M. & S., pf	30
Great Nor., ore ctf	24
Greene Cananea	35
Gulf States Steel	85
Homestake	‡90
Inspiration Con	40
International Nickel	27
Kennecott	30
Lackawanna Steel	74
Miami Copper	26
Nat'l Lead, com	40
National Lead, pf	98
Nev. Consol	17
Ontario Min	5
Quicksilver	‡ .50
Quicksilver, pf	‡
Ray Con	20
RepublicI.&S.,com.	76
Republic I. & S., pf	90
Sloss-Sheffield	35
Tennessee C. & C.	11
U. S. Steel, com	85
U. S. Steel, pf	104
Utah Copper	75
Va. Iron C. & C	48

N. Y. CURB†	Dec. 24
Big Ledge.	1
Butte & N. Y.	‡ .75
Butte C. & Z	6
Butte Detroit	
Caledonia	45
Calumet & Jerome.	1
Can. Cop. Corpn	1
Carlisle	‡2
Cashboy	03
Con. Ariz. Sm.	1
Con. Coppermines	6
Con. Nev.-Utah.	‡
Emma Con	50
First Nat. Cop.	1
Goldfield Con.	33
Goldfield Merger.	.03
Greenmonster.	
Hecla Min	4
Howe Sound	‡3
Jerome Verde	
Kerr Lake	14
Louisiana	.50
Magma	39
Majestic	29
McKinley-Dar-Sa	.57
Milford	1
Mohican	‡
Mother Lode	26
N. Y. & Hond	‡12
Nipissing Mines.	8
Nixon Nevada	1
Ohio Cop	
Ray Hercules	‡3
Richmond	‡ .56
Rochester Mines	.30
St. Joseph Lead	15
Standard S. L.	
Stewart	25
Success	09
Tonopah	3
Tonopah Ex	
Tribullion	‡
Troy Arizona	.15
United Cop	‡ .50
United Verde Ext	35
United Zinc	‡1
Utica Mines	12
Yukon Gold	1

SAN FRAN.*	Dec. 22
Alta	‡ .03
Andes	‡ .07
Best & Belcher	‡ 02
Bullion	‡ 01
Caledonia	‡ 05
Challenge Con	‡ 04
Confidence	‡ 06
Con. Virginia	14
Gould & Curry	‡ 01
Hale & Norcross	‡ 02
Jacket-Cr. Pt	08
Mexican	08
Occidental	‡ 60
Ophir	04
Overman	‡ 04
Savage	‡ 03
Sierra Nevada	‡ 13
Union Con	82
Utah Con	‡ 01
Belmont	2 90
Jim Butler	72
MacNamara	18
Midway	05
Mont.-Tonopah	‡ 10
North Star	05
Rescue Eula	08
West End Con	67
Atlanta	07
Booth	02
Comb. Frac	01
D'field Daisy	‡ 02
Florence	‡ 09
Jumbo Extension	13
Kewanas	‡ 04
Nevada Hills	05
Nevada Packard	‡ 15
Round Mountain	‡ 20
Silver Pick	‡ 04
White Caps	‡ 51
Big Jim	‡ 75
United Eastern	‡3 62

BOSTON EXCH.*	Dec. 24
Adventure	1
Ahmeek	72
Algomah	25
Allouez	45
Ariz. Com., ctfs	10
Arnold	‡ .20
Bonanza	21
Butte-Balaklava.	25
Calumet & Ariz	59
Calumet & Hecla.	415
Centennial	12
Copper Range	42
Daly West	1
Davis-Daly	4
East Butte	8
Franklin	4
Granby	70
Hancock	7
Hedley	‡15
Helvetia	25
Indiana	75
Isle Royale	21
Keweenaw.	1
Lake	5
La Salle	1
Mason Valley	4
Mass	5
Mayflower.	.75
Michigan.	1
Mohawk	58
New Arcadian	1
New Idria	13
North Butte	12
North Lake	.25
Ojibway.	.75
Old Dominion	38
Osceola	54
Quincy	64
St. Mary's M	49
Santa Fe	60
Seneca	6
Shannon	5
Shattuck-Ariz	14
So. Lake	1
So. Utah	10
Superior	4
Superior & Bost.	2
Trinity	3
Tuolumne	1
U. S. Smelting	43
U. S. Smelt'g, pf	44
Utah Apex	2
Utah Con	9
Utah Metal	2
Victoria	2
Winona	1
Wolverine	31
Wyandot	.50

BOSTON CURB*	Dec. 24
Alaska Mines Corp.	.25
Bingham Mines	8
Boston Ely	.65
Boston & Mont	.38
Butte & Lon'n Dev.	.13
Calaveras	1
Calumet-Corbin.	‡ 01
Chief Con.	1
Cortez	.10
Crown Reserve.	.25
Crystal Cop	.48
Eagle & Blue Bell.	2
Gila Copper.	17
Houghton Copper	60
Intermountain	70
Iron Cap, Com	12
Iron Cap Cop., pf.	‡14
Mexican Metals	.24
Mines of America	1
Mojave Tungsten.	18
Nat. Zinc & Lead.	25
Nevada-Douglas.	1
New Baltic	75
New Cornelia	14
Oneco.	25
Pacific Mines	‡ .35
Rex Cons	.10

SALT LAKE*	Dec. 18
Bannack	26
Big Four	‡ 01
Cardiff	2 50
Colorado Mining	06
Daly	1 00
Daly-Judge	6 50
Empire Copper.	1 12
Gold Chain	14
Grand Central	58
Iron Blossom	60
Lower Mammoth.	.03
May Day	01
Moscow	11
Prince Con	51
Rico Wellington	18
Silver-King Coal'n	2 25
Silver King Con	2 60
Sioux Con.	02
So. Hecla	70
Tintic Standard	1 45
Uncle Sam	02
Wilbert	17
Yankee	02

TORONTO*	Dec. 18
Adanac	10
Bailey	05
Beaver Con	25
Chambers Ferland	10
Coniagas	3 00
Hargraves	08
La Rose.	43
Peterson Lake	09
Temiskaming	27
Wettlaufer-Lor	04
Davidson	28
Dome Exten	09
Dome Lake	13
Hollinger	4 90
McIntyre	1 37
Newray	30
Porcu. Crown	23
Teck-Hughes	25
Vipond	10
West Dome	13

STOCK QUOTATIONS—Continued

COLO. SPRINGS	Dec. 22
Cresson Con.	4 75
Doctor Jack Pot	.03
Elkton Con	04
El Paso	15
Gold Sovereign.	.02
Golden Cycle	1 46
Granite	46
Isabella	.07
Mary McKinney	.06
Portland	1 14
United Gold M	15
Vindicator	.37

LONDON	Dec. 6
Alaska Tre'dwell	‡£1 0s 0d
Burma Corp	3 18 9
Cam & Motor	0 10 6
Camp Bird	0 7 0
El Oro	0 8 6
Esperanza.	0 8 0
Mexican Mines	5 18 9
Min. Corp. Can.	0 16 6
Nechi, pfd.	0 9 9
Oroville	0 19 3
Santa Gert'dis.	0 13 0
Tomboy.	1 0 9

* Bid prices. † Closing prices ‡ Last Quotations.

MONTHLY AVERAGE PRICES OF METALS

Silver	New York			London		
	1915	1916	1917	1915	1916	1917
Jan.	48 855	56 775	75 630	22 731	26 960	36 682
Feb	48 477	56 755	77 585	22 753	26 975	37 742
Mar.	50 241	57 035	73 861	23 708	27 597	36 410
April	50 250	64 415	73 875	23 709	30 662	36 963
May	49 915	74 269	74 745	23 570	35 477	37 940
June	49 034	65 024	76 971	23 267	31 060	39 065
July	47 519	62 940	79 010	22 597	30 000	40 110
Aug.	47 163	66 083	85 407	22 780	31 498	43 418
Sept.	48 680	68 515	100 740	23 591	32 584	50 920
Oct.	49 385	67 855	87 332	23 925	32 361	44.324
Nov.	51 714	71 604	85 891	25 094	34 192	43 584
Dec	54 971	75.765		26.373	36 410	
Year	49 684	65 661		23 675	31 315	

New York quotations cents per ounce troy, fine silver, London, pence per ounce, sterling silver, 0.925 fine.

Copper	New York		London			
	Electrolytic		Standard		Electrolytic	
	1916	1917	1916	1917	1916	1917
Jan.	24 008	28 673	88 083	131 921	116.167	142 895
Feb	26 440	31 750	102 667	137 895	133.167	148 100
Mar.	26 310	31 481	107 714	136 750	136 000	151 000
April	27 895	27 935	124 319	133 842	137 389	147.158
May	28 625	28 788	135 457	130 000	152 522	142 000
June	26 601	29 962	112 432	130 000	137 455	142 000
July.	23 865	26 620	95 119	128 409	125 500	140.409
Aug	26 120	25 380	110 283	122 391	126 304	137 000
Sept	26 855	25 023	113 905	117 500	134 071	135.250
Oct.	27 193	23 500	122 750	110 000	142 523	125.000
Nov	30 625	23 500	134 659	110 000	155 432	125.000
Dec	31 890		145.315		162 842	..
Year	27 202	..	116 059	..	138 281	.. ..

Tin	New York		London	
	1916	1917	1916	1917
January	41 825	44 175	175 548	185.813
February	42.717	51 420	181 107	198 974
March	50.741	54 388	193 609	207.443
April	51 230	55 910	199 736	220.171
May	49 125	63.173	196.511	245 114
June	42 231	62 053	179 466	242 083
July	38 510	62 520	168 357	242 181
August	38 565	62 681	169 870	243 978
September	38.830	61 542	171.345	244 038
October	41 241	61.851	179 307	247.467
November	44 109	74.740	186.932	274 943
December	42 635		183 368	..
Av. year	43.480	.. ..	182 096	..

Lead	New York		St. Louis		London	
	1916	1917	1916	1917	1916	1917
January.	5 921	7 626	5 826	7 530	31 167	30 500
February	6 246	8 636	6 164	8 595	31 988	30 500
March	7 136	9 199	7 375	9 120	34 440	30 500
April	7 630	9 288	7 655	9 158	34 368	30 500
May	7 463	10 207	7 332	10 202	32 967	30 500
June	6 936	11 171	6 749	11 123	31 011	30.500
July	6 352	10 710	6 185	10 644	28 137	30.500
August	6 244	10 594	6 088	10.518	29 734	30 500
September	6 810	8 680	6 699	8 611	30.786	30 500
October	7 000	6 710	6 898	6.650	30.716	30.500
November	7 042	6 249	6 945	6.187	30 500	30.500
December	7 513		7 405		30 500	.
Year	6 858		6 777		31 359	..

Spelter	New York		St. Louis		London	
	1916	1917	1916	1917	1916	1917
Jan	16 015	9 619	16 745	9 449	89 810	48 329
Feb	18 420	10 045	18 260	9 875	97 762	47 000
Mar	16 846	10 300	16 676	10.130	95.048	47 000
April	16 695	9 459	16 525	9 280	99 056	54 632
May	14 276	9 362	14 106	9 192	94 217	54 000
June	11 752	9 371	11 582	9 201	68 591	54 000
July	8 925	8 643	8 755	8 473	50.750	54 000
Aug	8 730	8 360	8 560	8 190	51 587	54 000
Sept	8 990	8 136	8 820	7 966	52 095	54 000
Oct	9 829	7 983	9 659	7 813	54 159	54 000
Nov	11 592	7.847	11 422	7 672	56 023	54 000
Dec	10 665		10 495		55 842	.
Year	12 804	.. .	12 634		72 071	

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton.

Pig Iron, Pgh	Bessemer‡		Basic‡		No. 2 Foundry	
	1916	1917	1916	1917	1916	1917
January	$21 60	$35 95	$18 78	$30 95	$19 70	$30 95
February	21 16	30 37	18 03	30 95	19 51	30.95
March	21 81	37 37	19 20	33 49	19 45	35 91
April	21 65	42 23	18 05	38 90	19 45	40 06
May	21 78	46 04	19 11	42 84	19 58	43 60
June	21 95	54 22	18 05	50 05	19 34	50 14
July	21 95	57 45	18 95	53 80	19 20	53 95
August	21 95	54 17	18 95	50 37	19 22	53 95
September	22 88	46 40	19 58	42 24	19 53	48 58
October	24 61	37 25	21 20	33 95	21 61	33 95
November	30 07	37 25	28 18	33 95	26 55	33 95
December	35 16		30 05		30 79	
Year	$23 88		$20 98		$21 15	

‡ As reported by W. P. Snyder & Co.

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